Effects of Climate Change on Agriculture

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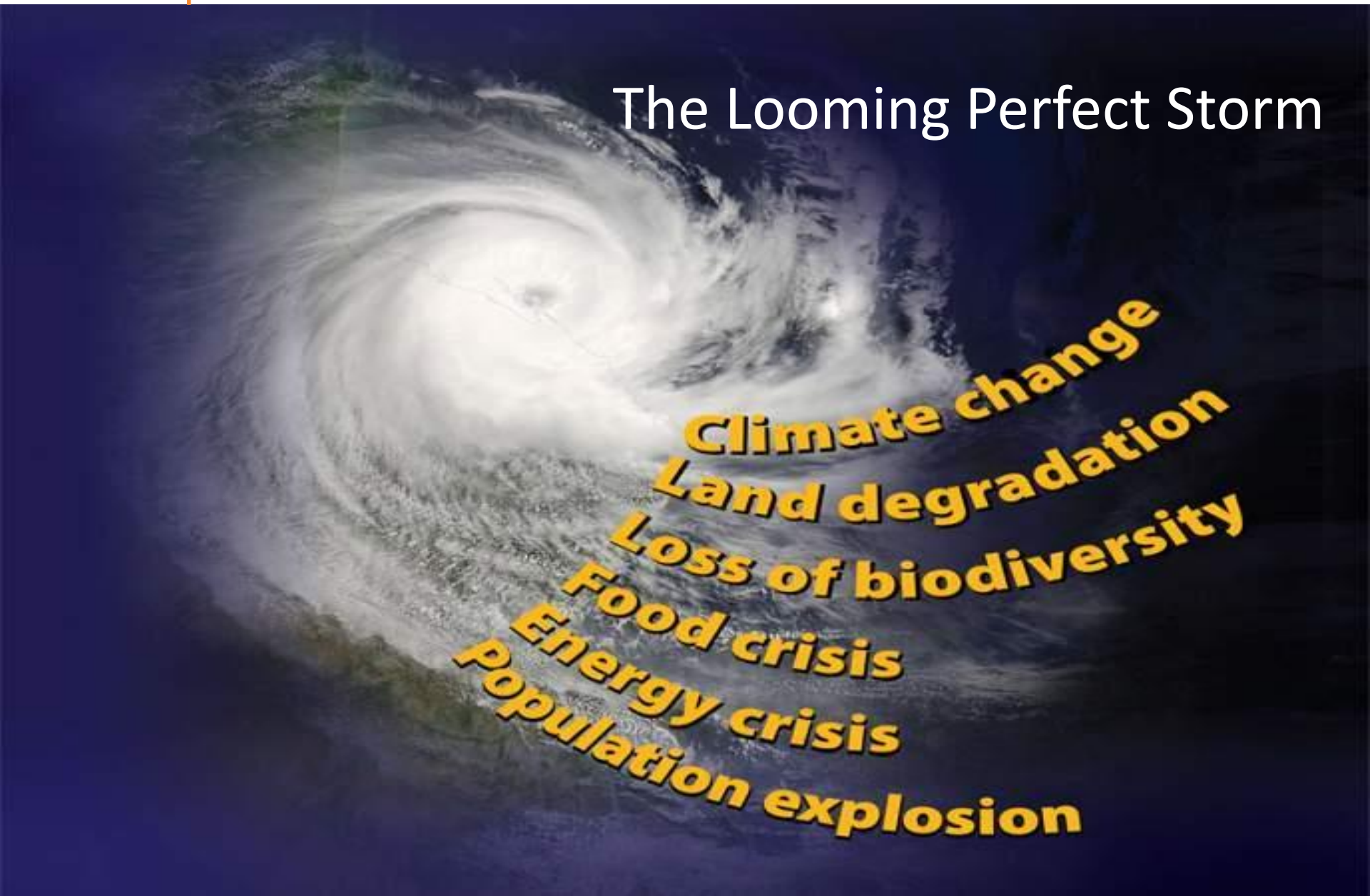
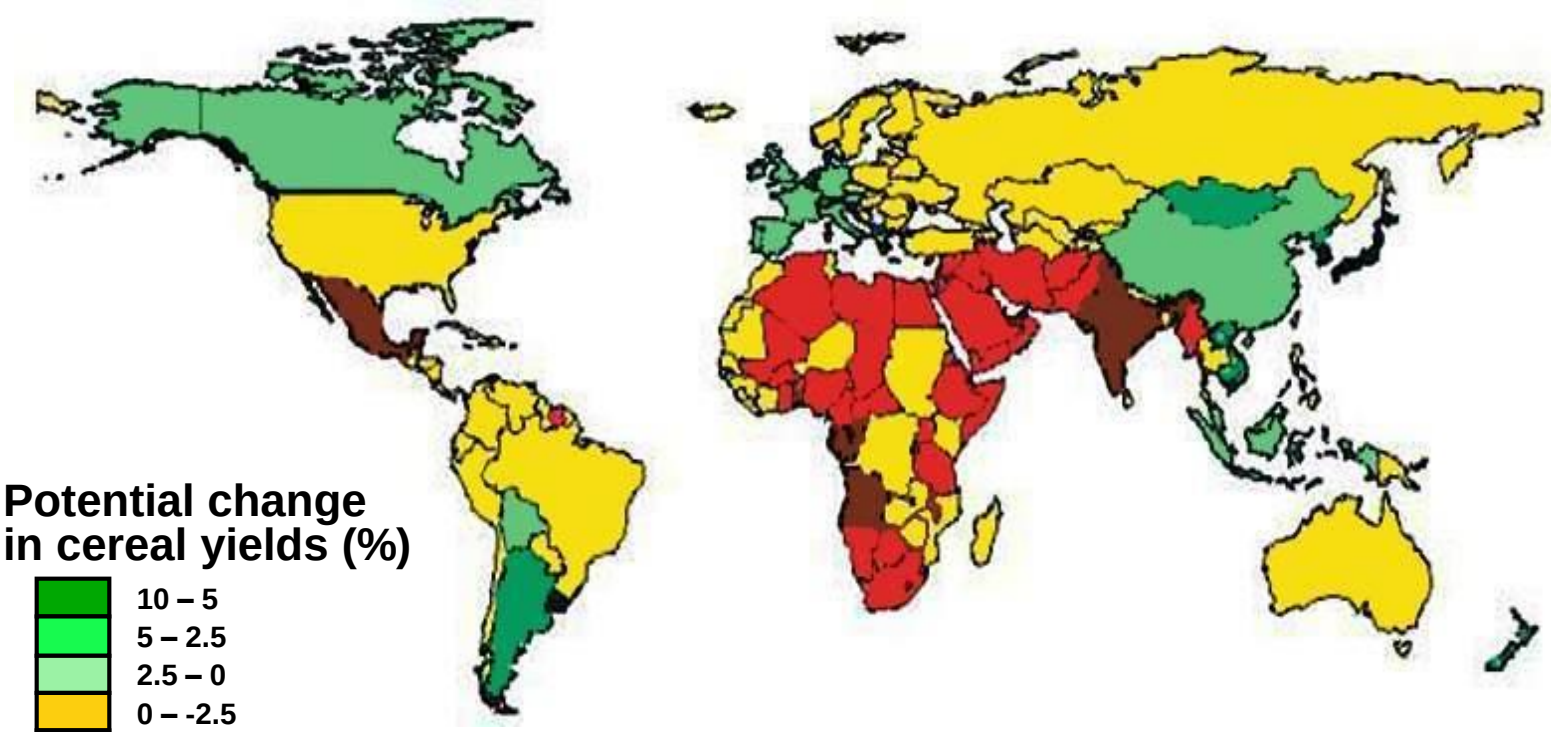
GRSV Consulting Services

- A not-for-profit entity to support agriculture R4D globally
- Co-founders have > 15 decades of combined experience
- Consultancy Services include:
  - Due diligence for biotech and seed ventures
  - Think tank to assist in futuristic R4D strategy
  - Project management (design, monitoring, evaluation, impact assessment)
  - Knowledge hub for Smart Agriculture
  - Institution and capacity building and skill development
  - Facilitate South-South collaboration and partnerships

The Biggest Challenge (Photo: ICRISAT)



Climate change and crop yields by 2080s



Yield reductions up to 50% in many African countries, up to 30% in Central and South Asia (CGIAR 2010)

Effect of climate change on selected crops

Crop	Percent (%) change in grain yield		
	+ temp.	+ CO_2*	Net change
Sorghum	-(27 to 55%)	+(0 to 10%)	-(22 to 50%)
P. millet	-(38 to 56%)	+(0 to 10%)	-(33 to 51%)
Groundnut	-(38 to 44%)	+(10 to 20%)	-(23 to 29%)
Pigeonpea	-(23 to 26%)	+(10 to 20%)	-(8 to 11%)
Chickpea	-(22 to 24%)	+(10 to 20%)	-(7 to 9%)

Vulnerability of Asian agriculture to climate change

Regions	Food and Fiber	Water Resources	Coastal Ecosystems
Arid and semi-arid Asia			
Central Asia	Highly vulnerable	Highly vulnerable	Moderately vulnerable
Tibetan Plateau	Slightly or not vulnerable	Moderately vulnerable	Not applicable
Temperate Asia	Highly vulnerable	Highly vulnerable	Highly vulnerable
Tropical Asia and Small Island States			
South Asia	Highly vulnerable	Highly vulnerable	Highly vulnerable
Southeast Asia	Highly vulnerable	Highly vulnerable	Highly vulnerable

Impacts of climate change on agriculture-1

- Increase in water scarcity and frequency of drought.
- Increased risk of heat or drought stress to crops and livestock due to rise in temperature.
- Changed length of growing period
- Altered plant phenolgy reflecting in early maturation leading to reduction in yields
- Increased night-time respiration which reduces potential yields.

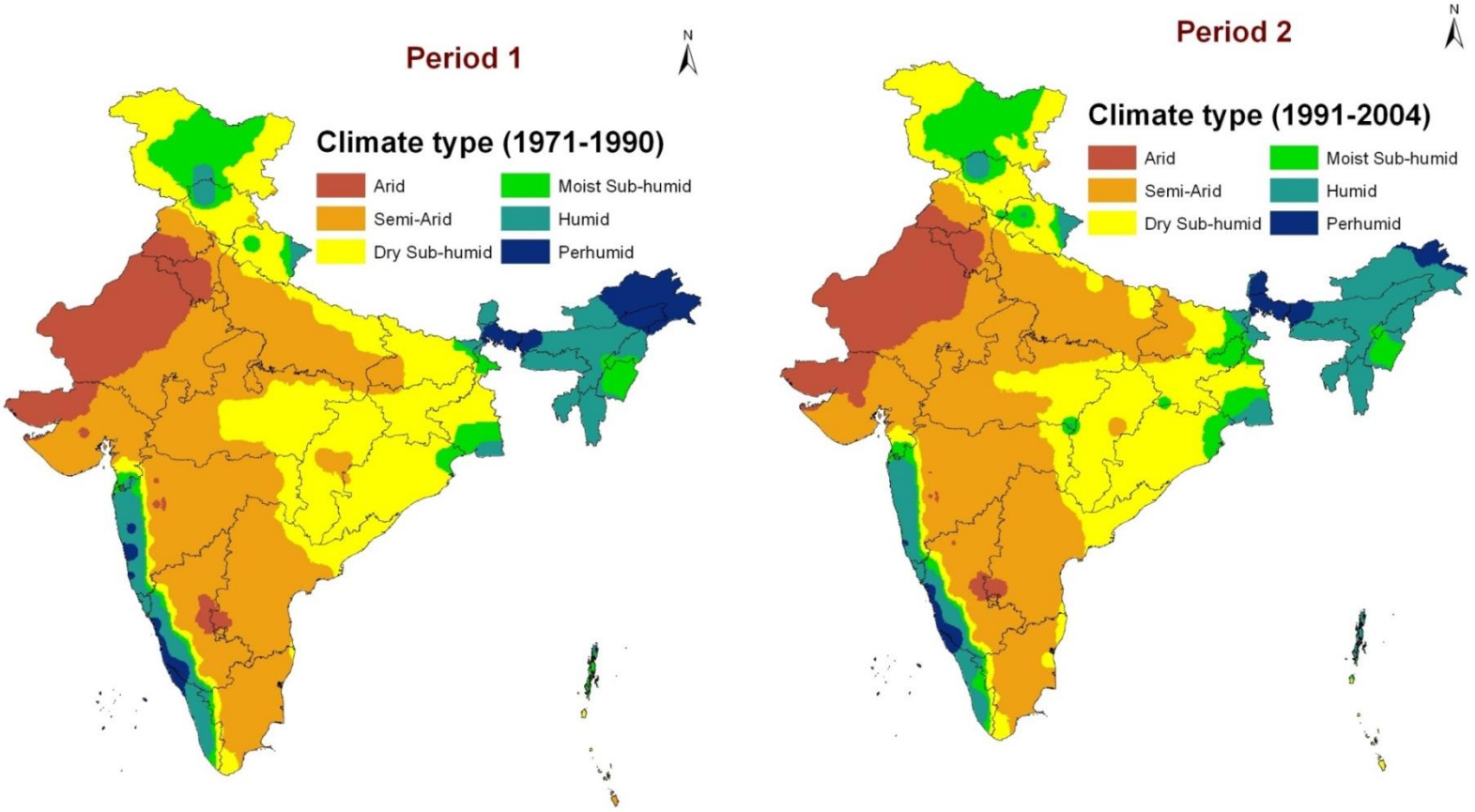
Impacts of climate change on agriculture-2

- Altered dynamics of species and interaction among species.
- Changed pattern in pest occurrence and damage caused by them demanding novel control strategies
- Reduction in pesticide effectiveness and increase in residues due to rise in temperature.

Climate variability: Impact on farmers

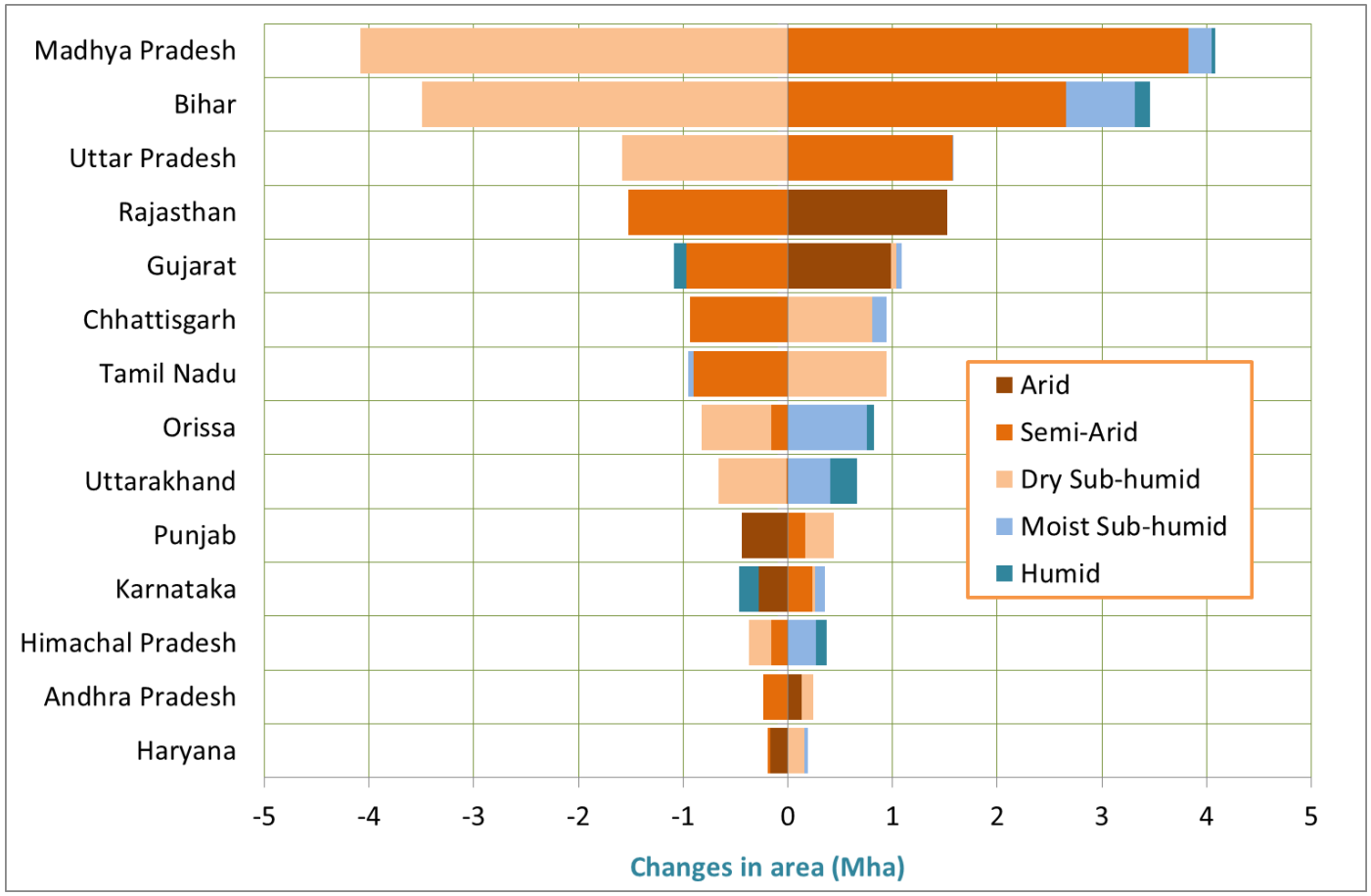
- Delayed sowing, changes in cropping pattern.
- More spray to control increased pest and disease.
- Crop failure due to frequent and persistent droughts.
- Less profits due to higher input prices, wages and stagnation of output prices.
- Shift towards non-farm occupations.
- Increased migration and asset divestment.

Changes in Status of Agroecological Regions (source: ICRISAT)



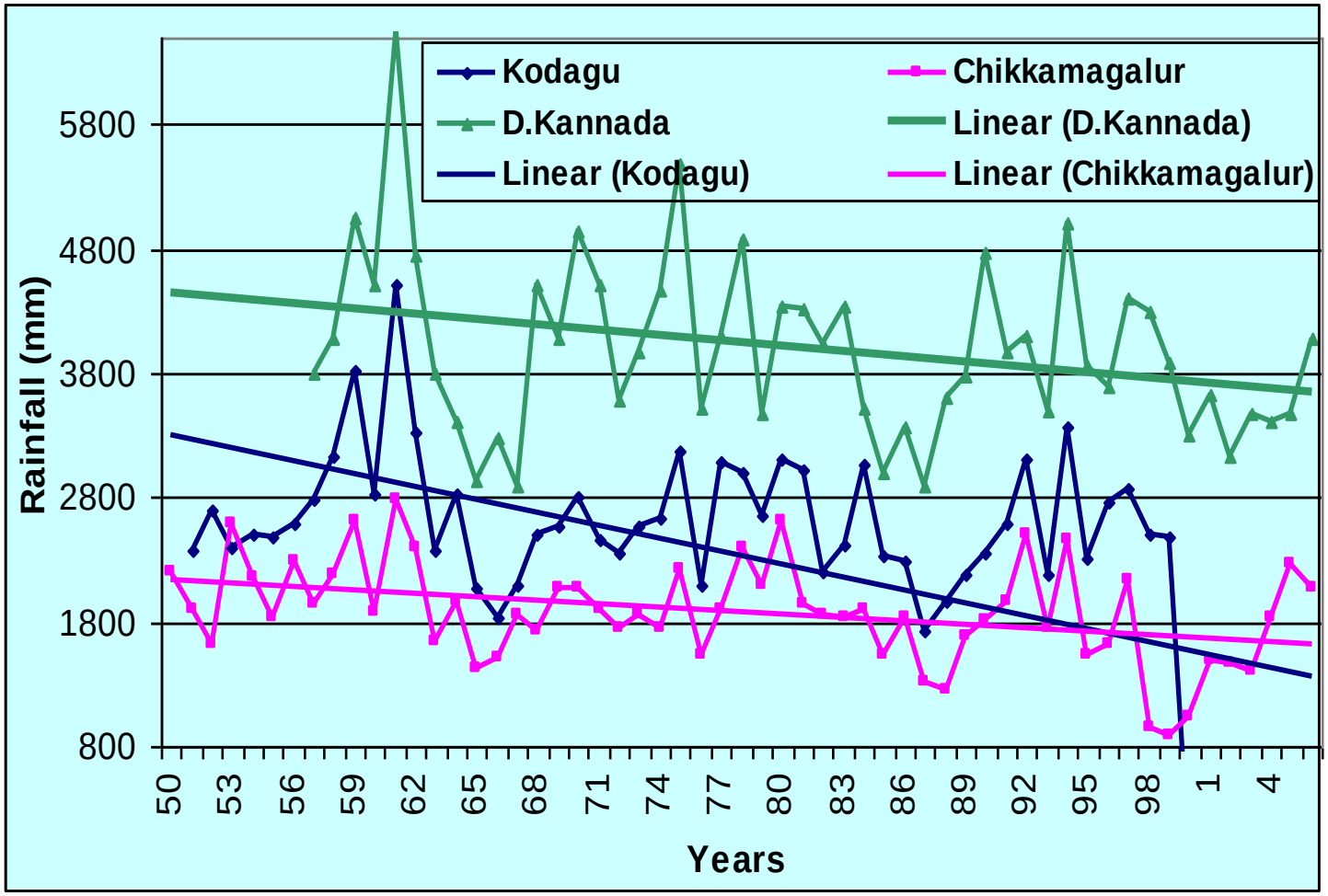
- Semi-arid areas increased by 8.45 M ha in MP, Bihar, UP, Karnataka and Punjab; over all 3.45 m ha added to SAT
- Dryness and wetness are increasing in different parts of the country in the place of moderate climates existing earlier in these regions

Changes in Status of Agroecological Regions between 1971-90 and 1991-2004 (Source: ICRISAT)



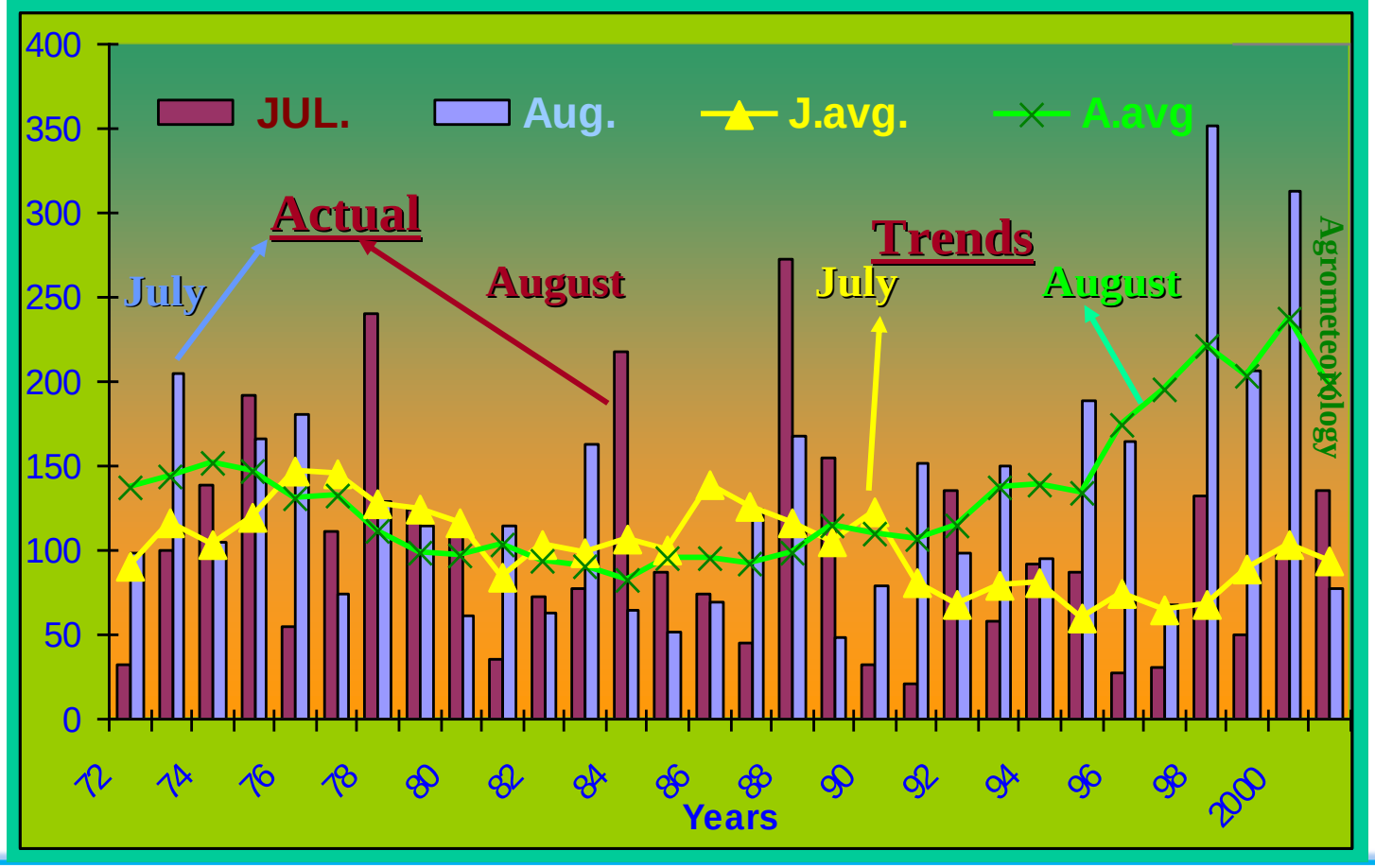
Change in Karnataka:

- Increase in Semi-Arid and Moist Sub-Humid areas
- Reduction in Arid and Humid areas



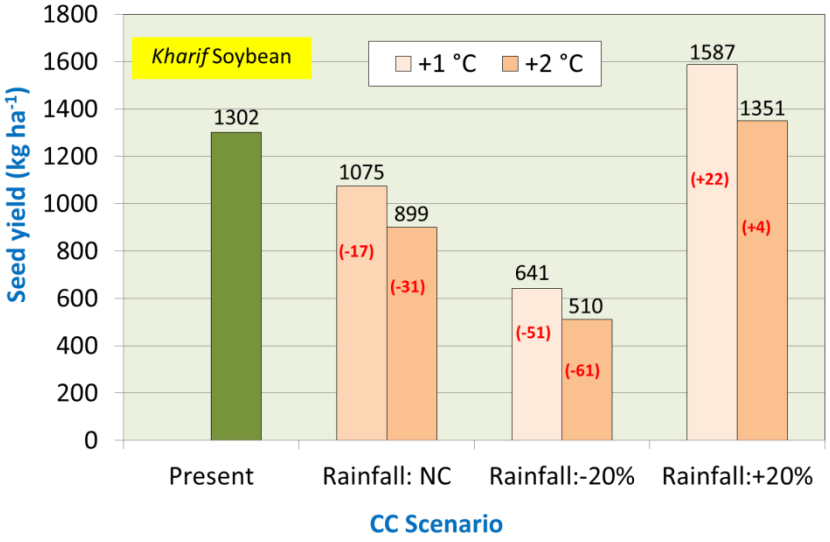
Declining trend of rainfall in Kodagu, Chikamagalur and Dakshina Kannada districts

Rainfall changes in Eastern Dry Zone



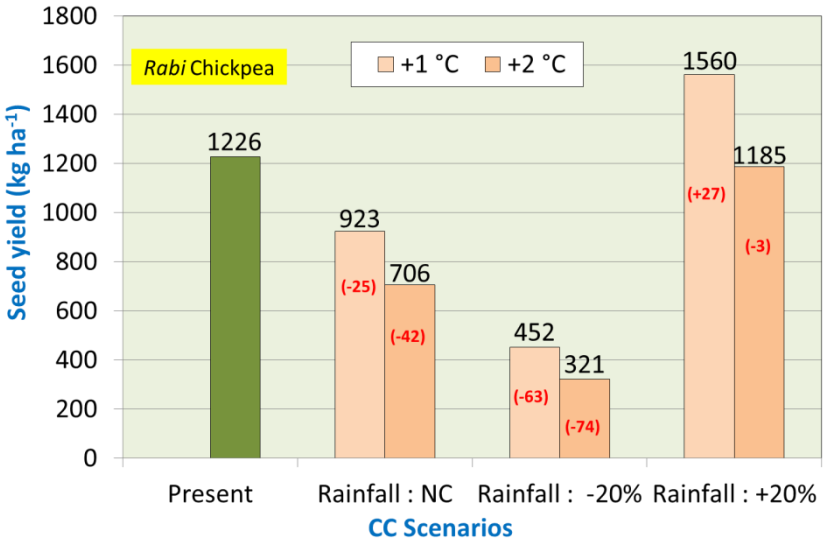
Declining in July rains and increasing in August rains in the Eastern Dry Zone of Karnataka

Climate Change Impacts on Soybean-Chickpea Cropping System at Dharwad (Source: ICRISAT)

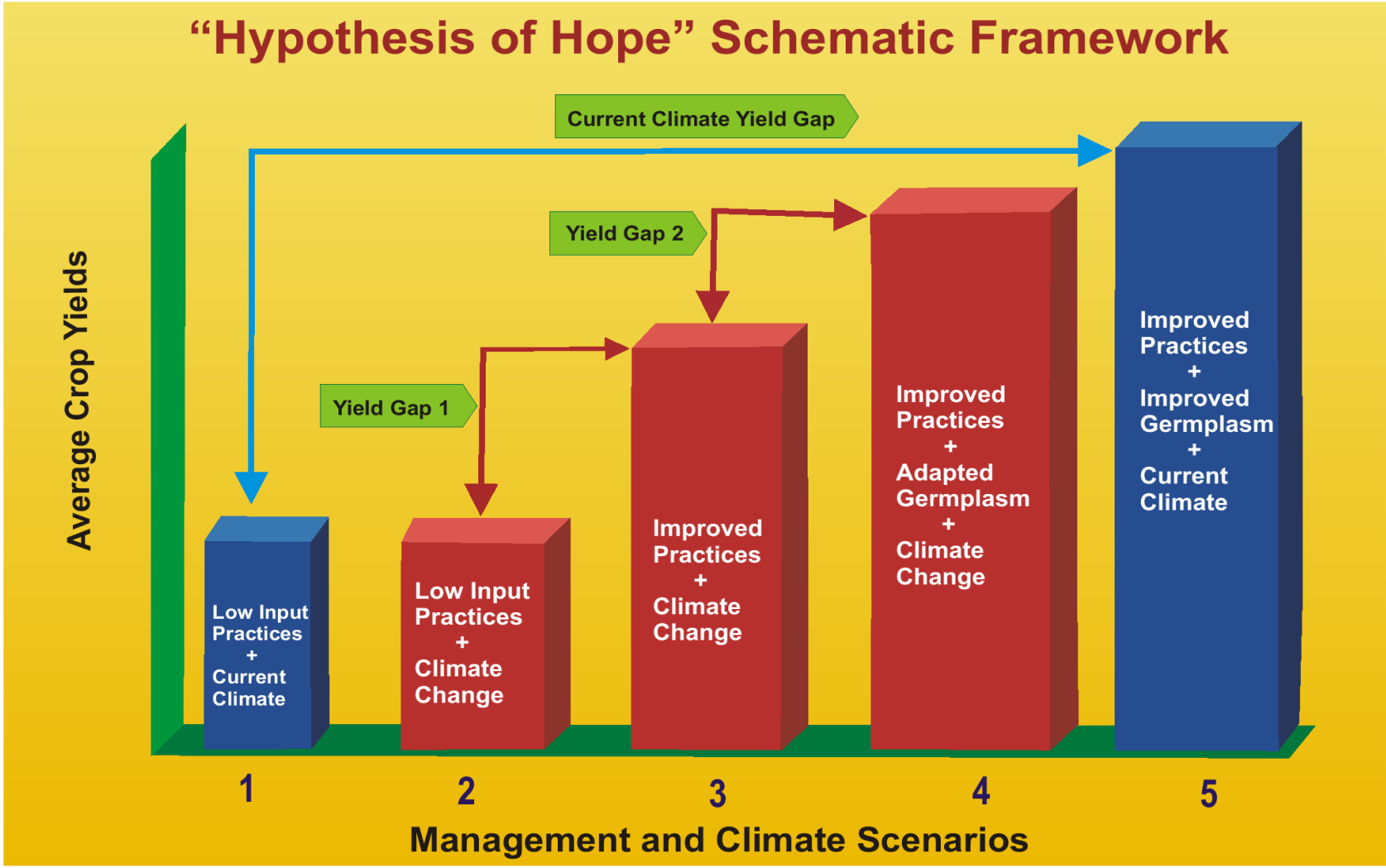


- Soybean yields could reduce by 31% with +2 °C. Under reduced rainfall scenarios, could reduce by 61%
- With +2 °C, WUE could reduce from 4.2 to 2.9 kg ha^{-1} mm^{-1}

- Chickpea yields could reduce by 42% with +2 °C. Low rainfall scenarios reduce yields by 74%
- CC impacts more on chickpea due to less rainfall in rabi



Climate change adaptation in the drylands (Source: ICRISAT)



Climate Change Research Themes: CCAFS

- Adaptation to progressive climate change
- Adaptation through managing climate risk
- Pro-poor climate change mitigation
- Integration for decision making

www.ccafs.cgiar.org




Climate-Smart Agriculture

- Integrated approach addressing climate change effects on food production:
  - Sustainably increase agriculture productivity and production
  - Adapt and build resilience to climate change effects
  - Reduce green-house gas emissions and carbon foot print of agriculture
- Needs financing to support implementation of Climate-Smart Agriculture practices
- General public and farming community need to be stakeholders in the decision making process

Future policy directions and actions-1

More funds for R4D on climate resilient agriculture

- **Institutionalize, consolidate and strengthen R4D efforts on climate resilient agriculture**
- **Holistic and proactive approaches in response to global contemporary challenges such as climate change,**

Consolidate and analyze various climatic and crop production models

- **Strategic research to help predict how farming systems can cope with current and adapt to future climate change to improve and stabilize yield.**

Future policy directions and actions

Farmer-centered, science-based approaches

- Efficient water management, weather and climate services, land-use practices and NRM, protection of biodiversity, integrated pest and disease management
- Improved climate change-resilient cultivars
- Bio-prospecting for CC-adaptive traits

Technology options and farmers' access to knowledge and scientific research

- Empower stakeholders through capacity building and collective action
- Promotion of value chains, farmers' role in carbon emission trading schemes, etc.

Linking farmers to markets

- Farmers' access to credit and crop insurance
- Public-private partnerships for processing and value-addition

Together,
we can help smallholder farmers to resiliency and Prosperity in the face of climate change!

Acknowledgements

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