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The U.S. Government's Global Hunger & Food Security Initiative

GLOBAL LEARNING AND EVIDENCE EXCHANGE
CLIMATE-SMART AGRICULTURE

DECEMBER 5–9, 2016 // SIEM REAP, CAMBODIA

Envisioning and Scaling
'Climate-Smart' Agriculture Into
South Asia Cereal Crop Systems

Andrew McDonald, International Maize and Wheat Improvement Center (CIMMYT)



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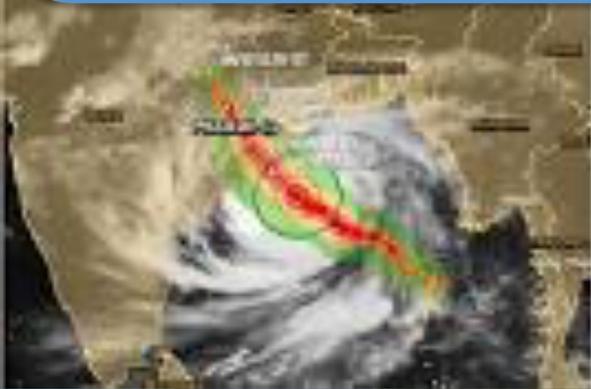


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Ganges Delta and Coastal Odisha:

- Endemic poverty / migration
- Rice – fallows or pulses, low cropping intensity
- Low levels of irrigation
- Pockets of seasonal salinity
- Weak markets
- Disaster prone (floods, cyclones)



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Eastern IGP:

- Thermal stress for wheat
- Wealth of water resources, but under-developed (< 50% land area)
- Rice – wheat, rice-maize systems
- Strengthening interest of private sector / Govt investments (e.g., BGREI)
- Small farms and fragmented landholdings



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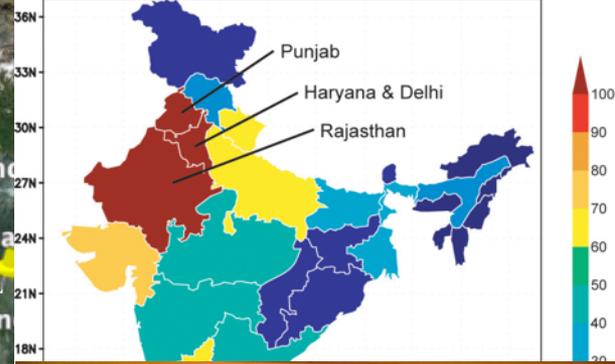
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NW Breadbasket of India:

- Large farms
- Mechanized, irrigated, + intensive
- Rice-wheat, cotton-wheat
- Supportive, but distorting policies
- Contested resources and depletion
- Regional hub of innovation

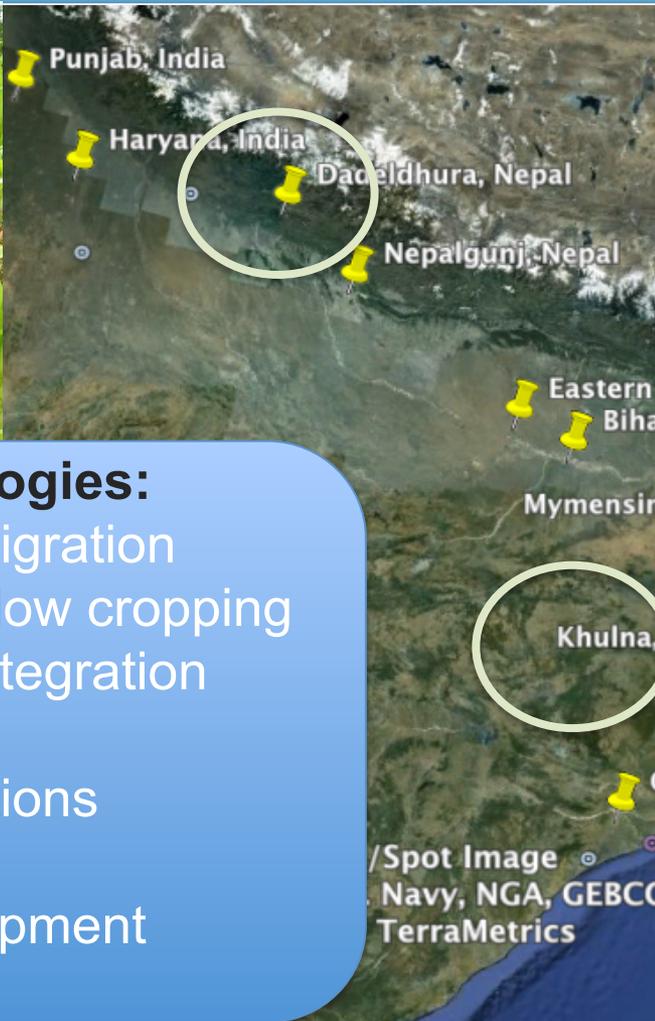


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Hill and Plateau Ecologies:

- Endemic poverty / migration
- Maize / upland rice, low cropping intensity, livestock integration
- Rainfed, poor soils
- Tribal, limited institutions
- Weak markets
- Remittances, development emphasis



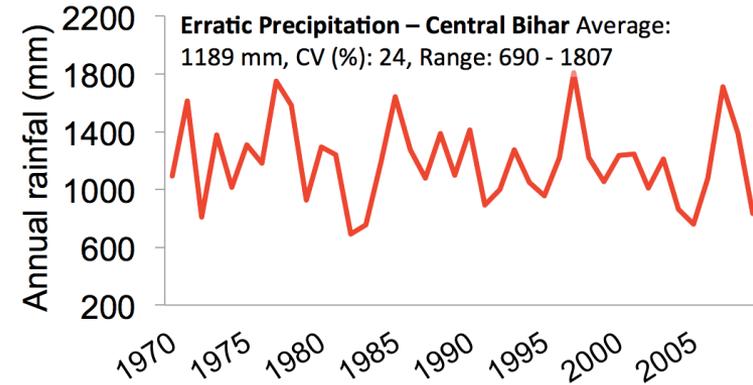
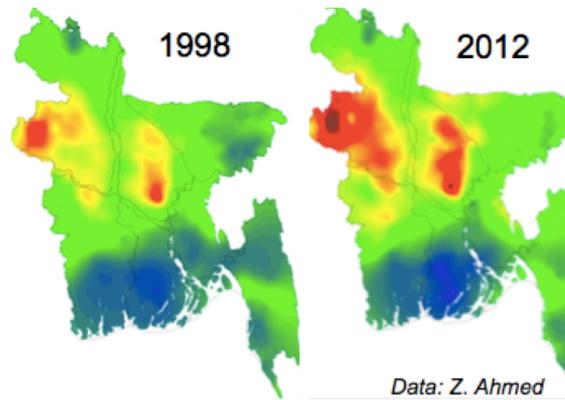
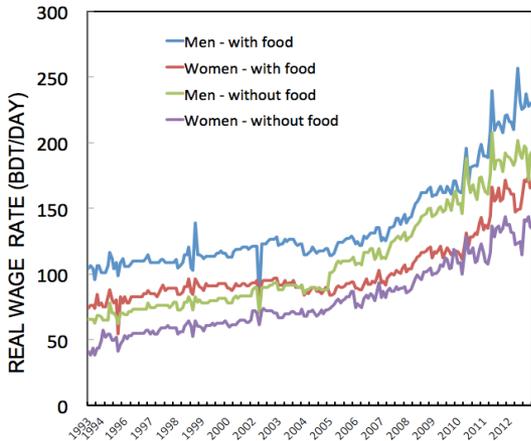
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DRIVERS OF CHANGE IN SOUTH ASIAN AG



Real wages doubling in the last decade

Pockets of resource depletion

(More?) Erratic climate patterns



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IMPLICATIONS OF A LESS PREDICTABLE MONSOON?



2011 - Early onset

- DSR failures
- Inundation damage
- High yields in conventional rice



2012 - Late onset

- Delayed rice establishment
- Old rice seedlings / fallows
- Delayed rabi establishment



2013 - Mid drought, late excess

- Crop abandonment
- Direct damage from Phalin
- Harvest delays in heavy soils





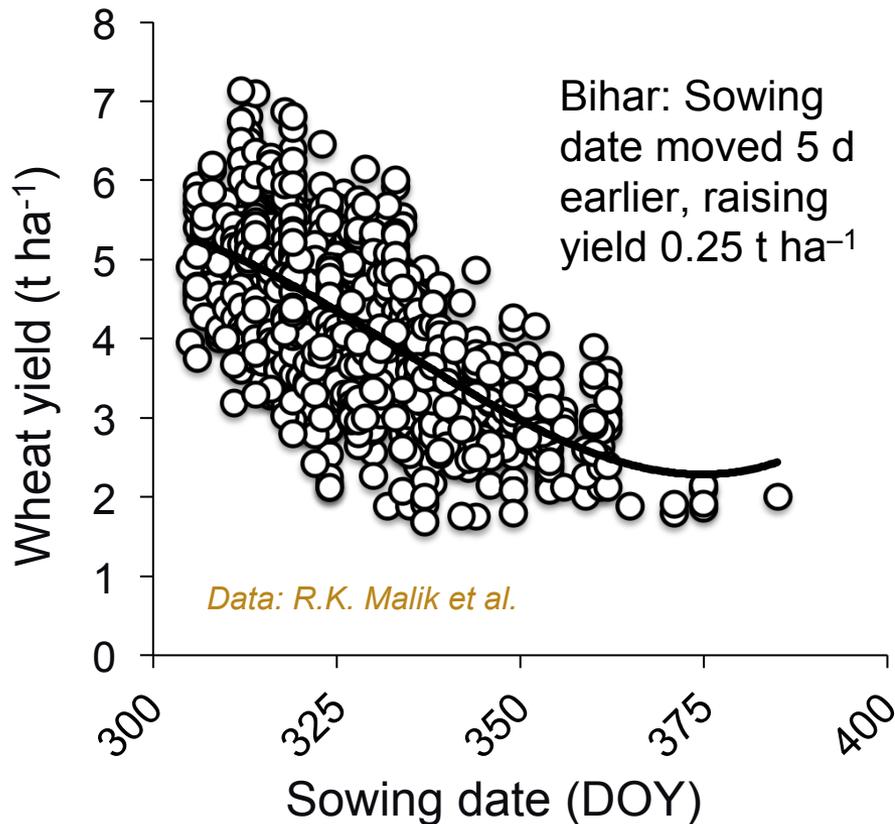
TARGETING COPING STRATEGIES FOR RESILIENCE

- Facilitate market-led transitions to **less water-demanding crops** like soybean in drought-prone areas
- Champion **rice nursery enterprises** to ensure farmers have access to appropriately-aged seedlings
- Encourage cultivation of **shorter duration and drought tolerant rice** cultivars and hybrids
- Through agro-advisory, disseminate information on **optimal rice sowing and transplanting dates** based on historical rainfall probabilities and weather forecast information
- With research-based evidence, **highlight the promise of technologies** like DSR to establish rice when early rainfall is deficient





SYSTEMS APPROACHES ARE ESSENTIAL



- Medium-duration **rice**
- Timely **rice** establishment
- Mechanized **rice** harvest
- Zero-tillage for wheat
- Long-duration wheat
- *Revised recommendations and social marketing*

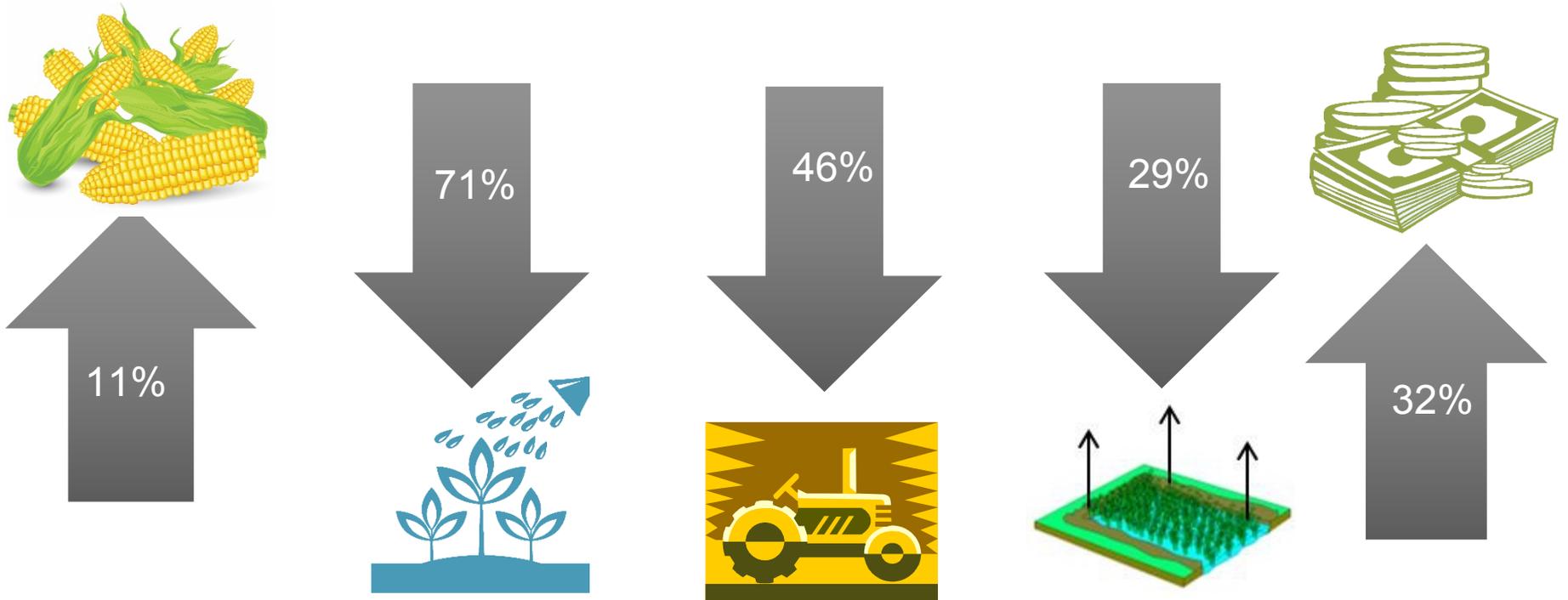




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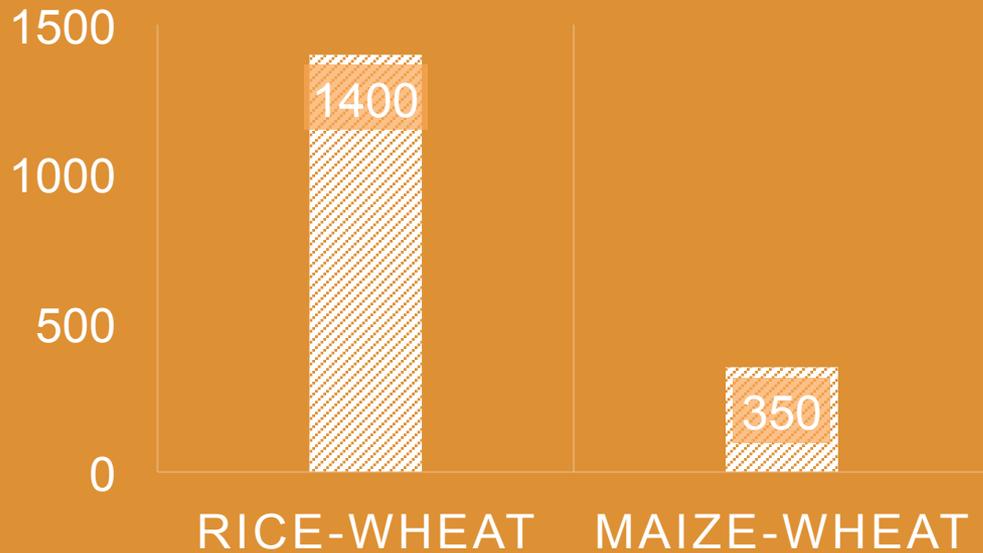
DIVERSIFICATION + CA + PA =



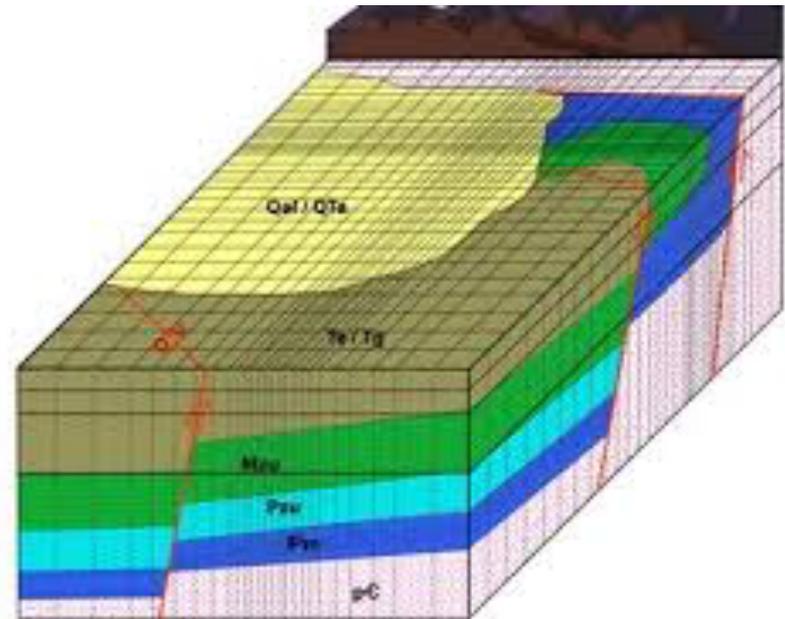
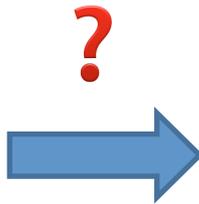
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IRRIGATION (MM)



Verifying CSA at nested scales:
Simulation results suggest 75% reduction in irrigation with maize substituting for *kharif* rice. Much less impact on 'consumptive' water use (15% reduction in ET) and uncertain influence on groundwater decline.





CONSIDERABLE INVESTMENT, BUT LITTLE CHANGE



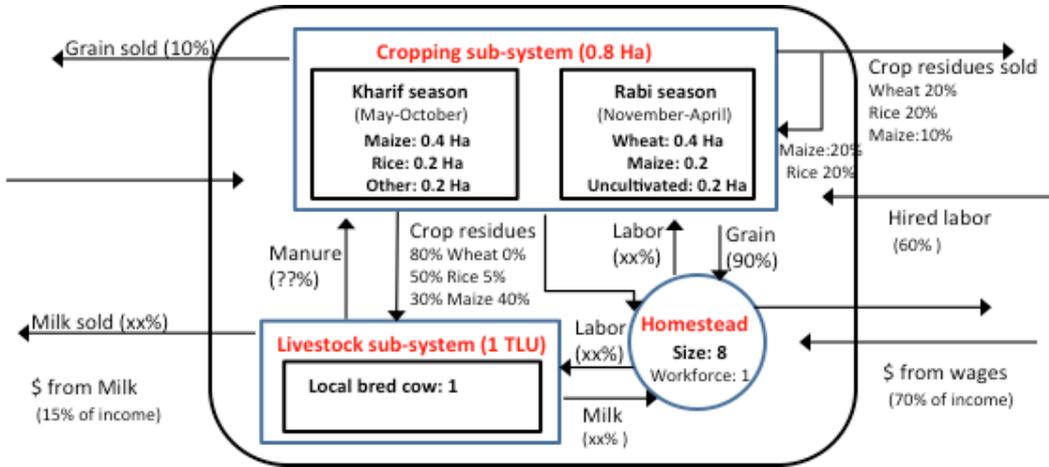
- 22 m hectares of winter fallows in India
- More than 473,000 ha can be cropped in coastal Odisha alone with profitability > \$750 ha per year
- **Why doesn't technical feasibility and apparent profitability always lead to positive change?**





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PRINCIPLE #1:
STRENGTHEN THE
SCIENCE OF DECISION
MAKING OF HOW AND WHY
 DIFFERENT FARMER 'TYPES'
 CHOSE TO INVEST (OR NOT)



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Define + extend BMPs to enhance yield and \$



Ensure grain quality with proper postharvest practices



Increase access to maize shellers



Pre-season planning and capacity development

PRINCIPLE #2: TECHNOLOGIES AS STARTING POINTS WITHIN 'FIT FOR PURPOSE' ALLIANCES



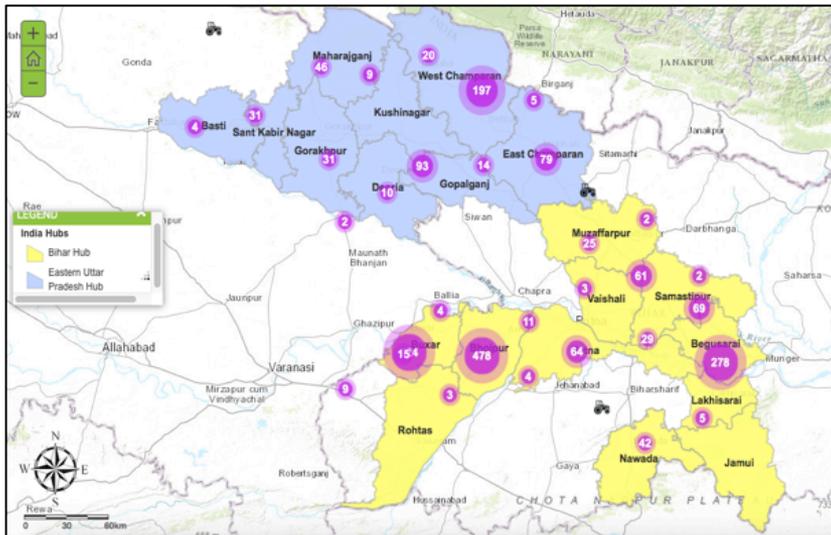
Facilitate aggregation & timely procurement



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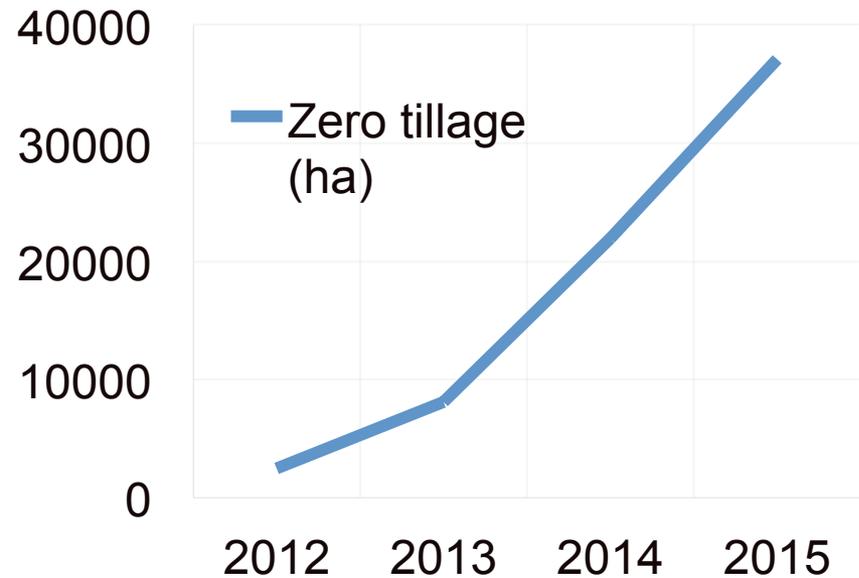
PRINCIPLE #3: SEEK AND NUTURE BUSINESS OPPORTUNITIES



2,909 ZT SP

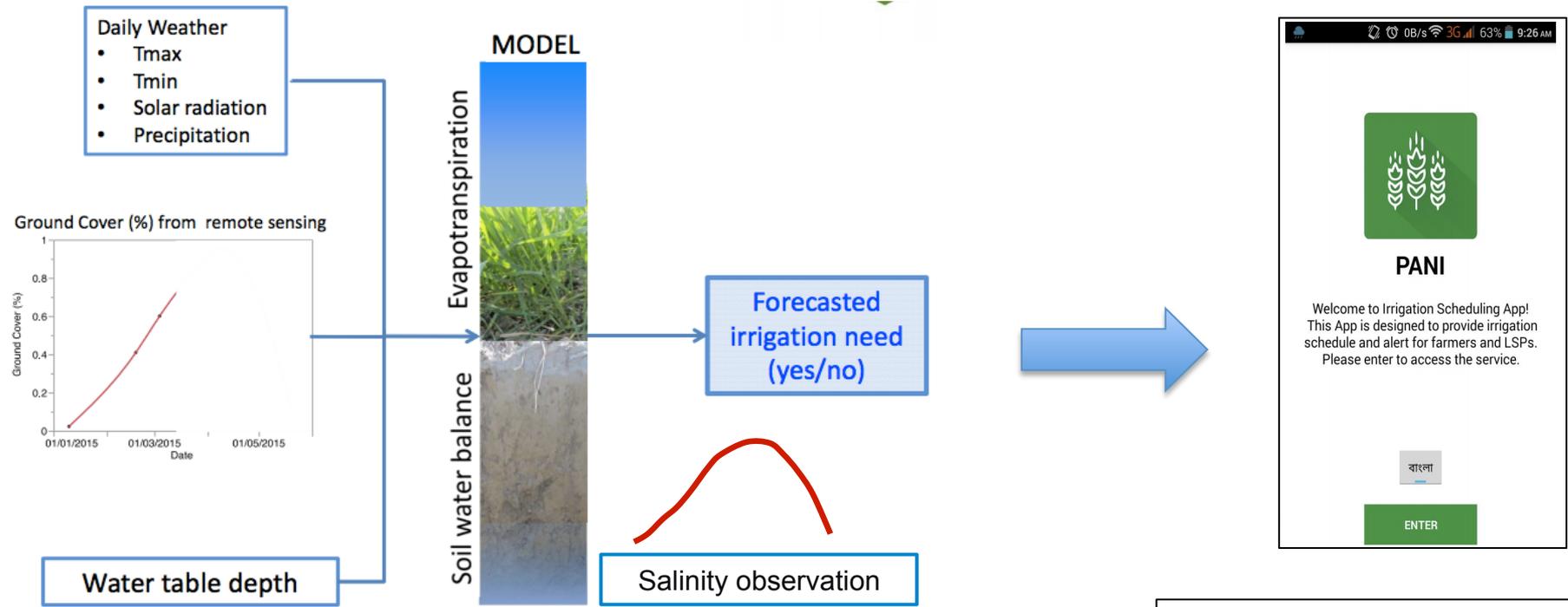
43,800 ha (18% growth p.a.)

Growth of the service economy for ZT wheat





FIELD-LEVEL DECISION TOOLS FOR SI



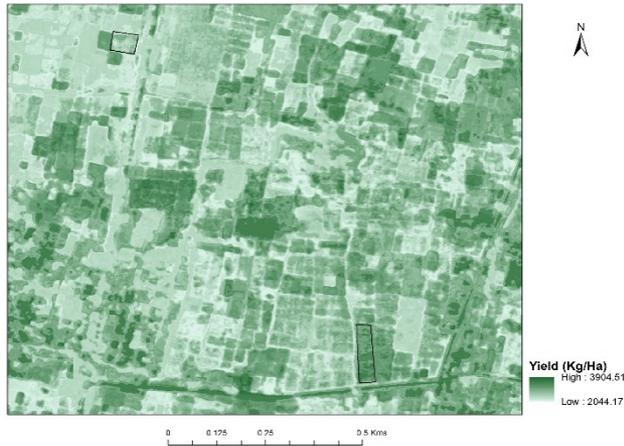
Who deploys the technology?

Pathways at coarser scales: more precise better than no adoption?





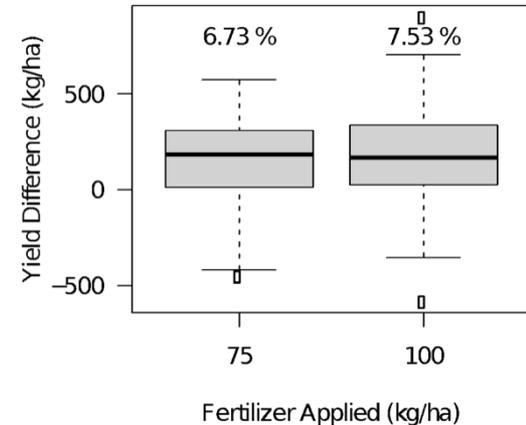
DON'T FORGET THE SIMPLE THINGS



Considerable in-field variability wrt N management (*reduces yield and increases carbon intensity of production*)



Low-cost precision spreaders save time and increase profitability



7-15% increase in AE_N with precision application





TAKE HOME MESSAGES

- The **IGP is diverse** and so are the entry points for CSA
- CSA programming based on single crops rather than **systems** misses significant opportunities
- **Scaling** considerations are just as important as technologies
- Avoid the RCT trap: **generalized 'goods' do not good**
- Process-based agronomy at nested scales (when necessary) to drive **foresight and targeting**





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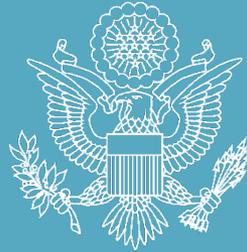
THE CEREAL SYSTEMS INITIATIVE
FOR SOUTH ASIA



NEPAL SEED AND FERTILIZER
PROJECT (NSAF)



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