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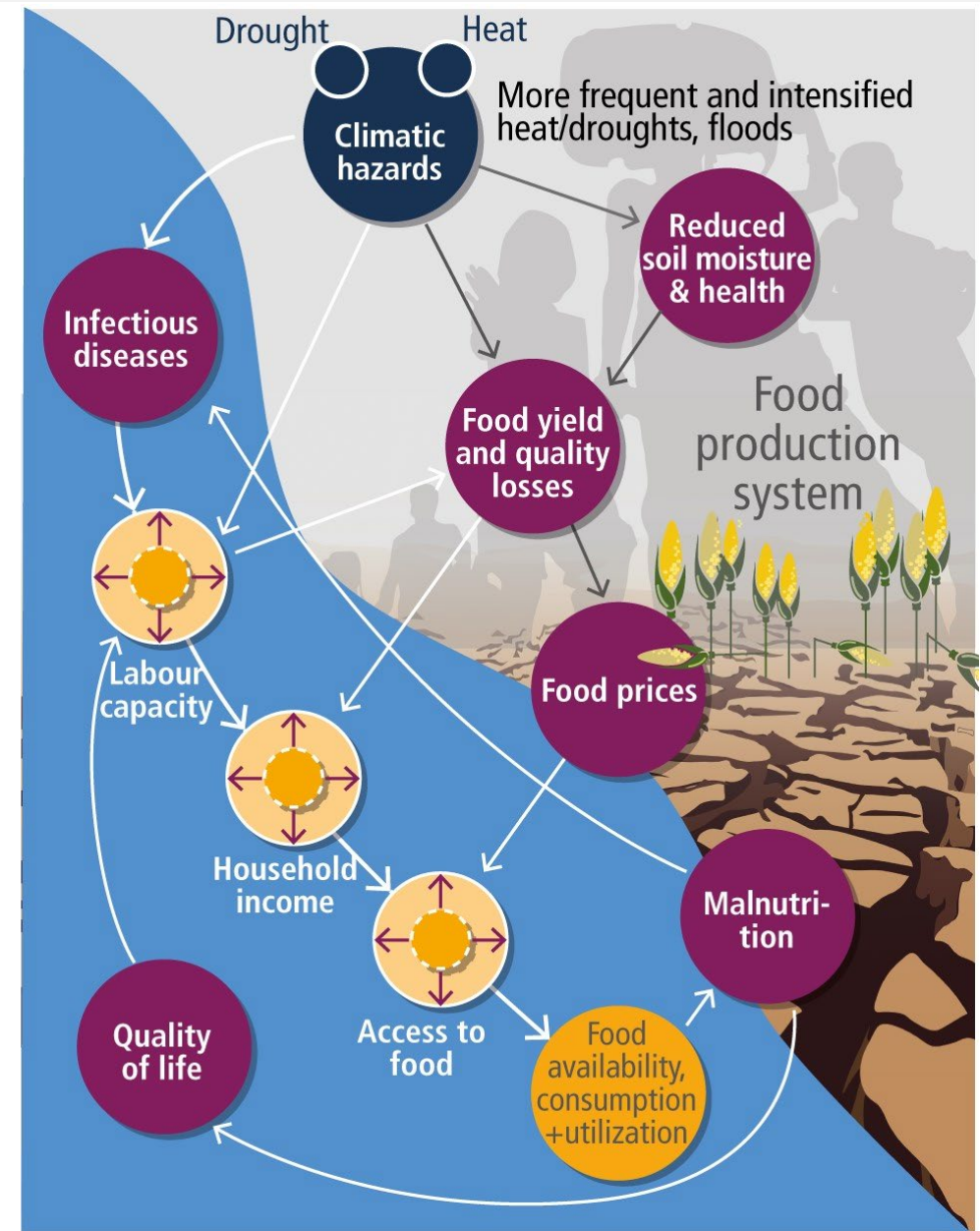
Climate change and agriculture: from challenges to solutions

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Hannover, November 12th, 2023

The cascading impacts of climate hazards on food and nutrition



From IPCC AR6 Fig. 5.2

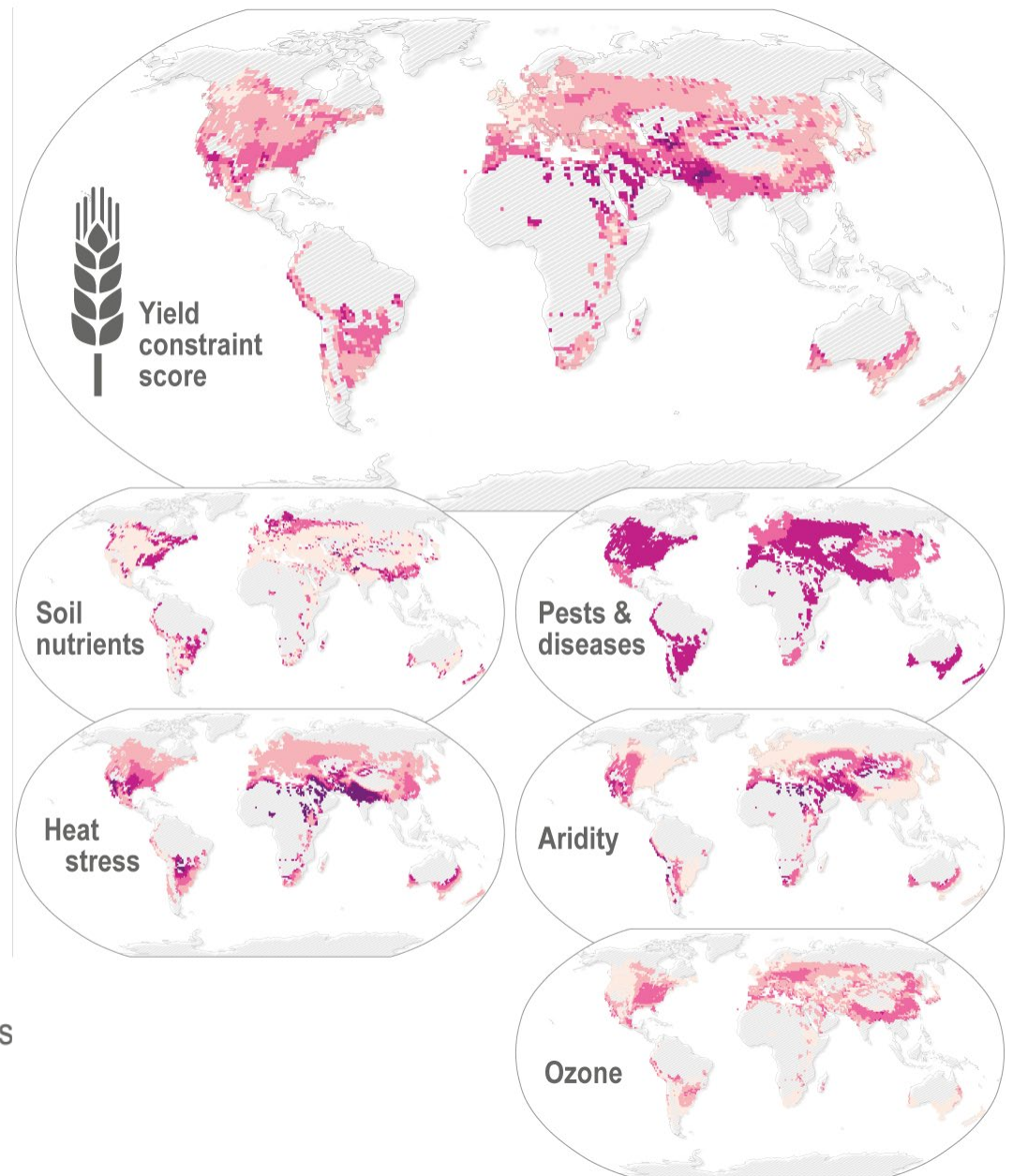
Synthesis of observed impacts on crop yields and productivity



Impact level: + Positive ◆ Mixed — Negative Confidence level: ● Low ● Medium ● High na = not assessed

From IPCC AR6 Fig. 5.3

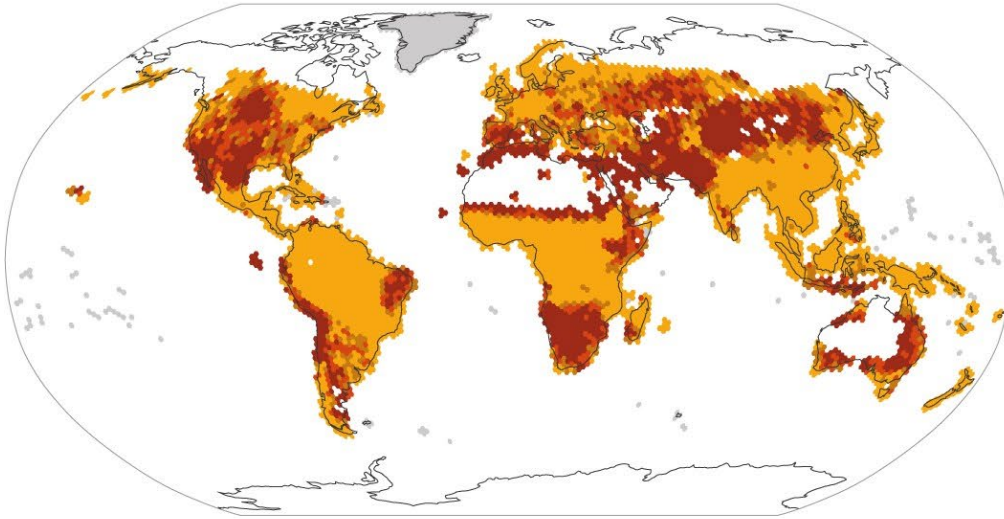
The global effects of five biotic and abiotic stresses on wheat



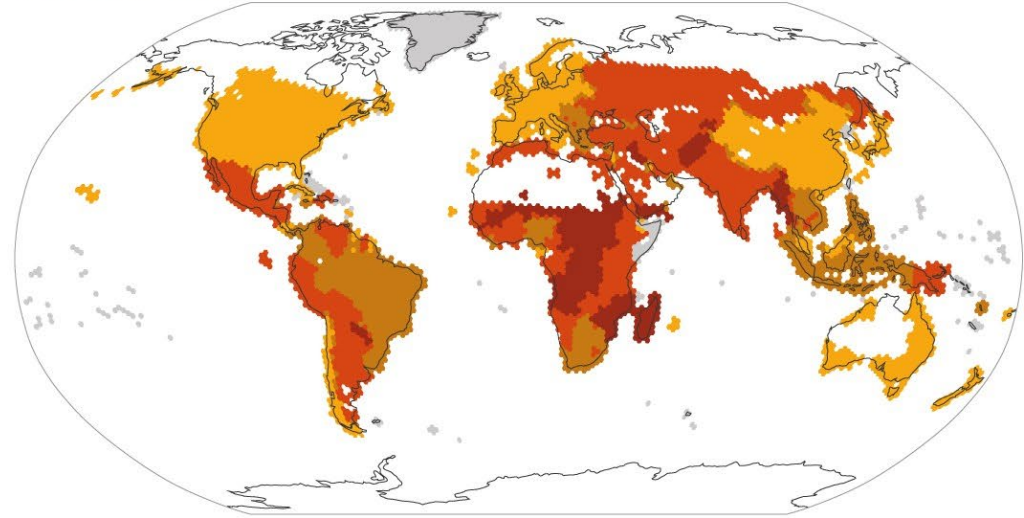
Modified from IPCC AR6 Fig. 5.3

From hazards to risks

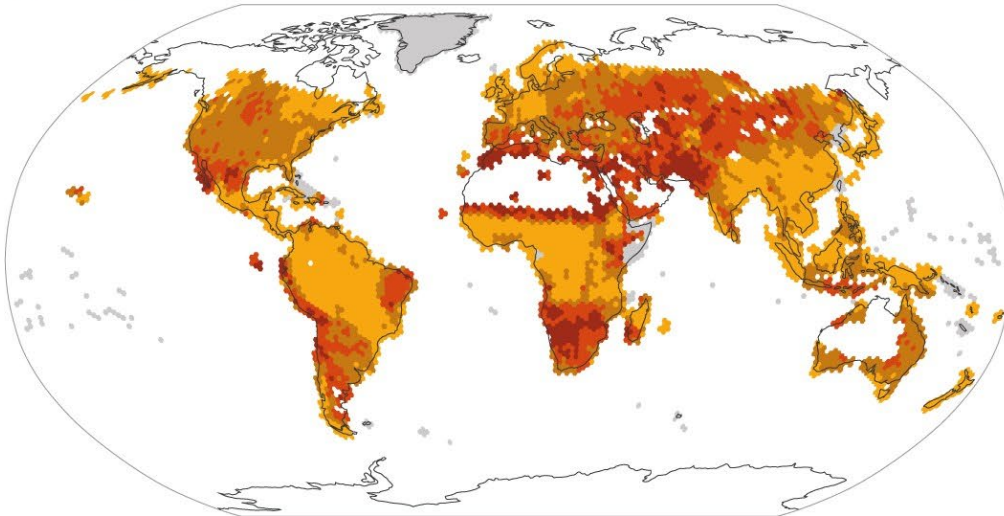
(a) Hazard and exposure indicator score



(b) Vulnerability index



(c) Drought risk index



Indicator scores for rainfed agriculture

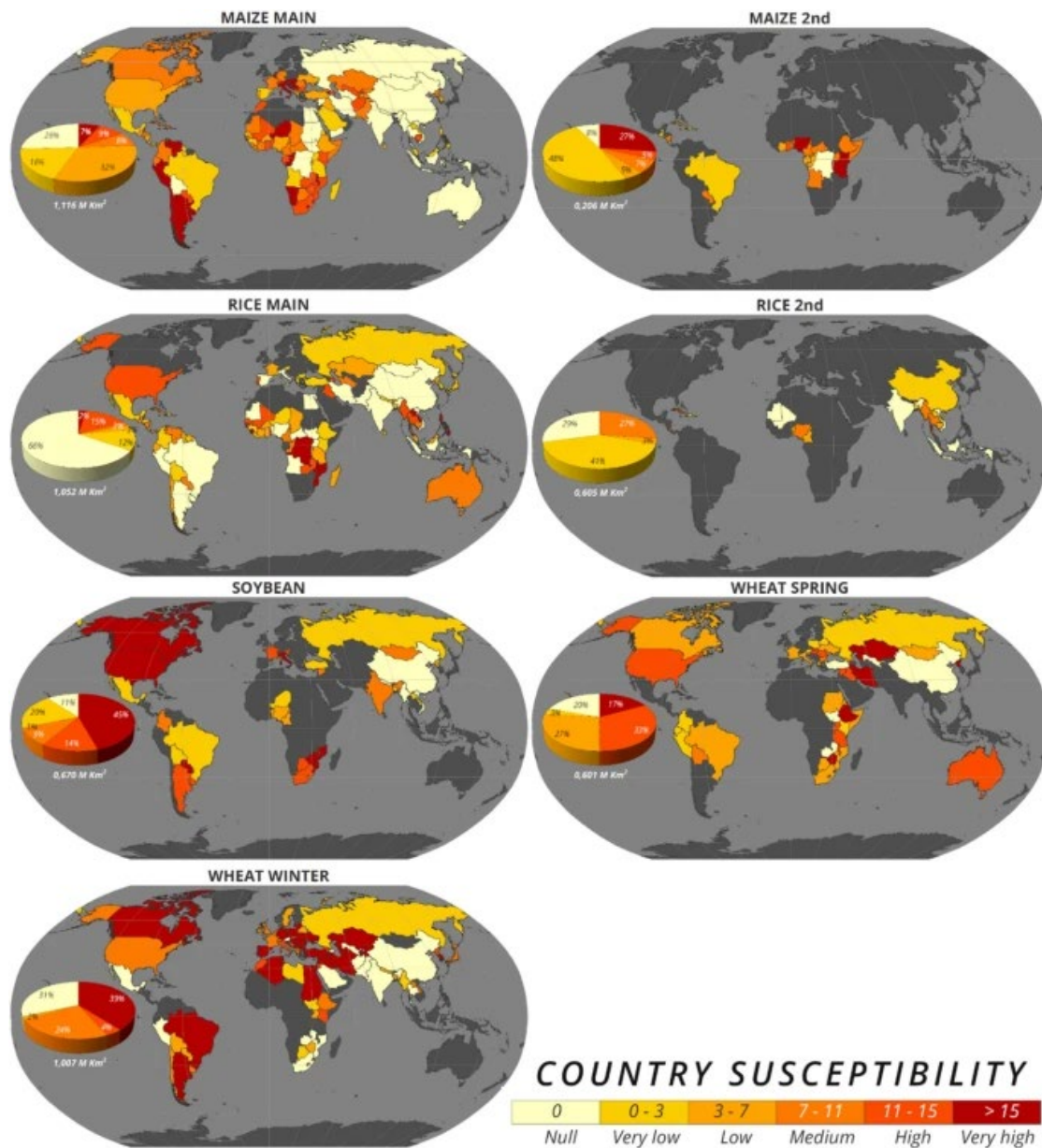


Areas with no crops

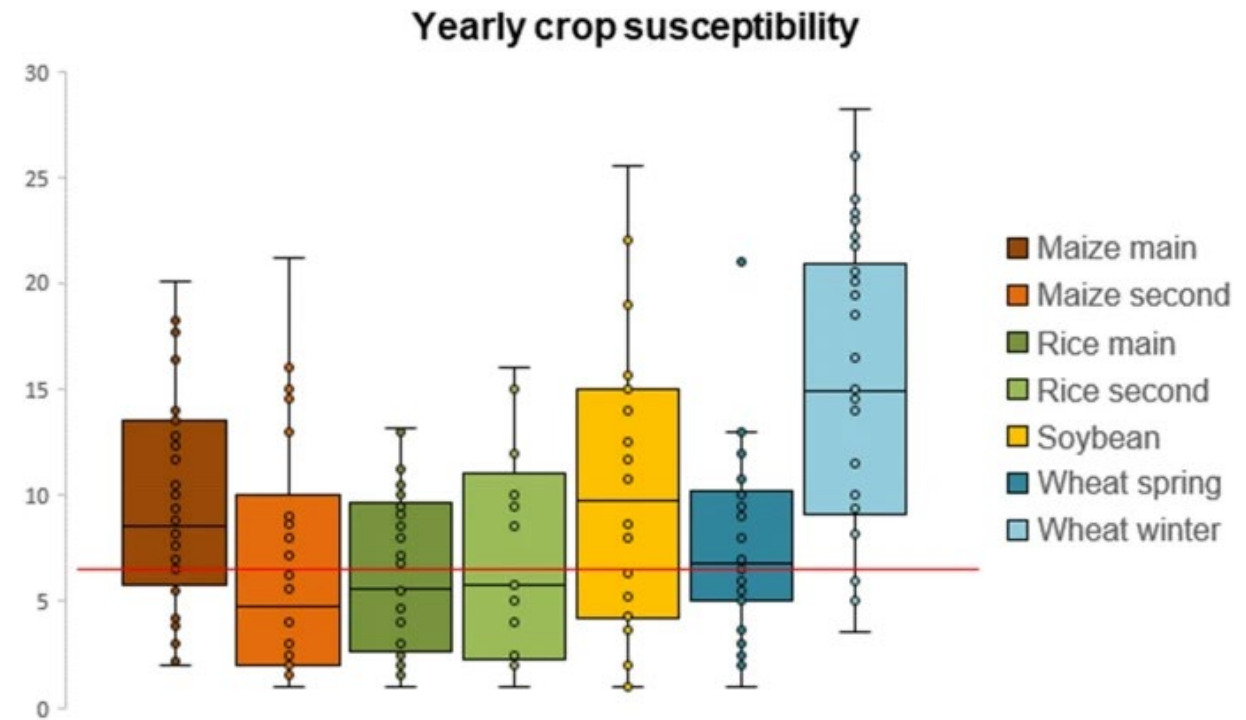
Areas with no data

Data averaged over 1.5° hexagons

Modified from IPCC AR6 Fig. 5.4

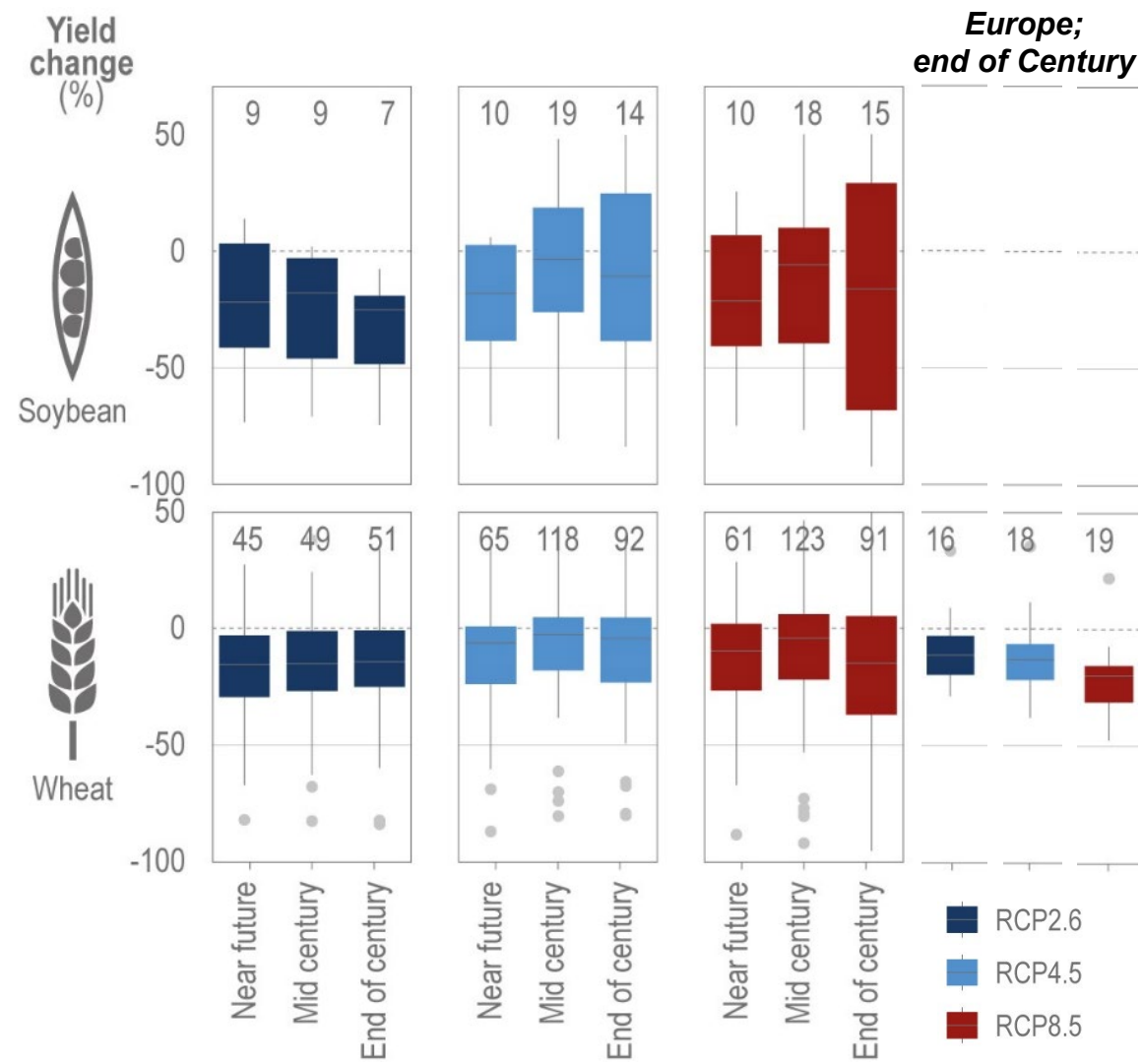
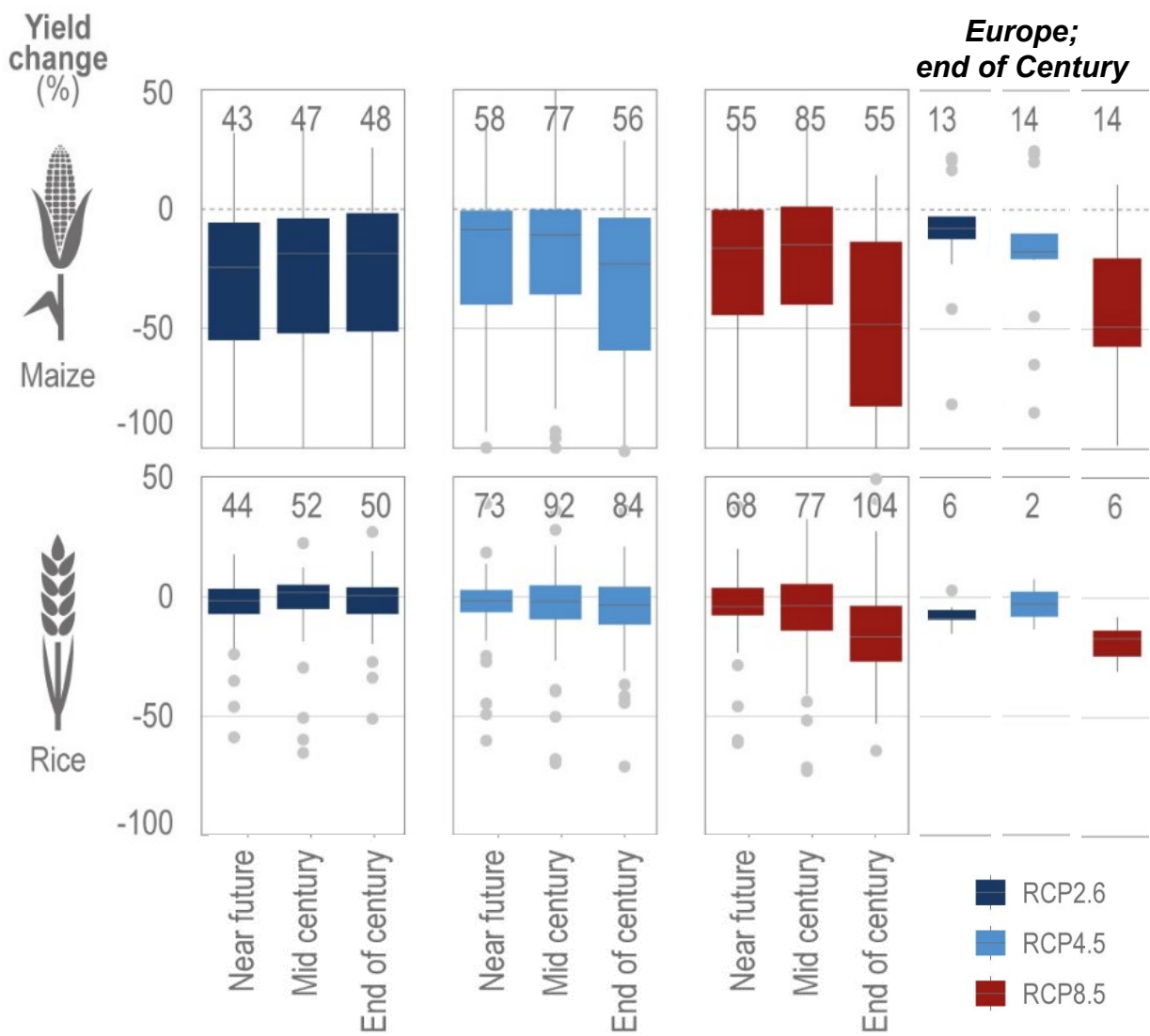


Crop & country susceptibility to multi-scale droughts (1981-2016)



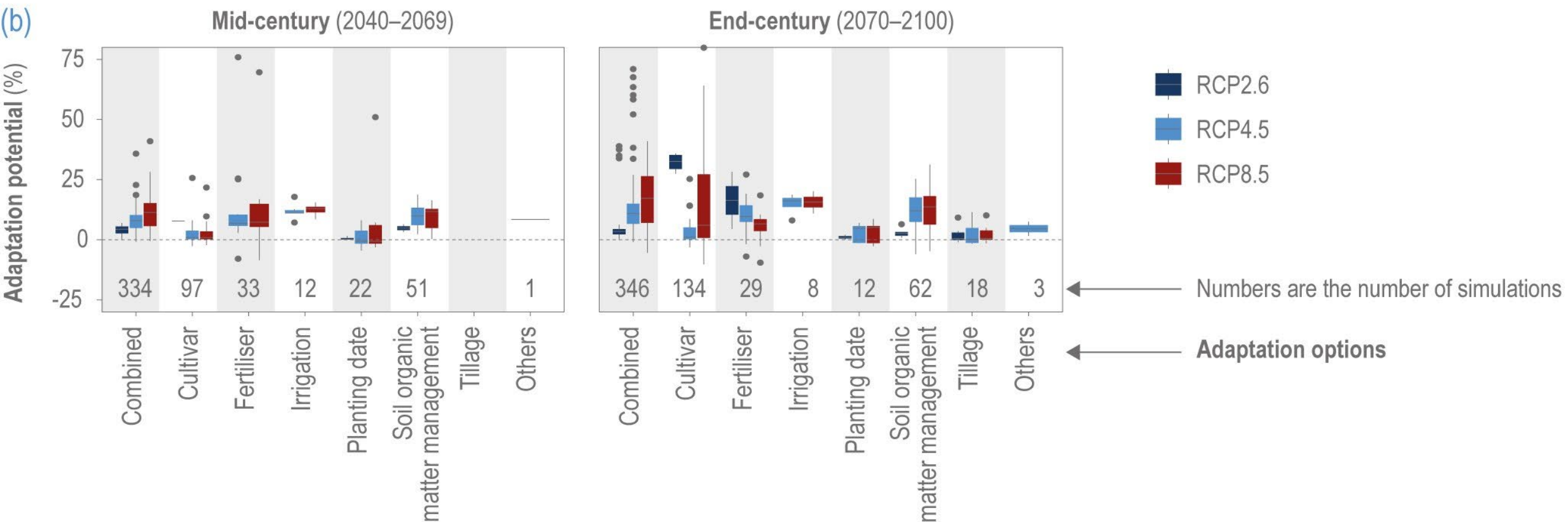
From Santini et al. (2022) Sci Rep.

Effects of future climate change on main crops



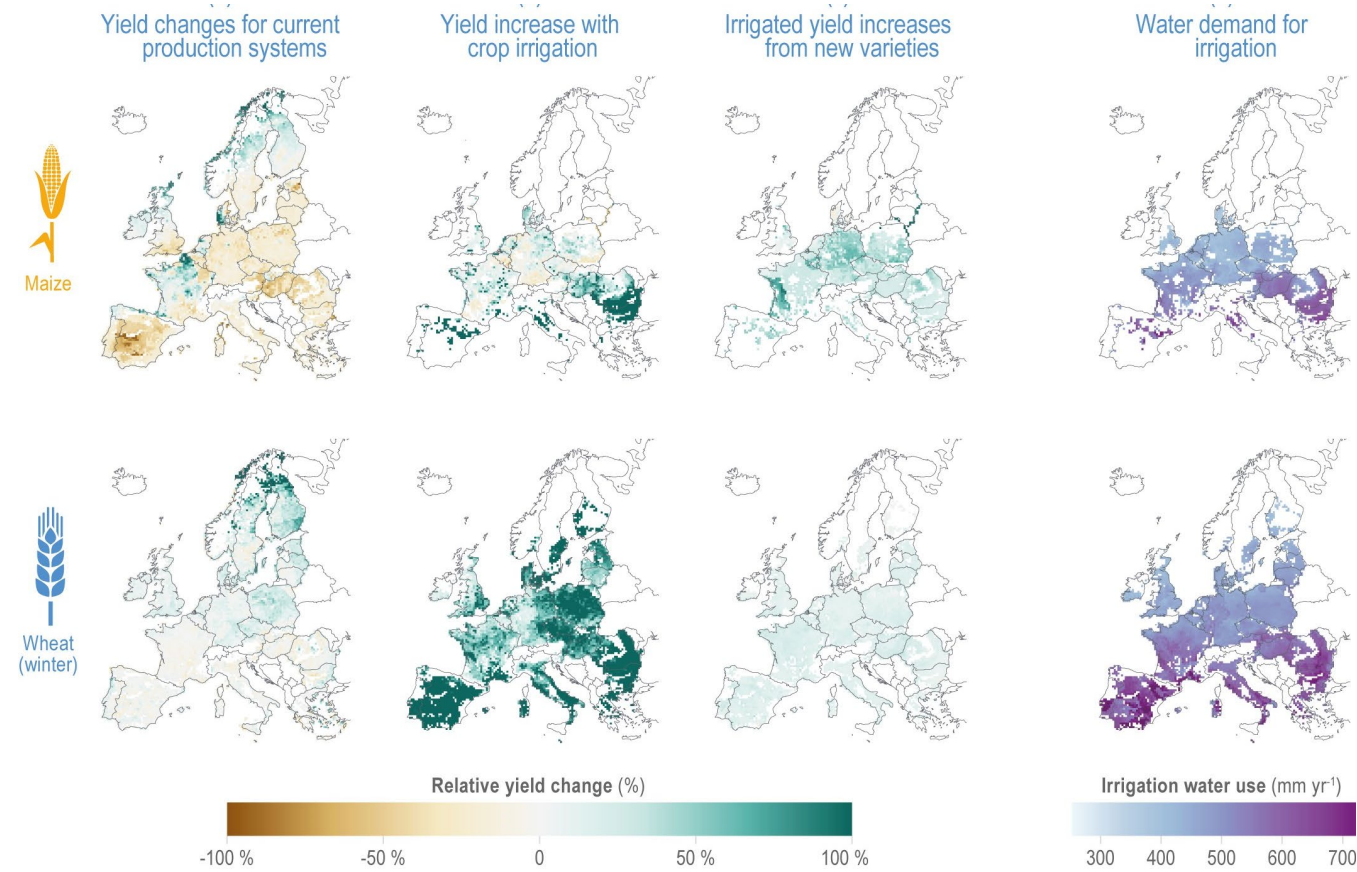
Modified from IPCC AR6 Fig. 5.5

Adaptation strategies

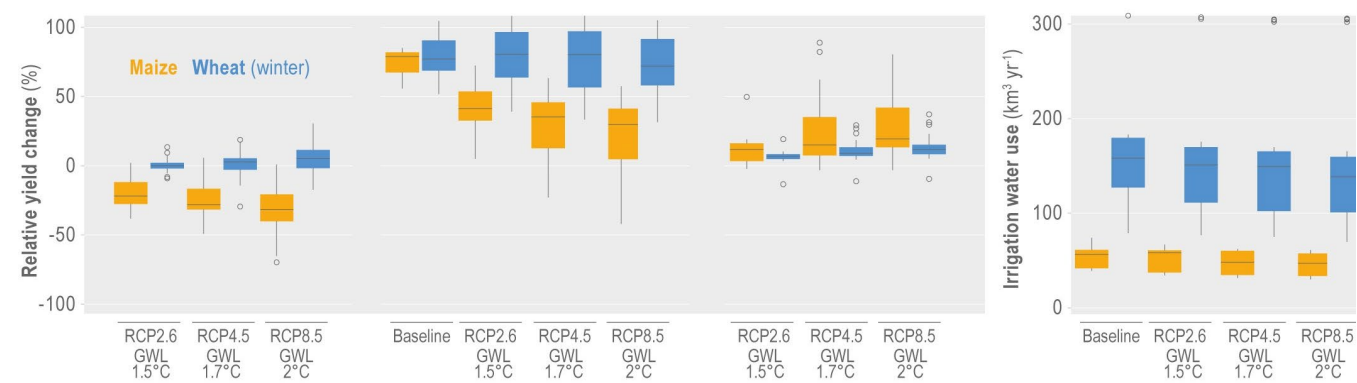


Modified from IPCC AR6 Fig. 5.8

A focus on Europe 2055 vs. 1995



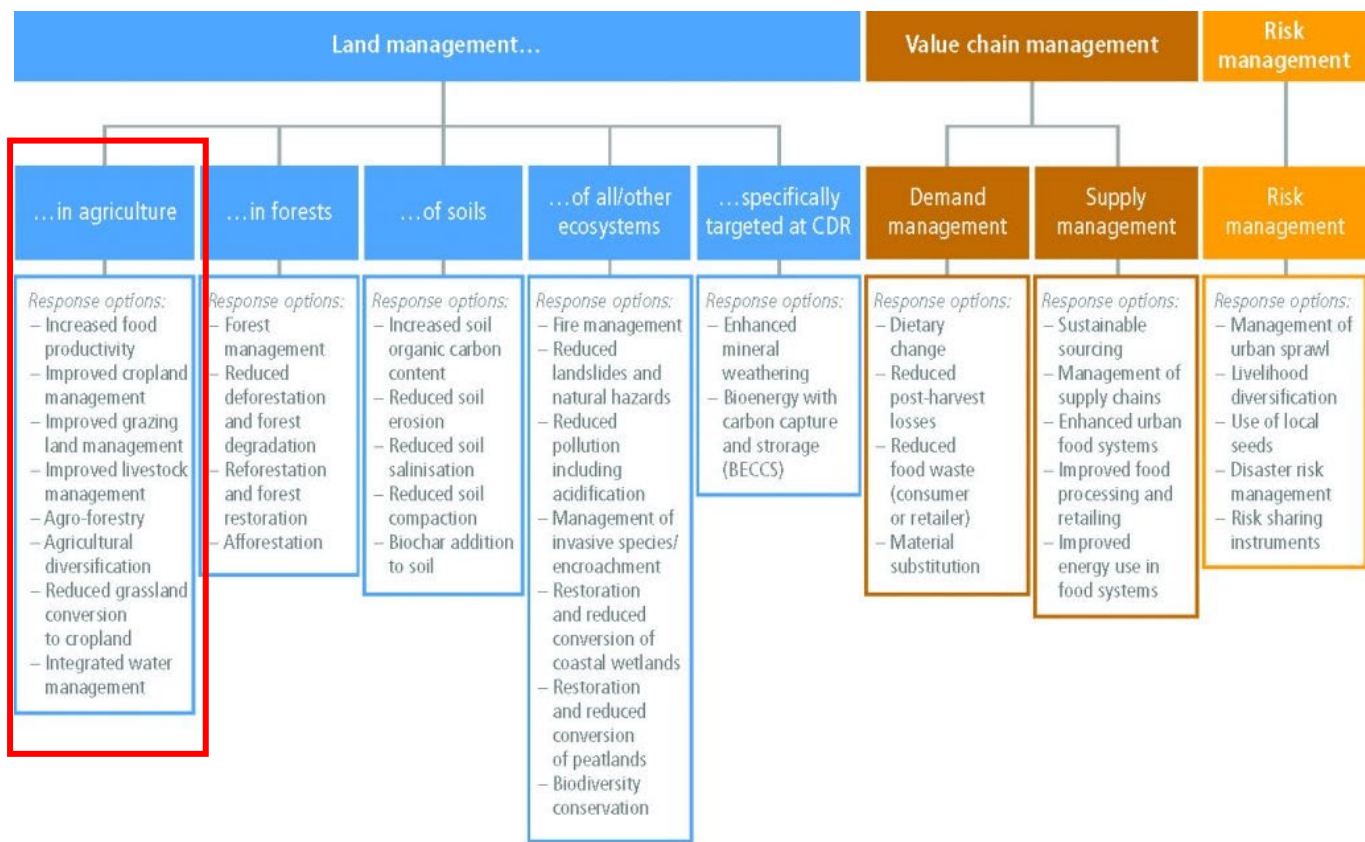
**GWL 1.7°C
RCP4.5
(1 model)**



**Climate and
impact model
ensemble**

From IPCC AR6 Fig. 13.15

Synergy with mitigation: integrated response options



	Mitigation	Adaptation	Desertification	Land degradation	Food
Large positive	More than 3 GtCO ₂ -eq yr ⁻¹	Positively impacts more than around 25 million people	Positively impacts more than around 3 million km ²	Positively impacts more than around 3 million km ²	Positively impacts more than around 100 million people
Moderate positive	0.3–3 GtCO ₂ -eq	1 million to 25 million	0.5–3 million km ²	0.5–3 million km ²	1 million to 100 million
Small positive	>0	Under 1 million	>0	>0	Under 1 million
Negligible	0	No effect	No effect	No effect	No effect
Small negative	<0	Under 1 million	<0	<0	Under 1 million
Moderate negative	–0.3 to –3 GtCO ₂ -eq	1 million to 25 million	0.5 to 3 million km ²	0.5 to 3 million km ²	1 million to 100 million
Large negative	More than –3 GtCO ₂ -eq yr ⁻¹	Negatively impacts more than around 25 million people	Negatively impacts more than around 3 million km ²	Negatively impacts more than around 3 million km ²	Negatively impacts more than around 100 million people

Integrated response option	Mitigation	Adaptation	Desertification	Land degradation	Food security
Increased food productivity					
Improved cropland management					
Improved grazing land management					
Improved livestock management					
Agroforestry					
Agricultural diversification					
Reduced grassland conversion to cropland		ND			
Integrated water management					

From IPCC SRCCL (2018)



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