Loss of products
Loss of biodiversity
Climate change

Three Problems - One Solution

Dr John Kerr
Loss of products

EU on brink of historic decision on pervasive glyphosate weedkiller

Glyphosate is found in 60% of UK bread and environmentalists welcome a ban but industry warn of uproar among farmers if herbicide is phased out.
Plant Protection Product Availability

Figure 3: Swing of overall R&D expenditure towards seeds and traits

- Agchem
- Seed Traits

Phillips McDougall (for ECPA)
Biodiversity Loss and CO2 Emissions

The Anthropocene
Breeding Bird Survey

Birds by name

Spotted flycatcher
Nitrogen Fertiliser

With average crop yields remaining at the 1900 level the crop harvest in the year 2000 would have needed four times more land and claimed nearly half of all ice-free continents, rather than under 15% that is required today.
Global Population

The diagram shows the global population over time, with different eras marked by timelines:

- **Paleolithic** (-8000 to -4000)
- **Neolithic** (-4000 to -3000)
- **Bronze Age** (-3000 to -2000)
- **Iron Age** (-2000 to 1)
- **Middle Ages** (1 to 1000)
- **Modern Era** (1000 to 2015)

The population is visualized on the right side, with a significant increase beginning around 1800, continuing to rise until 2015, peaking at 7 billion in 2011.
Critical Limits versus Competing Objectives
Farmers do not grow crops in schools of thought. The important thing is what is commonly agreed.
“Anyone who believes in indefinite growth on a physically finite planet is either mad, or an economist.”

— David Attenborough
“Anyone who believes in indefinite growth in anything physical, on a physically finite planet,’ he said,’ is either mad – or an economist.”

Kenneth Boulding, an Economist and President Kennedy’s environmental advisor forty five years ago
Political Context
“The last thing we want is to leave environmental debts for our children to clear up” “No generation has a freehold on this earth. All we have is a life tenancy – with a full repairing lease.”   Tory conference 1988
“In Scotland we are determined to play a leading role in developing the thinking about the concept [of natural capital] and its application.”

To World Forum on Natural Capital Edinburgh 2015
Natural Capital and Ecosystem Services

Natural Capital has been defined as the world’s *stocks* of natural assets which include geology, soil, air, water and all living things. It is from these *stocks* that we derive the *flow* of ecosystem services that sustain people.
Natural Capital: Agricultural Land (*stock*)

Ecosystem service: food (*flow*)
Since these flows of services have value the emerging system of natural capital accounting could, if harnessed properly, deliver that value as income to those who can demonstrably protect and improve the flow of these services.

Businesses able to maintain and enhance their stock of natural capital will be best placed in the future to reap the rewards of their investment.
The IUCN Model

No Net Loss and Net Positive Impact Approaches for Biodiversity

Exploring the potential application of these approaches in the commercial agriculture and forestry sectors

GLOBAL BUSINESS AND BIODIVERSITY PROGRAMME
STAGE 1: Identify priority biodiversity values in the region and define NPI goals

STAGE 2: Map locations, compile trends, and establish a baseline or reference frame of the selected biodiversity features
Targets and Baseline

Priority Project 10: Improving ecological connection
Project Priority 11: Sustainable land management
The Mitigation Hierarchy

Net positive impact

Additional conservation actions

Biodiversity values

Biodiversity impact

Biodiversity impact

Biodiversity impact

Biodiversity impact

Offset

Offset

Residual impact

Restoration

Restoration

Restoration

Minimization

Minimization

Minimization

Minimization

Avoidance

Avoidance

Avoidance

Avoidance

Avoidance

Avoidance

Avoidance
STAGE 3: Overlay production plans on biodiversity map and apply mitigation hierarchy.

Avoid
Minimise
Restore
Offset
Offset (compensate)
What does that mean in practice?
Virus Control in Finland (high grade region)

Problem of PVY increase in Finland.

Insecticides were found to be not effective in controlling PVY transmission.

Control could be achieved by discouraging aphids from feeding on young plants using a straw much. In conjunction with healthy seed.

Growers in Finland are gaining control of PVY using this method (Kirchner et al., 2014).
Tuber moth control in Victoria Australia

Victoria Australia potato growers were suffering major problems due to potato tuber moth.

Entomologist Paul Horne demonstrated an abundance of naturally occurring biological control agents for PTM.

Beneficial insects very susceptible to insecticides used to control virus vectors.

By eliminating use of insecticides, with a switch to use of virus tested seed, Victorian seed potato growers now control PTM and maintain control of virus.

Sprays reduced from 7 per year to zero over ten years.
An infestation of soft rush is **bad for both** farmers and biodiversity outcomes.

Ayrshire, Caithness and Strathspey are all examples of **successful partnership working** between farmers and conservation bodies.

**Control measures include** topping, **weed wiping** and reseeding.

All these measures improve both grazing and habitat value **attracting financial support.**