Special Report on Climate Change and Land

Current estimates of land-related global emissions and mitigation potentials

Agricultural landscape between Ankara and Hattusha, Anatolia, Turkey (40°00' N – 33°35' E)

www.ipcc.ch/report/SRCCL

Louis Verchot
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INTERGOVERNMENTAL PANEL ON climate change

WMO UNEP

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Gas	Units	Net anthropogenic emissions due to Agriculture, Forestry, and Other Land Use (AFOLU)			Non-AFOLU anthropogenic GHG emissions[6]	Total net anthropogenic emissions (AFOLU + non-AFOLU) by gas	AFOLU as a % of total net anthropogenic emissions, by gas	Natural response of land to human-induced environmental change[7]		Net land – atmosphere flux from all lands
Panel 1: Contribution of AFOLU										
		FOLU	Agriculture	Total						
		A	B	C = A + B	D	E = C + D	F = (C/E) *100	G		A + G
CO_2[2]	Gt CO_2 y^{-1}	5.2 ± 2.6	No data[11]	5.2 ± 2.6	33.9 ± 1.8	39.1 ± 3.2	13%	-11.2 ± 2.6		-6.0 ± 3.7
CH_4[3,8]	Mt CH_4 y^{-1}	19.2 ± 5.8	141.6 ± 42.5	160.8 ± 43	201.3 ± 100.6	362 ± 109				
	Gt CO_2e y^{-1}	0.5 ± 0.2	4.0 ± 1.2	4.5 ± 1.2	5.6 ± 2.8	10.1 ± 3.1	44%			
N_2O[3,8]	Mt N_2O y^{-1}	0.3 ± 0.1	8.3 ± 2.5	8.7 ± 2.5	2.0 ± 1.0	10.6 ± 2.7				
	Gt CO_2e y^{-1}	0.09 ± 0.03	2.2 ± 0.7	2.3 ± 0.7	0.5 ± 0.3	2.8 ± 0.7	81%			
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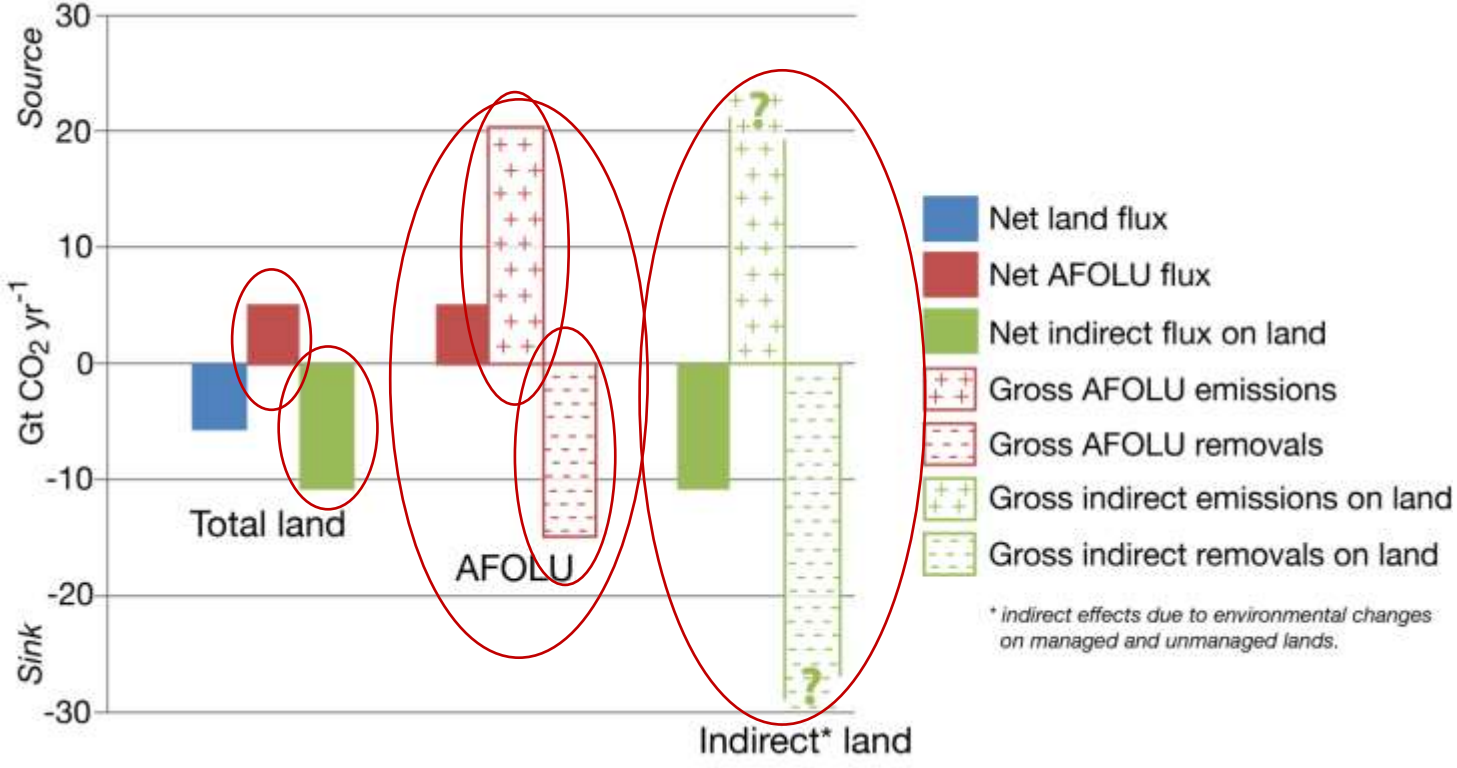
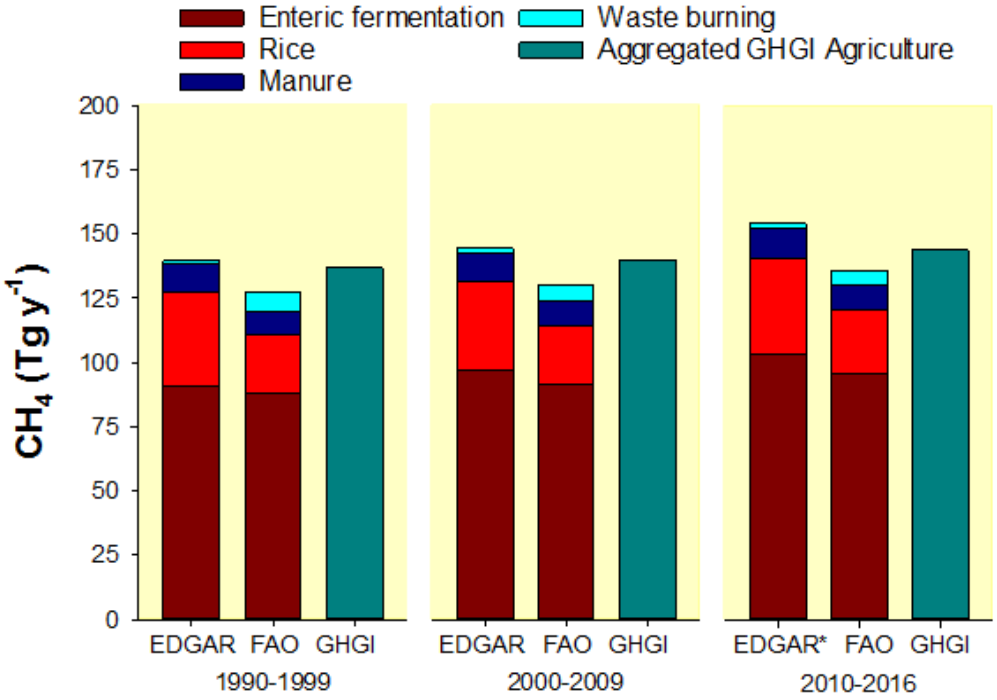
Understanding the gross emissions and removals that underlie the net land emission



Agriculture is responsible for 44% of global methane emissions



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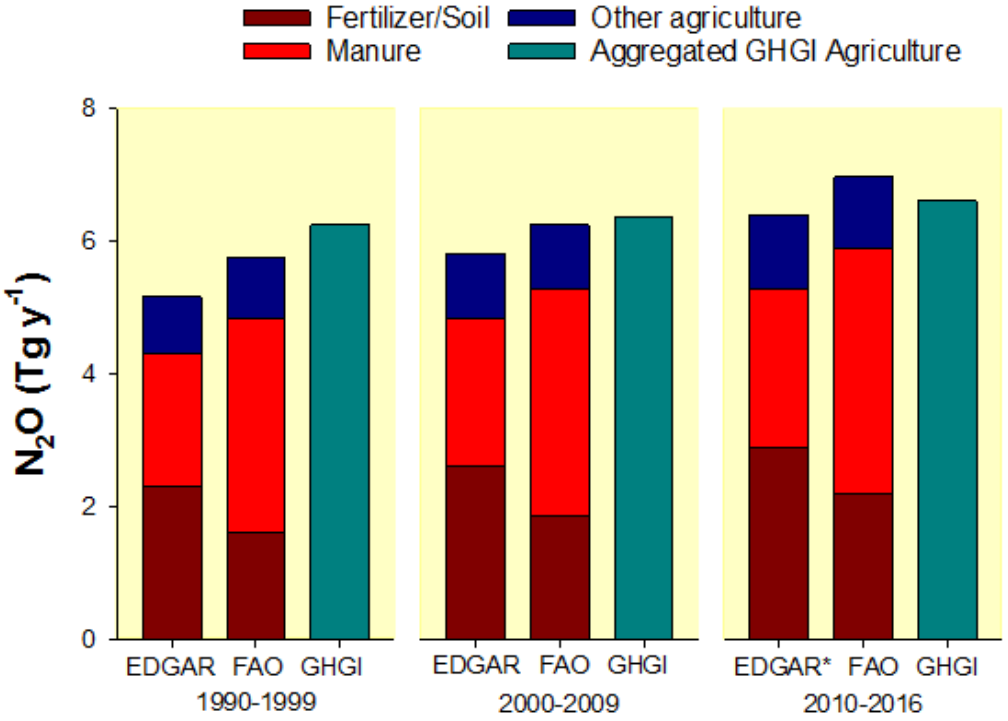
Agriculture is responsible for 81% of nitrous oxide emissions



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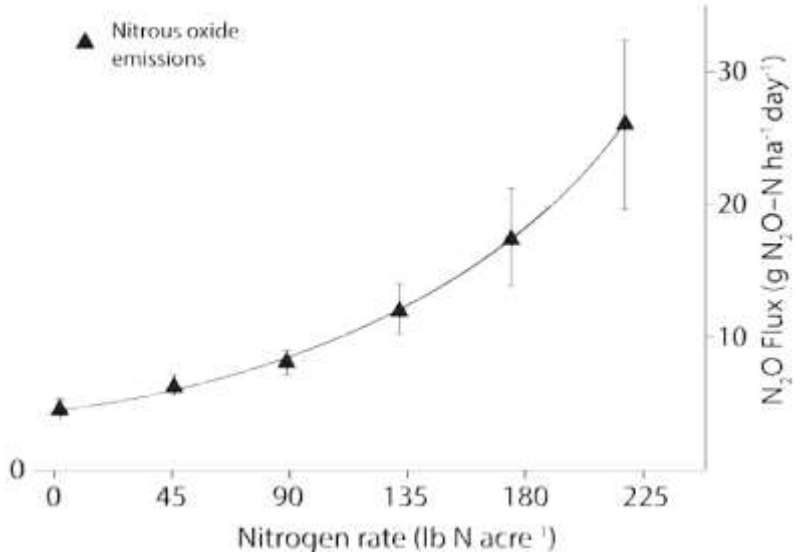
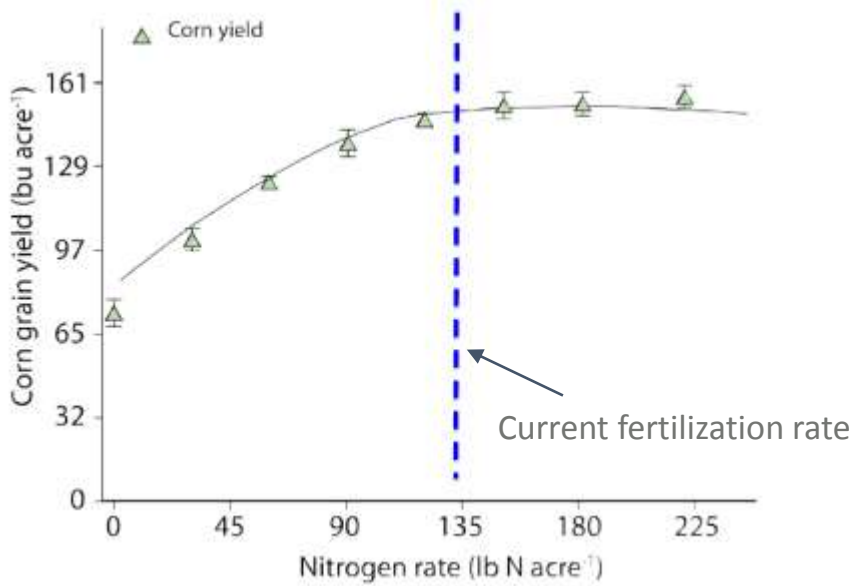
Response Options

- Many land-related responses that contribute to climate change adaptation and mitigation also enhance food security.
- There are limits to the deployment of land-based mitigation measures such as bioenergy crops or afforestation. Use at large scale increases food security risks and sustainable development.
- Avoiding, reducing and reversing desertification would enhance soil fertility, increase carbon storage in soils and biomass, while **benefitting agricultural productivity and food security**.

N_2O response to fertilizer is not linear. Solutions can be found in efficient nutrient management.





Data from Michigan, USA; Source: J. Doll based on Millar and Robertson (2015)

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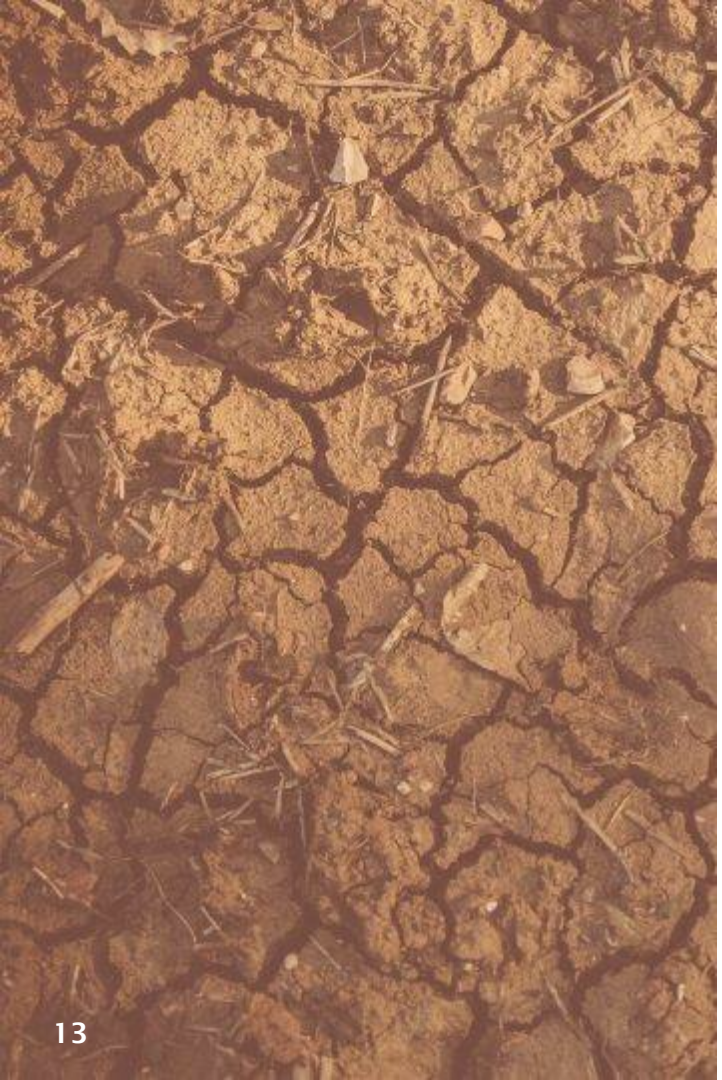
Response options

- Land challenges and response options **vary based on region and context.**
- Some options have benefits for all land-climate challenges.
- Many response options can be **applied without competing for available land;** Some **greatly increase competition for land**.
- Bioenergy and BECCS are **scale dependant**, but they have a **large mitigation potential**.
- **Monoculture bioenergy crops** can result in land competition and have **adverse effects** for food, land degradation, biodiversity and water scarcity.

Interlinkages

- Some response options have co-benefits or are more **effective when paired**. Others may conflict.
- Some response options are **less feasible** than others.
- **Coordinated action** is required to enable responses.
- **Delayed action** will mean more of a **need to respond** to land challenges **but less potential for land-based responses** (due to climate change and other pressures).
- **Early action has challenges** related to technology, upscaling and barriers.



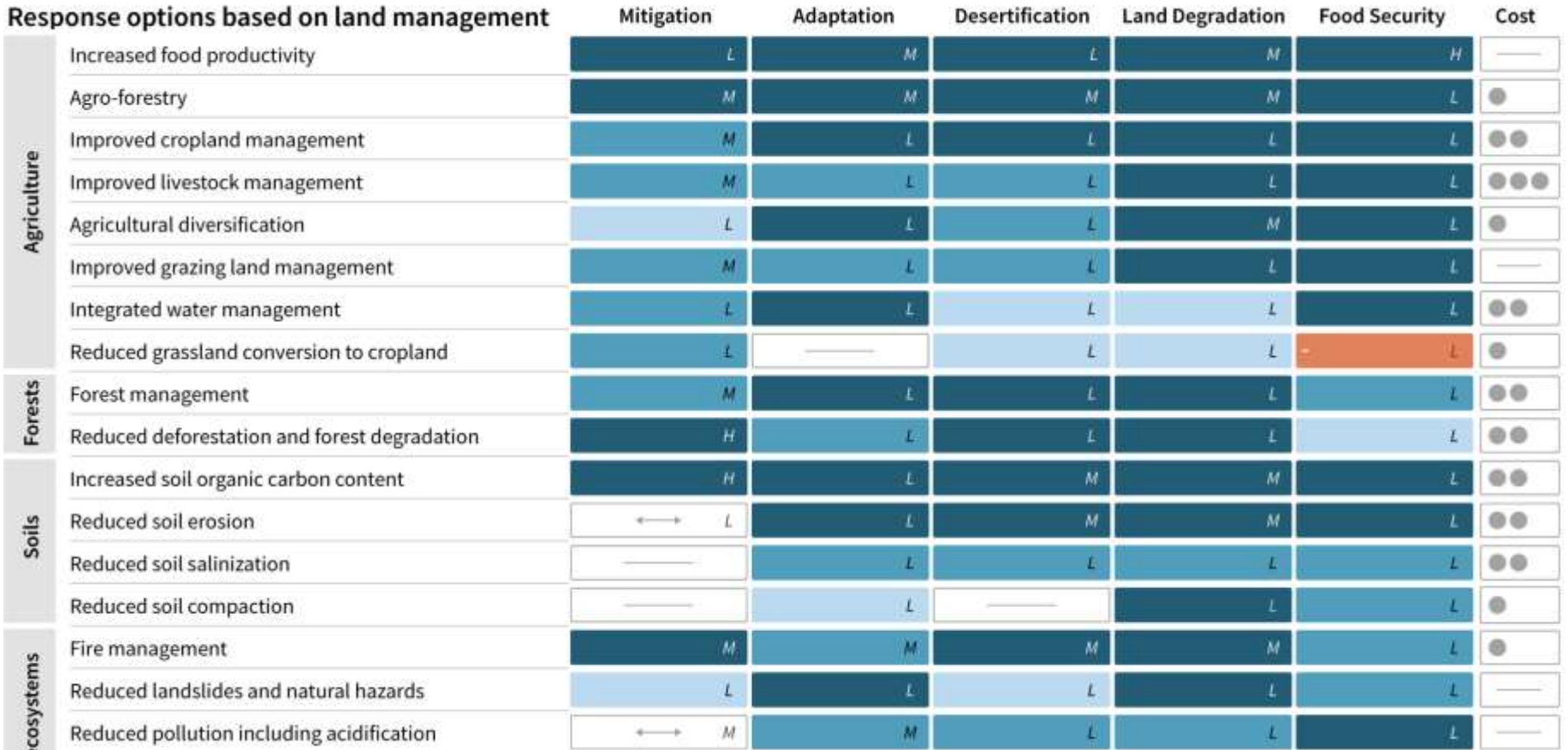
Risk Management

- Global temperature increases and its impacts on land results in **compound risks** to food systems, human and ecosystem health, livelihoods, the viability of infrastructure, and the value of land.
- Risks related to land degradation, desertification and food security increase with temperature and **can reverse development gains**.
- Delaying mitigation in other sectors and shifting the burden to the land sector, increases risks, including adverse effects on food security & ecosystem services.

The Big Picture

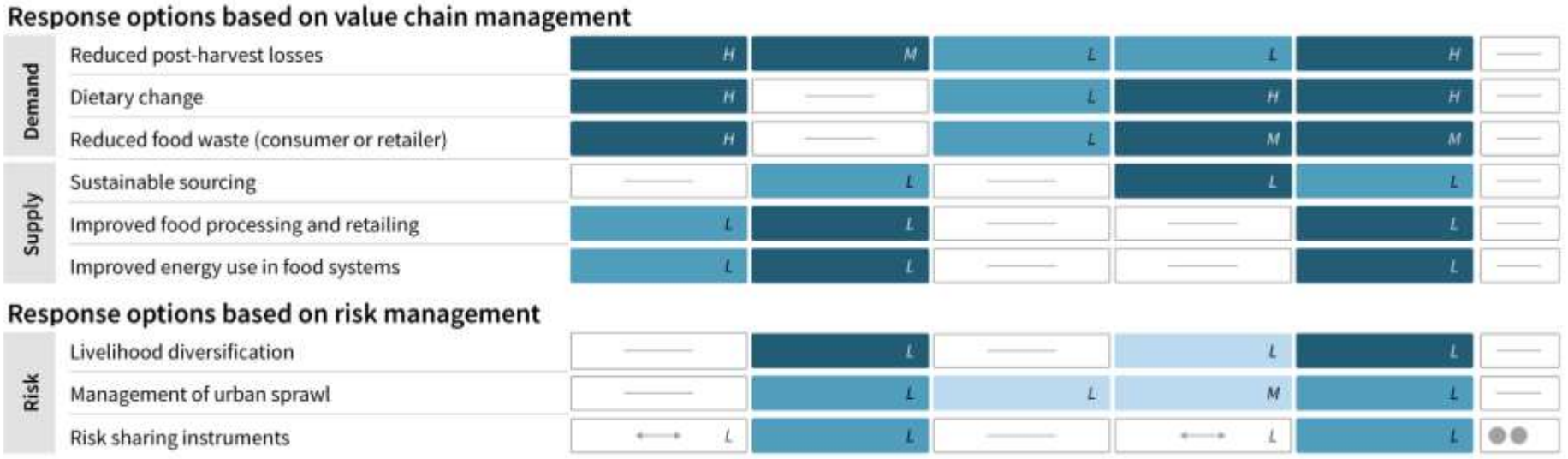
- The potential for mitigating climate can only be realised if **agricultural emissions** are **included in mainstream climate policy**.
- **Acting early** will avert or minimise risks, reduce losses and generate returns on investment.
- **Measuring progress towards goals** is important to decision-making, adaptive governance & policy success.
- A **flexible, adaptive, iterative approach** is needed for the complexity of land and climate interactions and food security.

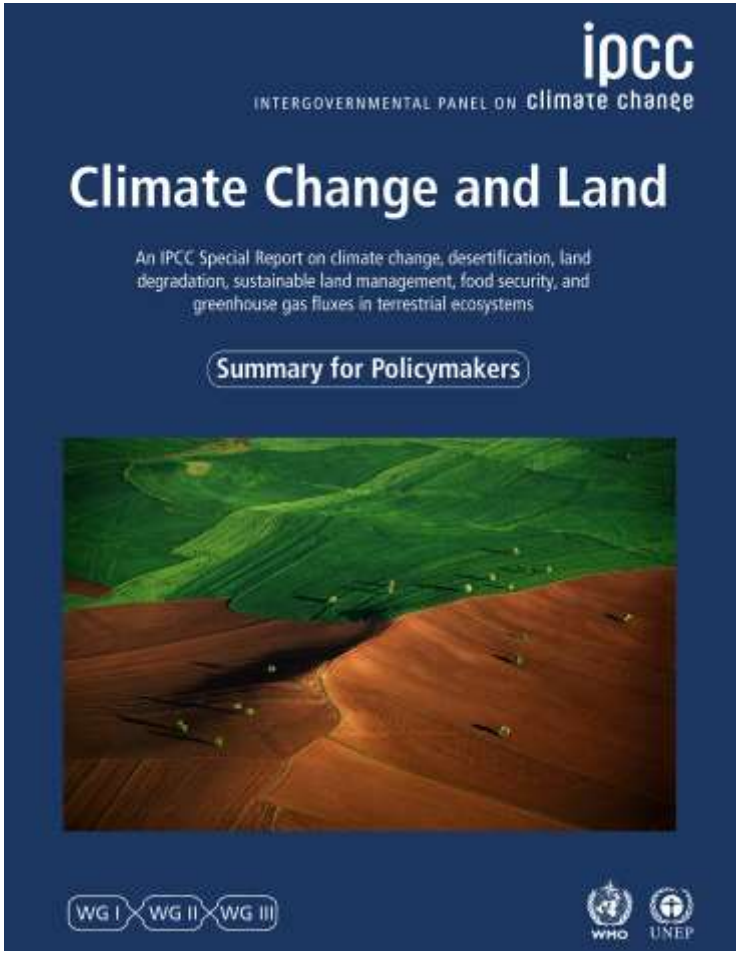
SPM Figure 3 – 1



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	●
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	—

SPM Figure 3 – 1





FOR MORE INFORMATION:

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