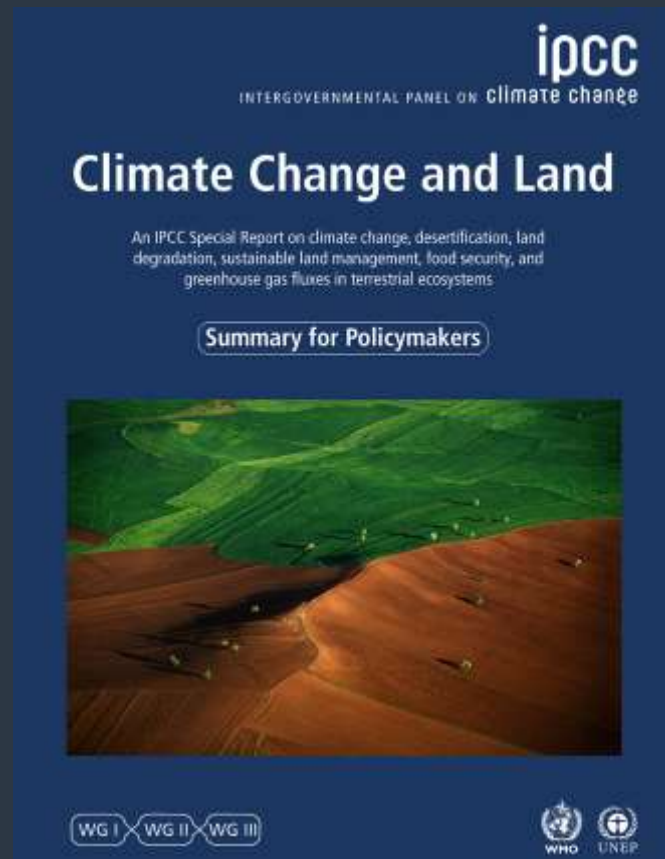


Introduction to the IPCC Special Report on Climate Change and Land

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Trinity College Dublin and IPCC WGIII TSU

Oxford Real Farming Conference

Oxford, UK, Wednesday 8th January 2020



- 1: Framing and Context
- 2: Land-Climate Interactions
- 3: Desertification
- 4: Land Degradation
- 5: Food Security
- 6: Interlinkages between desertification, land degradation, food security and GHG fluxes: Synergies, trade-offs and Integrated Response Options
- 7: Risk management and decision making in relation to sustainable development

Report Structure

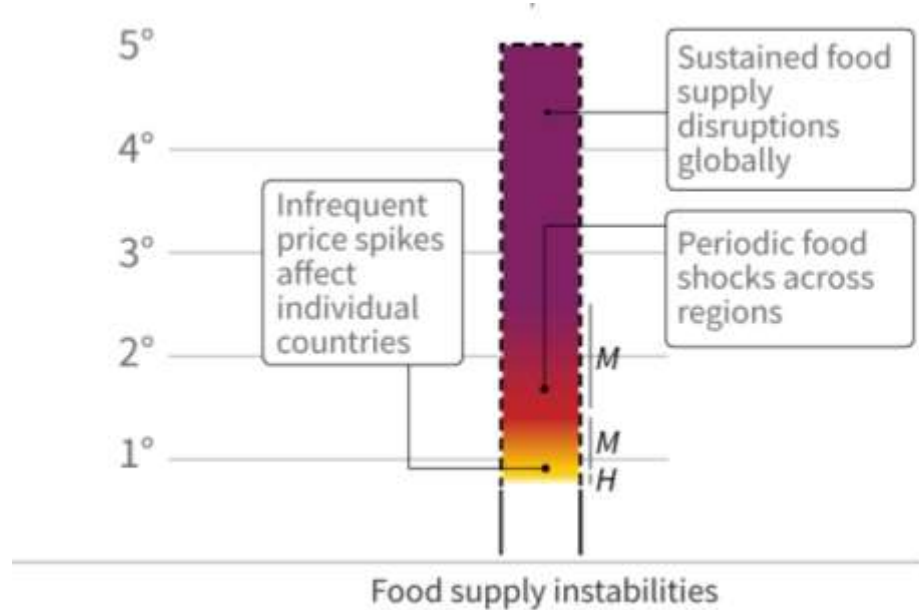
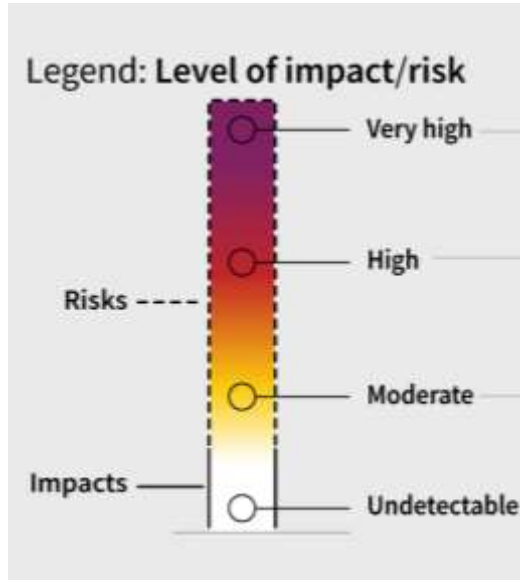
“ Land is a critical resource – we rely on it for food, water, health and wellbeing – but it is already under growing human pressure. Climate change is adding to these pressures



Climate change - making a challenging situation worse

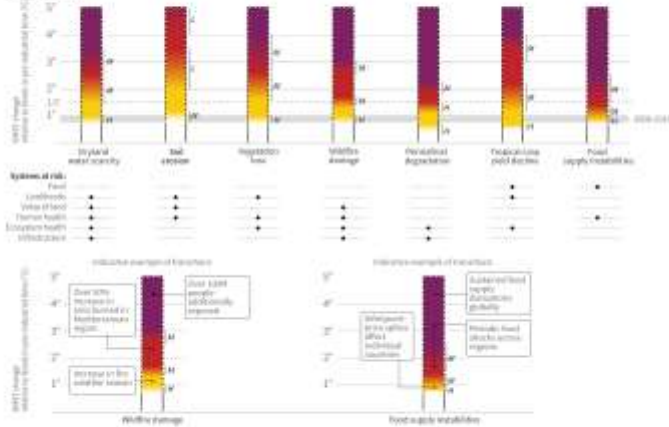
- The temperature over the land surface has already increased almost twice the global average
- Climate zones are shifting. Many extreme events have become more frequent and intense
- Future climate change will cause reduced crop yields and increased food prices
- Land degradation occurs over $\frac{1}{4}$ of the Earth's ice-free land area – driven primarily by unsustainable land management
- Climate change exacerbates the rate and magnitude of land degradation processes
- **In a warmer climate the capacity of land to store carbon can be reduced**

Assessment of risk – example: food supply instabilities



A. Risks to humans and ecosystems from changes in land-based processes as a result of climate change

Increases in global mean surface temperature (GMST), relative to pre-industrial levels, affect processes involved in desertification (water scarcity), land degradation (soil erosion, vegetation loss, salinisation, permafrost thaw) and food security (crop yields and food supply instabilities). Changes in these processes threaten risks to food systems, livelihoods, infrastructure, the value of land, and human and ecosystem health. Changes in one process (e.g. wildfire or water scarcity) may result in compound risks. Risks are location-specific and differ by region.



B. Different socioeconomic pathways affect levels of climate related risks

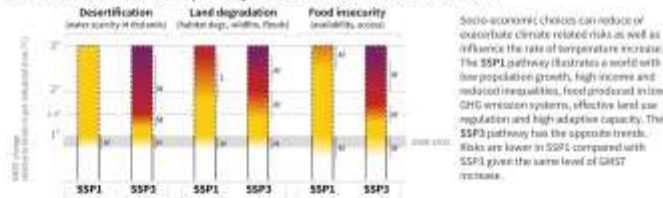


Figure SPM.2

- Current levels of global warming are associated with **moderate risks** for soil erosion, vegetation loss, coastal degradation and tropical crop yield decline
- At around 2.0°C of global warming risks from permafrost degradation, and food supply instabilities are projected to be **very high**
- Socioeconomic pathways also affect levels of risk associated with different temperature levels

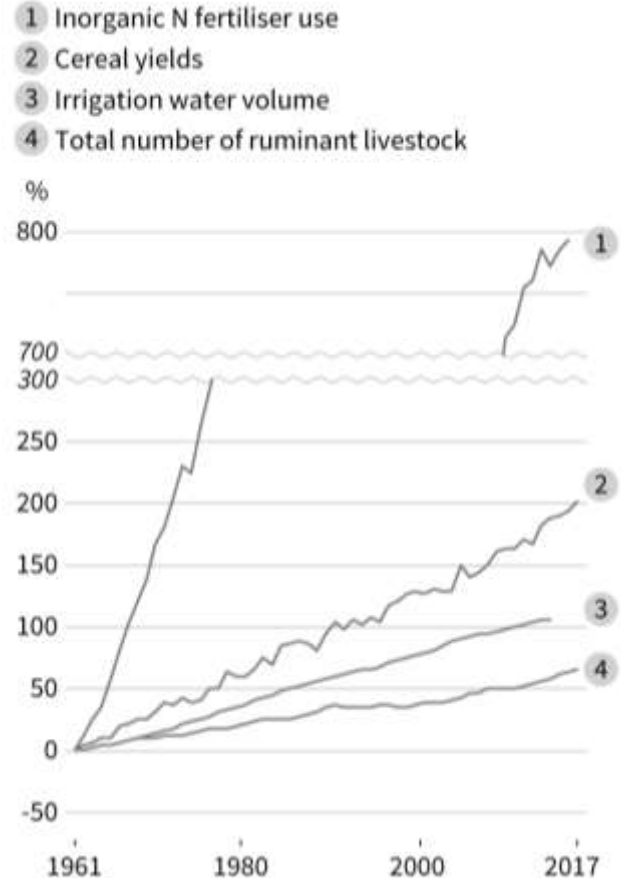


Agriculture, food production, and deforestation are major drivers of climate change.

Intensification – consumption and production

- Population growth and changes in the consumption of food, feed, fiber, timber and energy have driven land use intensification
- Since 1961 cereal crop yields have increased by over 200%
- Over the same period there has been around an **800% increase** in the rate of nitrogen fertilizer used
- There has also been a marked increase in **ruminant livestock** numbers and the amount of **water used for irrigation**
- At the same time **25-30%** of food produced globally is lost or wasted

CHANGE in % rel. to 1961



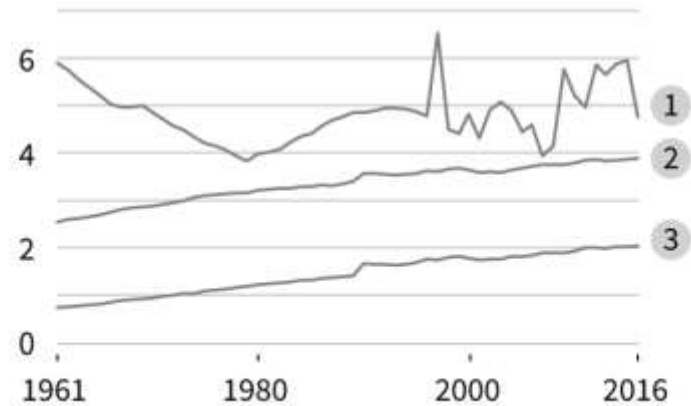
Trends in global GHG emissions

- Agriculture, forestry and other types of land use account for 23% of human GHG emissions
- Since 1961 steady increase in CH₄ and N₂O from agriculture
- This has been driven by changes in the scale and intensity of land use
- At the same time **land is also a major carbon sink** – absorbing an equivalent of almost a third of CO₂ emissions from fossil fuels and industry

CHANGE in EMISSIONS since 1961

- 1 Net CO₂ emissions from FOLU (GtCO₂ yr⁻¹)
- 2 CH₄ emissions from Agriculture (GtCO₂eq yr⁻¹)
- 3 N₂O emissions from Agriculture (GtCO₂eq yr⁻¹)

GtCO₂eq yr⁻¹

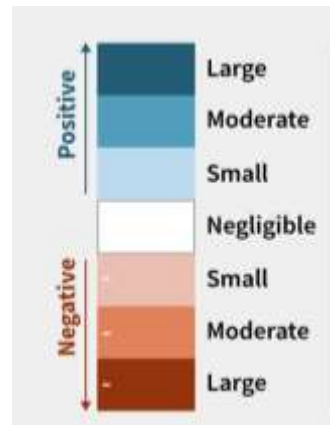




There are **actions available** to us that can simultaneously **improve land, enhance food security and improve nutrition.**

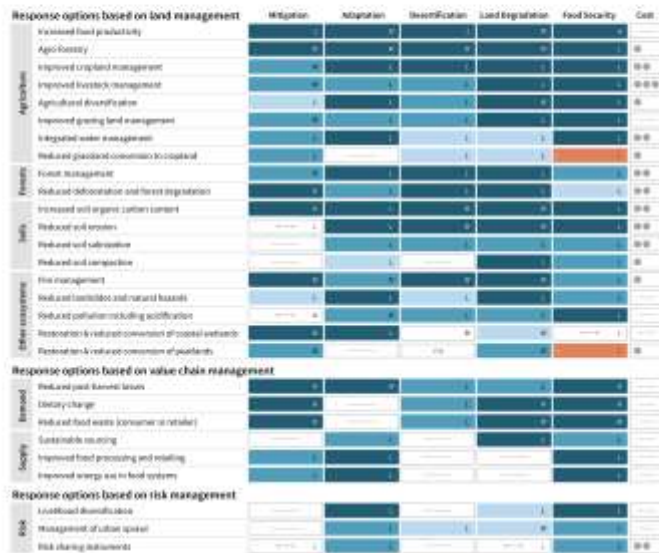
Response options based on land management

| | Mitigation | Adaptation | Desertification | Land Degradation | Food Security | Cost | |
|------------------|------------------------------------------------------|------------|-----------------|------------------|---------------|------|-----|
| Agriculture | Increased food productivity | L | M | L | M | H | — |
| | Agro-forestry | M | M | M | M | L | ● |
| | Improved cropland management | M | L | L | L | L | ●● |
| | Improved livestock management | M | L | L | L | L | ●●● |
| | Agricultural diversification | L | L | L | M | L | ● |
| | Improved grazing land management | M | L | L | L | L | — |
| | Integrated water management | L | L | L | L | L | ●● |
| | Reduced grassland conversion to cropland | L | — | L | L | L | ● |
| Forests | Forest management | M | L | L | L | L | ●● |
| | Reduced deforestation and forest degradation | H | L | L | L | L | ●● |
| Soils | Increased soil organic carbon content | H | L | M | M | L | ●● |
| | Reduced soil erosion | ↔ L | L | M | M | L | ●● |
| | Reduced soil salinization | — | L | L | L | L | ●● |
| | Reduced soil compaction | — | L | — | L | L | ● |
| Other ecosystems | Fire management | M | M | M | M | L | ● |
| | Reduced landslides and natural hazards | L | L | L | L | L | — |
| | Reduced pollution including acidification | ↔ M | M | L | L | L | — |
| | Restoration & reduced conversion of coastal wetlands | M | L | M | M | ↔ L | — |
| | Restoration & reduced conversion of peatlands | M | — | na | M | L | ● |



Potential global contribution of response options to mitigation, adaptation, combating desertification and land degradation, and enhancing food security

Panel A shows response options that can be implemented without or with limited competition for land, including some that have the potential to reduce the demand for land. Co-benefits and adverse side effects are shown quantitatively based on the high end of the range of potentials assessed. Magnitudes of contributions are categorised using thresholds for positive or negative impacts. Letters within the cells indicate confidence in the magnitude of the impact relative to the threshold used (see legend). Confidence in the direction of change is generally higher.



Options shown are those for which data are available to assess global potential for three or more food challenges. The magnitudes are assessed independently for each option relative to a baseline.



Figure SPM.3

- Global assessment – land-based options are not additive
- Many of these response options can be of benefit across multiple challenges, are at an advanced technology level and many are relatively low cost
- However, report found that the scale of deployment of some response options is a cause of concern
- Specifically, the deployment of **bioenergy, reforestation, afforestation and biochar** needs to be implemented carefully to avoid negative effects on food security and biodiversity



The way we produce our food matters; dietary choices can help reduce emissions and pressure on land.

Summary for policy makers: B.6.2

*Diversification in the food system (e.g., implementation of integrated production systems, broad-based genetic resources, and diets) can reduce risks from climate change (medium confidence). **Balanced diets, featuring plant-based foods, such as those based on coarse grains, legumes, fruits and vegetables, nuts and seeds, and animal-sourced food produced in resilient, sustainable and low-GHG emission systems, present major opportunities for adaptation and mitigation while generating significant co-benefits in terms of human health (high confidence).** By 2050, dietary changes could free several million km² (medium confidence) of land and provide a technical mitigation potential of 0.7 to 8.0 GtCO₂ eq yr⁻¹, relative to business as usual projections (high confidence). Transitions towards low-GHG emission diets may be influenced by local production practices, technical and financial barriers and associated livelihoods and cultural habits (high confidence). {5.3, 5.5.2, 5.5, 5.6}*

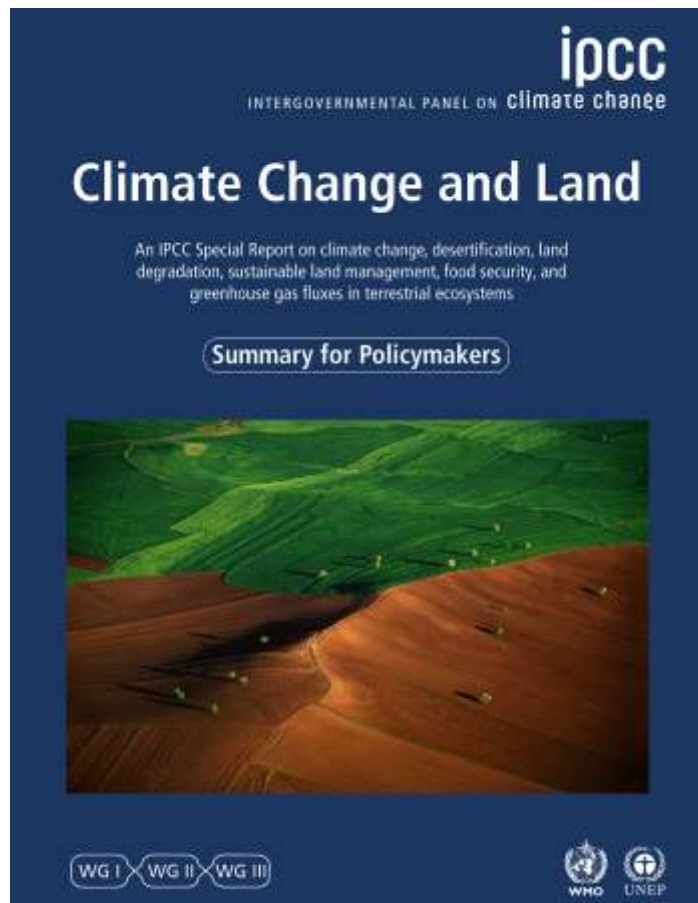


Response options – summary

- Protect current **carbon stocks** and restore degraded ecosystems (peatlands, forests)
- Increased bioenergy and forestry cover – sustainable implementation required
- **Food system – production:** improved livestock and pasture management, agricultural diversification, agroforestry, and increasing soil carbon
- **Food system – demand:** moving towards more plant-based diets and animal sourced food produced in sustainable and low-GHG emission systems
- Reducing **food loss and waste** (25-30% currently lost or wasted)

“ **Better land management can play its part in tackling climate change, but it can't do it all.**

- Reducing greenhouse gas emissions from all sectors is essential if we want to keep below 2°C



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