

# Deteriorating Food Security in India

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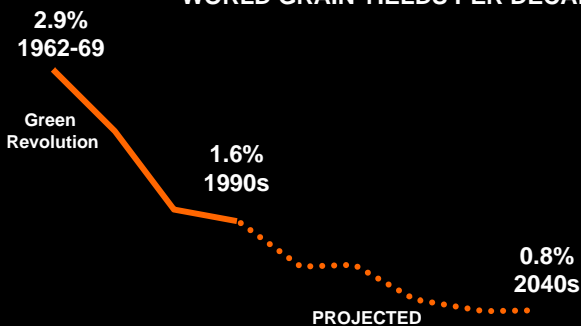


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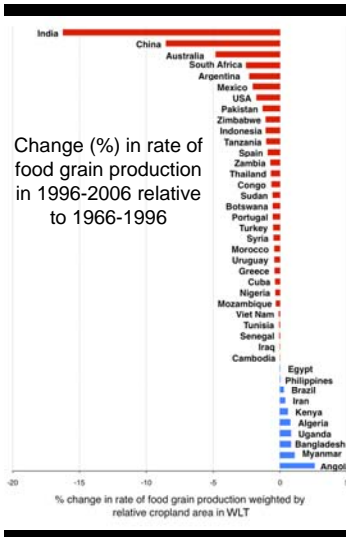
Outline:

- Food grain production in the semi-arid tropics
- Patterns of change in crop production observed by satellite data
- Possible drivers of declines in food grain production

## AVERAGE ANNUAL RATE OF GROWTH IN WORLD GRAIN YIELDS PER DECADE



FAO: International Food Policy Research Institute



Over the last decade, 31 out of 41 countries that hold 90% of the water-limited croplands show a decline in annual average growth rate of food grain production.

Food grain: cereals+coarse grains+pulses  
 Data from FAOSTAT

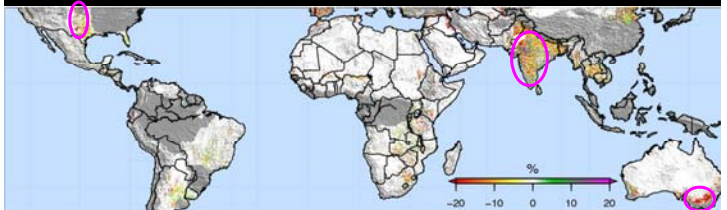
## Annually Integrated NDVI



1982-2006 trend in iNDVI calculated from GIMMS G

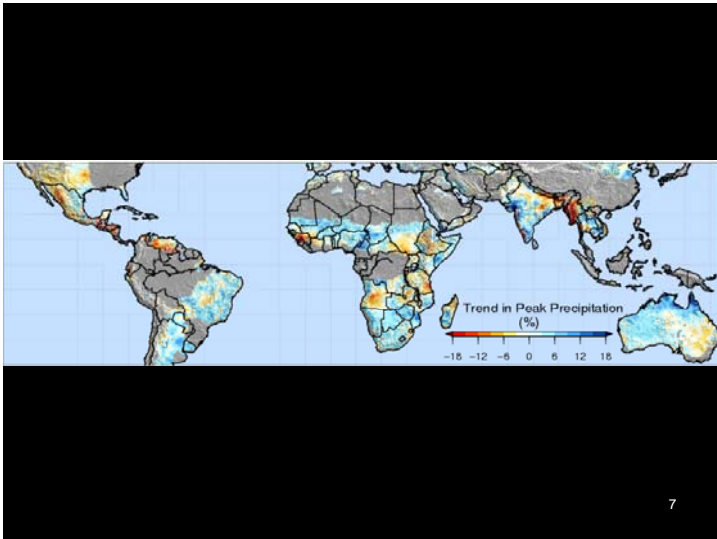
$$NDVI = \frac{NIR - RED}{NIR + RED}$$

45% of the water-limited tropical croplands show a decline in relative growth of integrated NDVI over the last decade

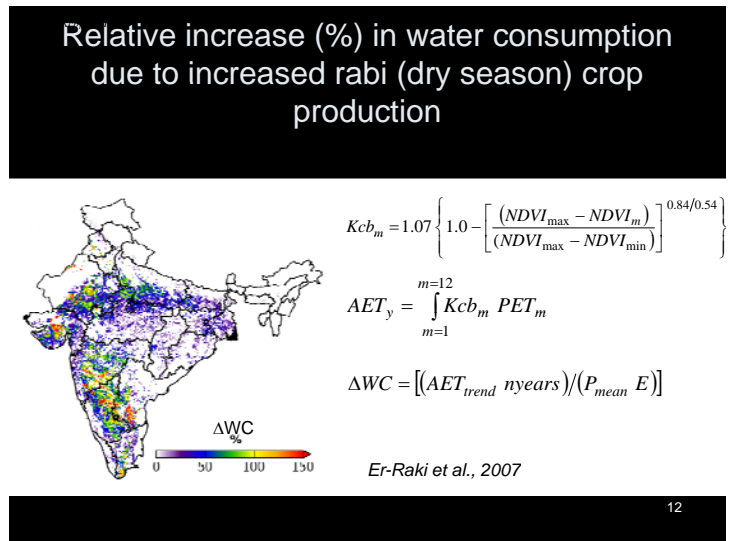
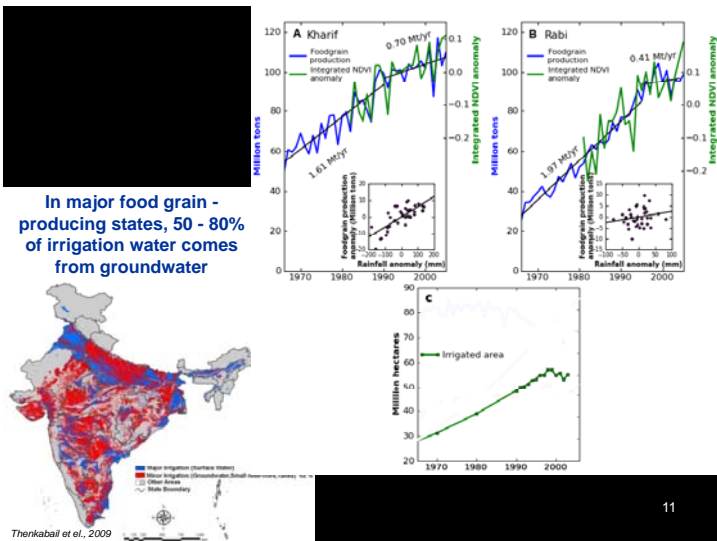
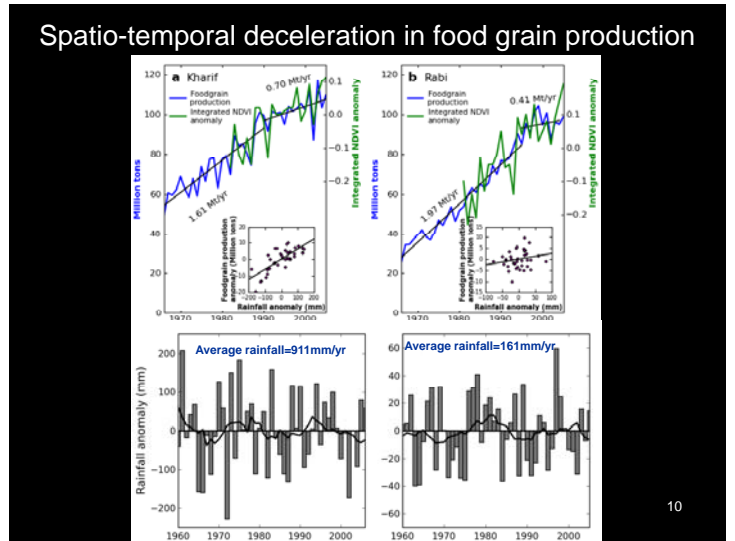
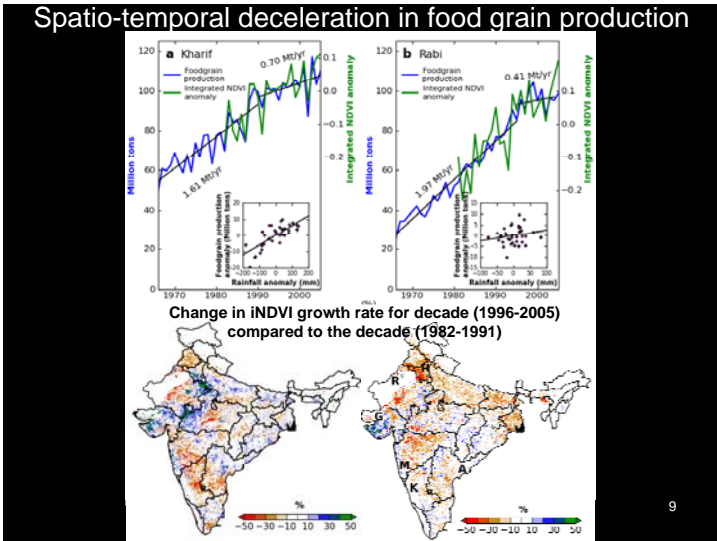
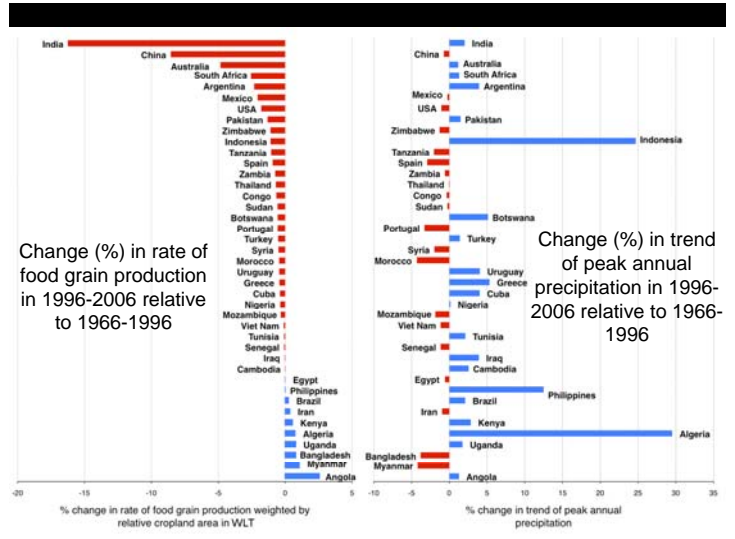


% change in vegetation greenness during 1996-2006 compared to 1982-1992 as calculated from GIMMS-G NDVI

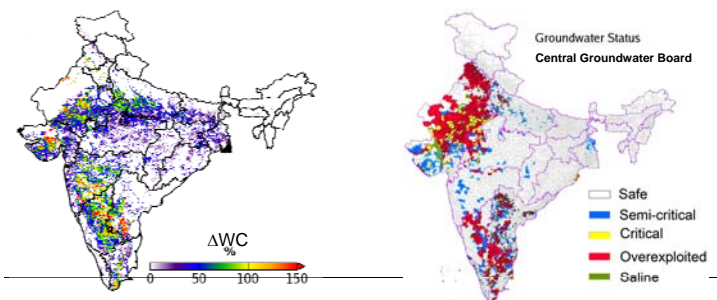
$$NDVI = \frac{NIR - RED}{NIR + RED}$$



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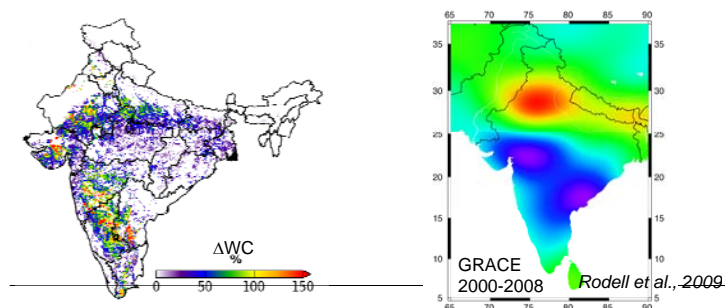


## Relative increase (%) in water consumption due to increased rabi (dry season) crop production

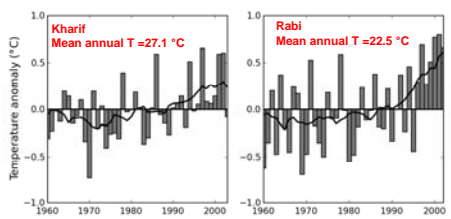


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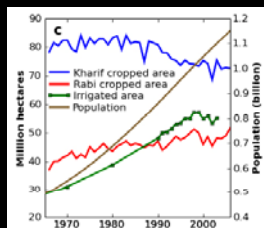
## Relative increase (%) in water consumption due to increased rabi (dry season) crop production



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Warming climate, decline in cropped area and urbanization are also possibly contributing to stagnating food grain production



Change in nightlights from DMSP/OLS composite  
R 2008 G 2000 B 1992



## Conclusions

- We presented a satellite-based, independent assessment of the declines in relative growth rates of food grain production in India reported by crop statistics.
- Various environmental drivers are involved in this decline (gw exploitation, warming, cropland area, competing resources from urbanization).
- Improved water management and overall use efficiency are essential for reversing the recent food grain production stagnation.

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Thank you!



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