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February 26, 2014

Are farmers willing to pay for drought tolerant rice?

Evidence from Bihar and other policy research priorities for cereal farming systems in South Asia

Speakers

John McMurdy, *USAID Bureau for Food Security*

Patrick S. Ward, *IFPRI*

David Spielman, *IFPRI*

Facilitator

Julie MacCartee, *USAID Bureau for Food Security*

MPEP SEMINAR
February 28

Latest Impact Findings on Financing Africa's Smallholder Farmers

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John Magnay & Simona Haiduc of Opportunity International

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Q&A Webinar • March 6, 2014 • 11am – 1pm • Washington, DC Time

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John McMurdy

USAID Bureau for Food Security

John McMurdy is an international research and biotechnology advisor at USAID, where he works on development programs involving agricultural biotechnology, biotechnology/ biosafety policy, and conservation agriculture. Before relocating to Washington, John worked as the Chief Technology Officer at Corum Medical, a small SBIR funded medical device company he co-founded with engineer and physician colleagues while in graduate school. John received his Ph.D in Biomedical Engineering from Brown University and B.S. and M.S. from the University of Rochester.

Patrick S. Ward
International Food Policy Research Institute

Patrick S. Ward is an associate research fellow with IFPRI based in New Delhi, India. His research focuses on policy and behavioral issues related to risk management and new agricultural technologies and practices to promote the sustainable intensification of cereal systems in the Indo-Gangetic Plains of South Asia. He holds a Ph.D. in Agricultural Economics from Purdue University, and was previously a visiting researcher with the International Center for Climate Governance in Venice, Italy.

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David Spielman

International Food Policy Research Institute

David J. Spielman is a senior research fellow with IFPRI, based in Washington, DC. His research focuses on agricultural science policy; seed systems; and community-driven development. David was previously based in Addis Ababa, Ethiopia with IFPRI (2004-11). Earlier in his career, he worked on agricultural development topics for the World Bank (Washington, D.C.), the Aga Khan Development Network (Pakistan), and other organizations. David received a Ph.D. in Economics from American University, an M.Sc. in Development Studies from the London School of Economics, and a B.A. in International Relations from Tufts University.

Are farmers willing to pay for drought tolerant rice?

Evidence from Bihar, India

Patrick S. Ward David J. Spielman

International Food Policy Research Institute

26 February 2014

Cereal Systems Initiative for South Asia

Goal: To increase food, nutrition, and income security at scale in South Asia through sustainable intensification of cereal-based systems

- Three countries: Bangladesh, India, Nepal
- Two donors: USAID, BMGF
- Duration: Phase I: 2009-2012; Phase II: 2012-2015
- Website: http://csisa.cimmyt.org

The impact challenge: catalyzing durable change with millions of small and medium-scale farmers

CSISA's policy research agenda

Policy analysis and outreach to...

- Encourage private investment and public-private partnerships in pro-poor technology development and delivery
- Address changing labor, gender, assets, and migration dynamics related to pro-poor technology development and delivery

Website: http://www.ifpri.org/book-736/node/8754

CSISA's policy research

Seeds, traits, and fertilizer

- Industry structure and biotechnology sector in India, Bangladesh, and Nepal
- Hybrid rice in India and Bangladesh
- Abiotic stress tolerance traits in rice in Bihar and Odisha, India
- Promoting balanced chemical fertilizer use using soil test-based recommendations

Machinery and equipment

- Market strategies for laser land levelling in easter Uttar Pradesh, India
- Labor and gender dimensions of mechanized rice transplanters in Bihar
- Industry structure and market power in India's agricultural equipment sector
- Impact of MGNREGA on farmers' adoption of production technologies in India

Crop management

- Drought tolerant rice and weather index insurance in Bangladesh and Odisha, India
- Impacts of shocks and vulnerability on input use and farm management practices

Are farmers willing to pay for drought-tolerant rice? Evidence from Bihar, India

Aims and objectives

- Estimate demand for drought-tolerant rice in Bihar using well-structured discrete choice experiments
- Gain a better understanding for the traits valued by farmers in choosing rice seeds
- Explore variation in demand and the potential for market segmentation, subsidy targeting, etc.
- Analyze potential for private/public sector involvement in the delivery of pro-poor technologies

Motivation

How do we combine efforts to incentivize private sector innovation with efforts to reach small-scale, resource-poor farmers?

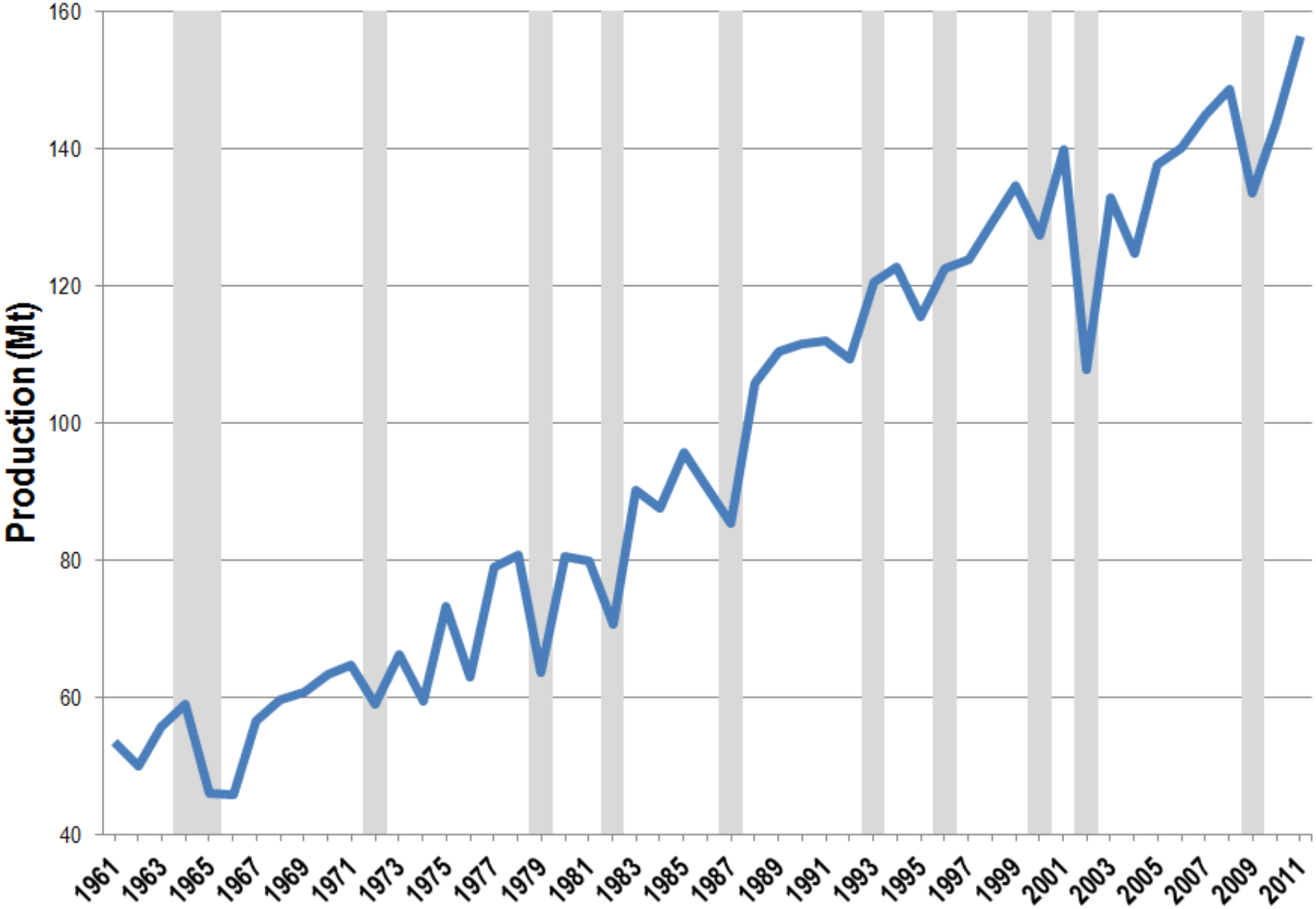
- *Humanitarian use exemptions*
  - Ex: Golden Rice for Vitamin A-deficient women and children
- *Technology subsidies*
  - Ex: Human and animal vaccines
- *Technology embodiment*
  - Ex: open-pollinated varieties of Bt eggplant
- *Market segmentation*
  - Ex: Microfinance services

Droughts and rice production in India

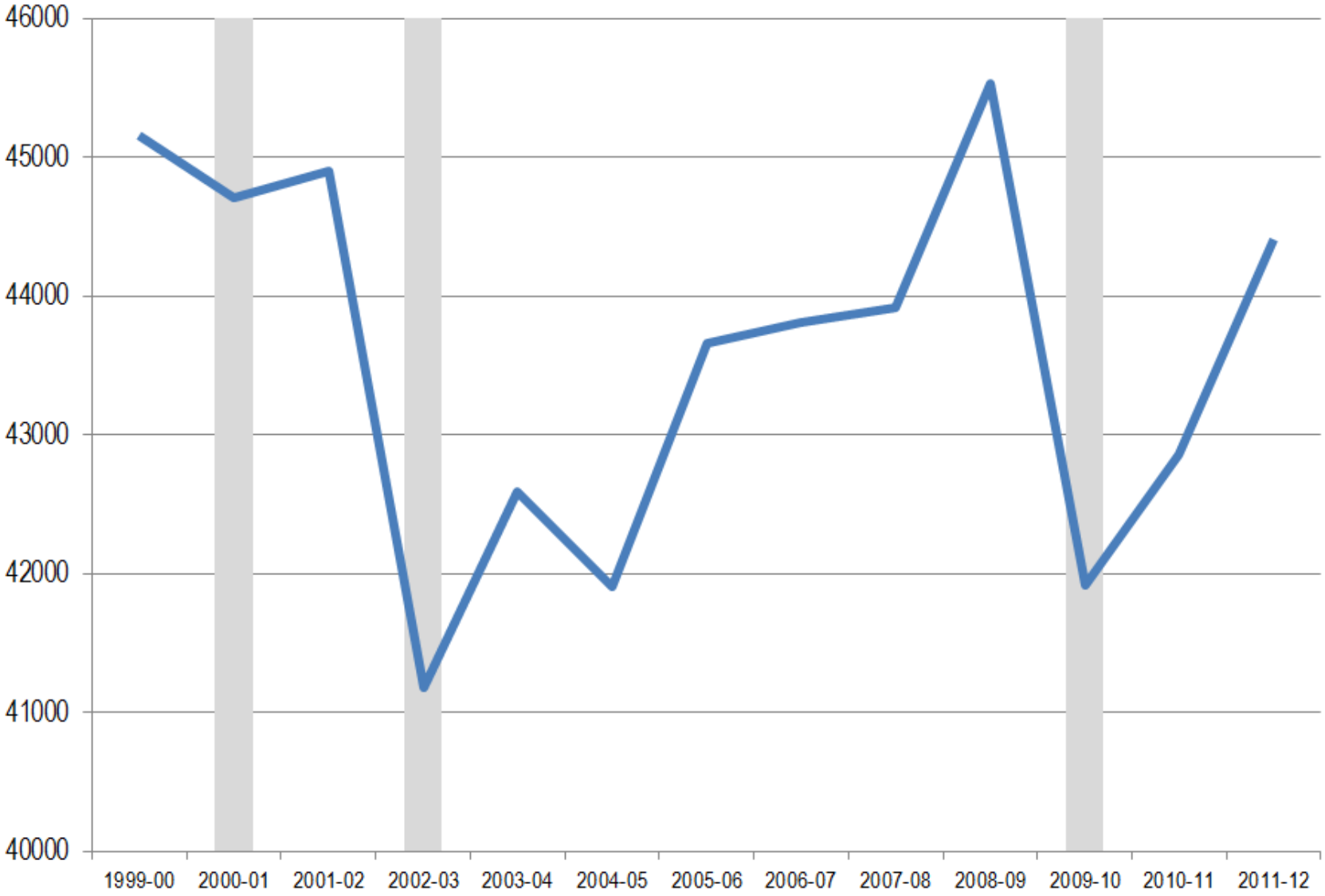
Droughts present a significant constraint to rice production (Pandey et al., 2007; Serraj et al., 2009)

- India has 22.3 million ha of unfavorable areas:
  - 6.3 million ha. of upland rice
  - 16 million ha. of rainfed lowland rice
- 20% of India's total land area is drought prone
- Evidence suggests that droughts have been occurring with greater frequency in India since the beginning of the 20th century (World Bank, 2008)
- When droughts occur, rice production is significantly affected

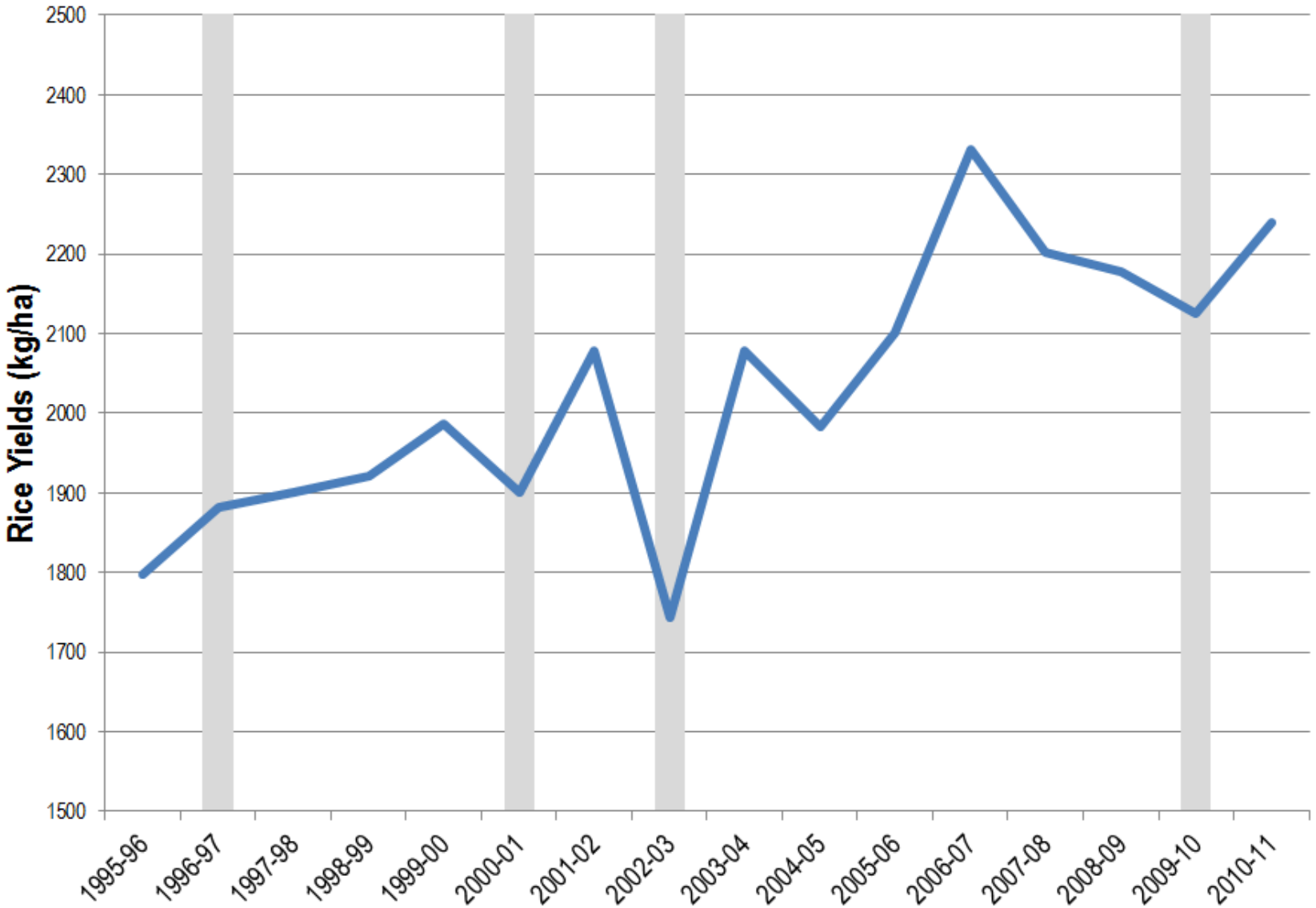
Droughts and rice production in India



Droughts and area under rice production



Droughts and rice yields



Social consequences of droughts

Direct effects are often accompanied by secondary effects:

- Lower farm incomes
- Higher food prices for consumers
- Increased indebtedness
- Asset depletion
- Poverty and malnutrition
- Drought risk reduces productivity even in favorable years because farmers avoid investing in inputs when they fear crop loss (Pandey et al., 2007)

Drought-tolerant rice: Current developments and challenges

- DT rice may present a means of avoiding the increasing threats of droughts
  - Productivity-enhancing (yield variability reducing)rather than purely productivity-increasing (yield increasing)
- IRRI Sahbhagi dhan:
  - Released in 2009 in Jharkhand and Odisha
  - Tolerant under drought stress
    - Yield advantage of 29% and 19% over check varieties in rainfed drought-affected conditions
    - Maintains yield advantage even under severe drought
  - No yield penalty under normal conditions
    - Yield advantage of 23% and 31% over check varieties under non-stressed conditions

Challenges to DT adoption

- Benefits of DT may not be evident at all levels of stress
  - Under normal or irrigated conditions, DT may not perform differently than non-DT
  - At severe stress levels, DT may be indistinguishable from non-DT
  - Moderate drought stress is best for learning about benefits
- Complicates learning about DT

Methodology

Choice experiments are designed to

- Ascertain how consumers evaluate purchasing options
- Evaluate demand for goods that consumers may not be familiar with or for which markets do not exist
- Closely simulate real-world purchasing decisions

Choice tasks

ASSUME THAT THE FOLLOWING FOUR RICE SEEDS WERE THE ONLY CHOICE YOU HAVE, WHICH ONE WOULD YOU PREFER TO BUY AND GROW?

RICE SEED CHARACTERISTICS	RICE SEED A	RICE SEED B	RICE SEED C	MY CURRENT SEED D
DURATION (DAYS)	Long (greater than 135 days)	Medium (120-135 days)	Short (less than 120 days)	I LIKE NEITHER A NOR B NOR C. I PREFER TO CONTINUE TO CULTIVATE THE VARIETY I CULTIVATED THIS PAST RICE SEASON 
YIELD (MAUNDS/ACRE)	50 Maunds/Acre	59 Maunds/Acre	50 Maunds/Acre	
	26 Maunds/Acre	36 Maunds/Acre	32 Maunds/Acre	
	17 Maunds/Acre	17 Maunds/Acre	16 Maunds/Acre	
GRAIN CAN BE STORED AND RE-USED AS SEED NEXT SEASON	Yes	Yes	No	
SEED PRICE(PRICE/KG)	15	140	25	
SEED RATE (KG/ACRE)	4-6 kg/acre	12-16 kg/acre	4-6 kg/acre	

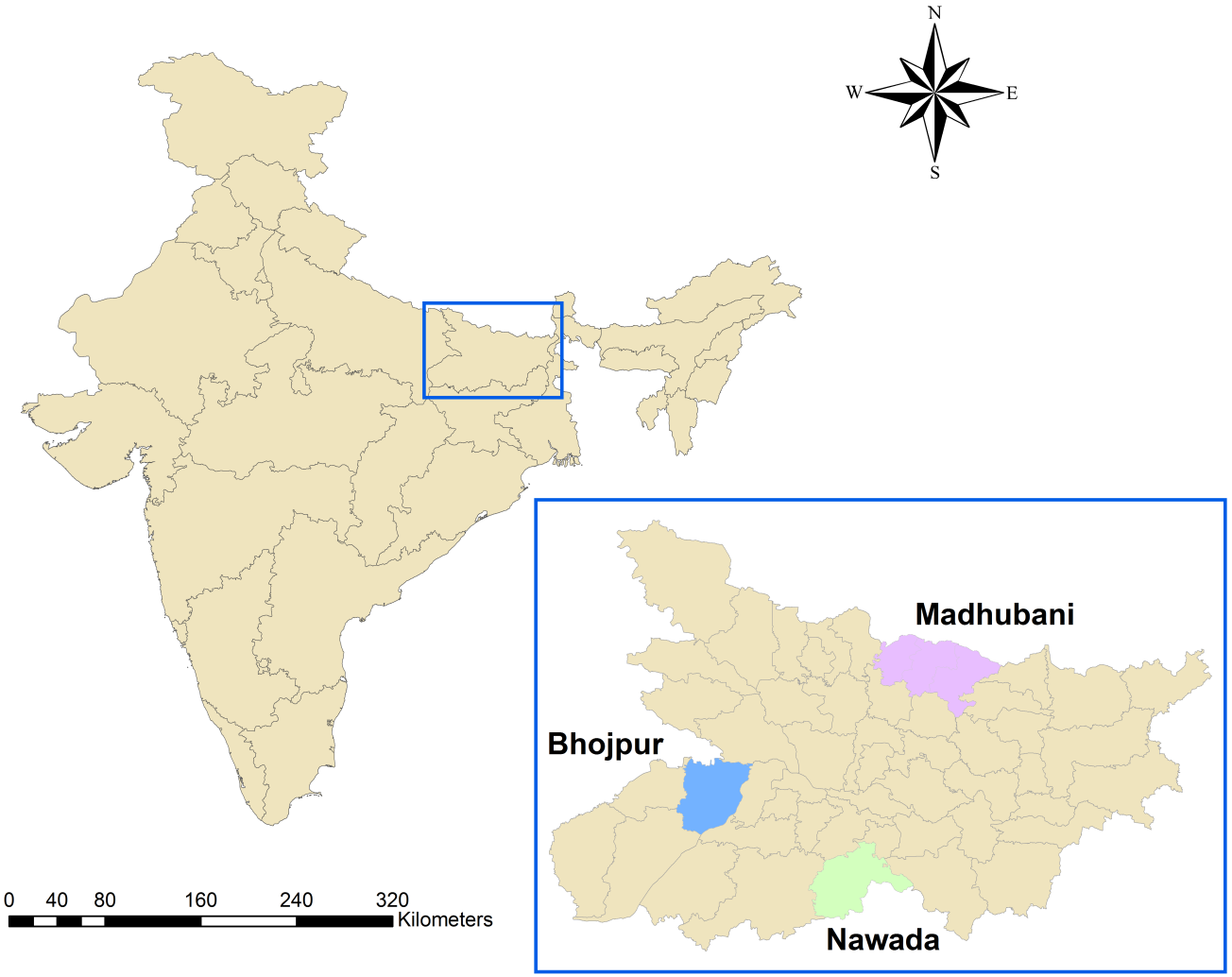
Risk and loss aversion experiments

Lottery-based experiments used to gauge aversion to risk and losses

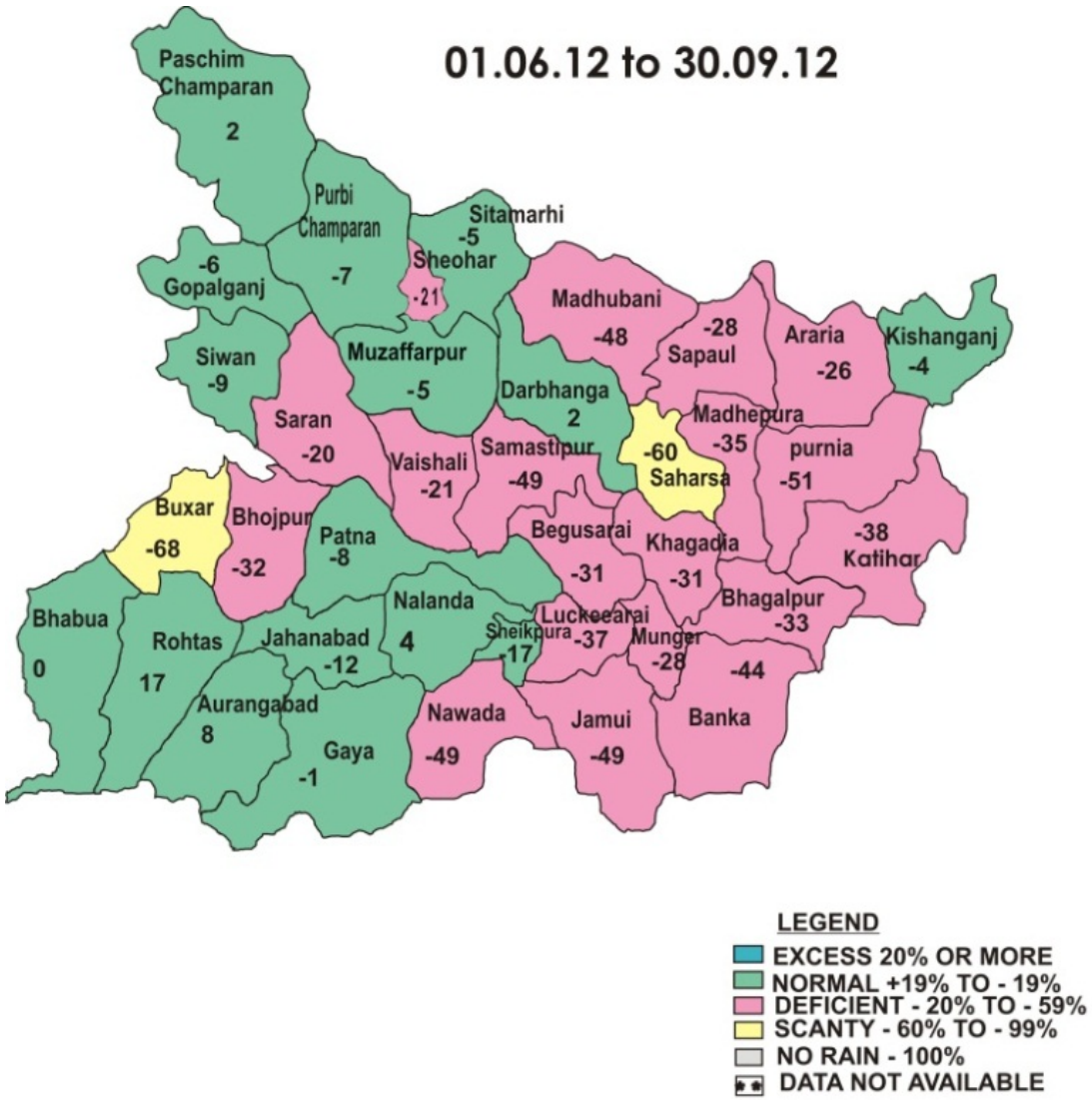
Option (A)	Option (B)	
Certain Payment	"Winning" Lottery Payment	"Losing" Lottery Payment
₹10	₹26 if chip is ①	₹5 if chip is ②, ③, ④, ⑤, ⑥, ⑦, ⑧, ⑨, or ⑩
₹10	₹28 if chip is ①	₹5 if chip is ②, ③, ④, ⑤, ⑥, ⑦, ⑧, ⑨, or ⑩
₹10	₹32 if chip is ①	₹5 if chip is ②, ③, ④, ⑤, ⑥, ⑦, ⑧, ⑨, or ⑩
₹10	₹36 if chip is ①	₹5 if chip is ②, ③, ④, ⑤, ⑥, ⑦, ⑧, ⑨, or ⑩
₹10	₹41 if chip is ①	₹5 if chip is ②, ③, ④, ⑤, ⑥, ⑦, ⑧, ⑨, or ⑩
₹10	₹47 if chip is ①	₹5 if chip is ②, ③, ④, ⑤, ⑥, ⑦, ⑧, ⑨, or ⑩
₹10	₹56 if chip is ①	₹5 if chip is ②, ③, ④, ⑤, ⑥, ⑦, ⑧, ⑨, or ⑩
₹10	₹6 if chip	
₹10	₹7 if chip	
₹10	₹8 if chip	
₹10	₹10 if chip	
₹10	₹13 if chip	
₹10	₹18 if chip	
₹10	₹28 if chip	

(A)		(B)	
"Winning" Lottery Payment	"Losing" Lottery Payment	"Winning" Lottery Payment	"Losing" Lottery Payment
You win **₹25** if chip is ①, ②, ③, ④, or ⑤	You *lose* **₹4** if chip is ⑥, ⑦, ⑧, ⑨, or ⑩	You win **₹30** if chip is ①, ②, ③, ④, or ⑤	You *lose* **₹21** if chip is ⑥, ⑦, ⑧, ⑨, or ⑩
You win **₹4** if chip is ①, ②, ③, ④, or ⑤	You *lose* **₹4** if chip is ⑥, ⑦, ⑧, ⑨, or ⑩	You win **₹30** if chip is ①, ②, ③, ④, or ⑤	You *lose* **₹21** if chip is ⑥, ⑦, ⑧, ⑨, or ⑩
You win **₹1** if chip is ①, ②, ③, ④, or ⑤	You *lose* **₹4** if chip is ⑥, ⑦, ⑧, ⑨, or ⑩	You win **₹30** if chip is ①, ②, ③, ④, or ⑤	You *lose* **₹21** if chip is ⑥, ⑦, ⑧, ⑨, or ⑩
You win **₹1** if chip is ①, ②, ③, ④, or ⑤	You *lose* **₹4** if chip is ⑥, ⑦, ⑧, ⑨, or ⑩	You win **₹30** if chip is ①, ②, ③, ④, or ⑤	You *lose* **₹16** if chip is ⑥, ⑦, ⑧, ⑨, or ⑩
You win **₹1** if chip is ①, ②, ③, ④, or ⑤	You *lose* **₹8** if chip is ⑥, ⑦, ⑧, ⑨, or ⑩	You win **₹30** if chip is ①, ②, ③, ④, or ⑤	You *lose* **₹16** if chip is ⑥, ⑦, ⑧, ⑨, or ⑩
You win **₹1** if chip is ①, ②, ③, ④, or ⑤	You *lose* **₹8** if chip is ⑥, ⑦, ⑧, ⑨, or ⑩	You win **₹30** if chip is ①, ②, ③, ④, or ⑤	You *lose* **₹14** if chip is ⑥, ⑦, ⑧, ⑨, or ⑩
You win **₹1** if chip is ①, ②, ③, ④, or ⑤	You *lose* **₹8** if chip is ⑥, ⑦, ⑧, ⑨, or ⑩	You win **₹30** if chip is ①, ②, ③, ④, or ⑤	You *lose* **₹11** if chip is ⑥, ⑦, ⑧, ⑨, or ⑩

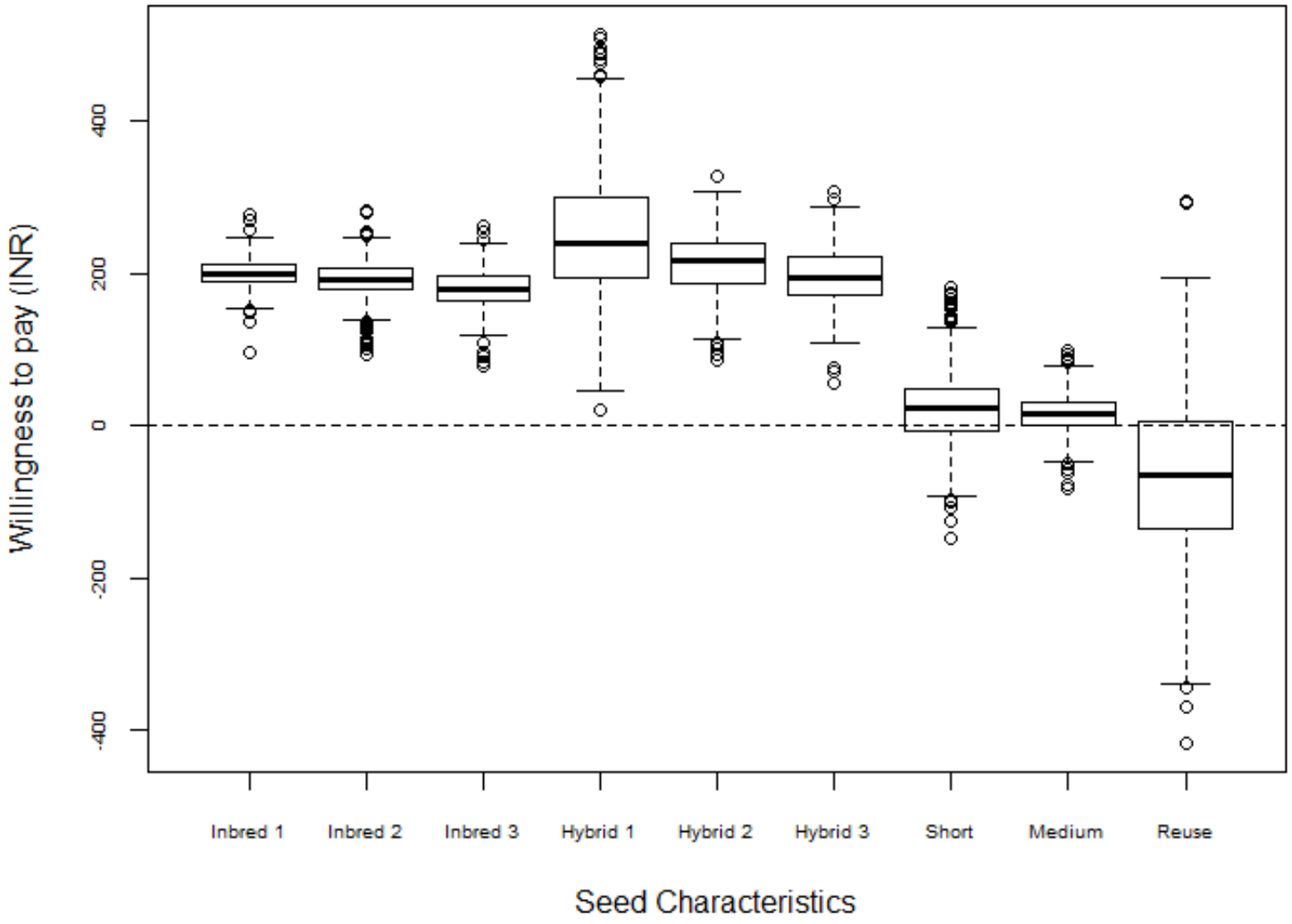
Sample Districts



Rainfall Deficiencies–2012 *Kharif*

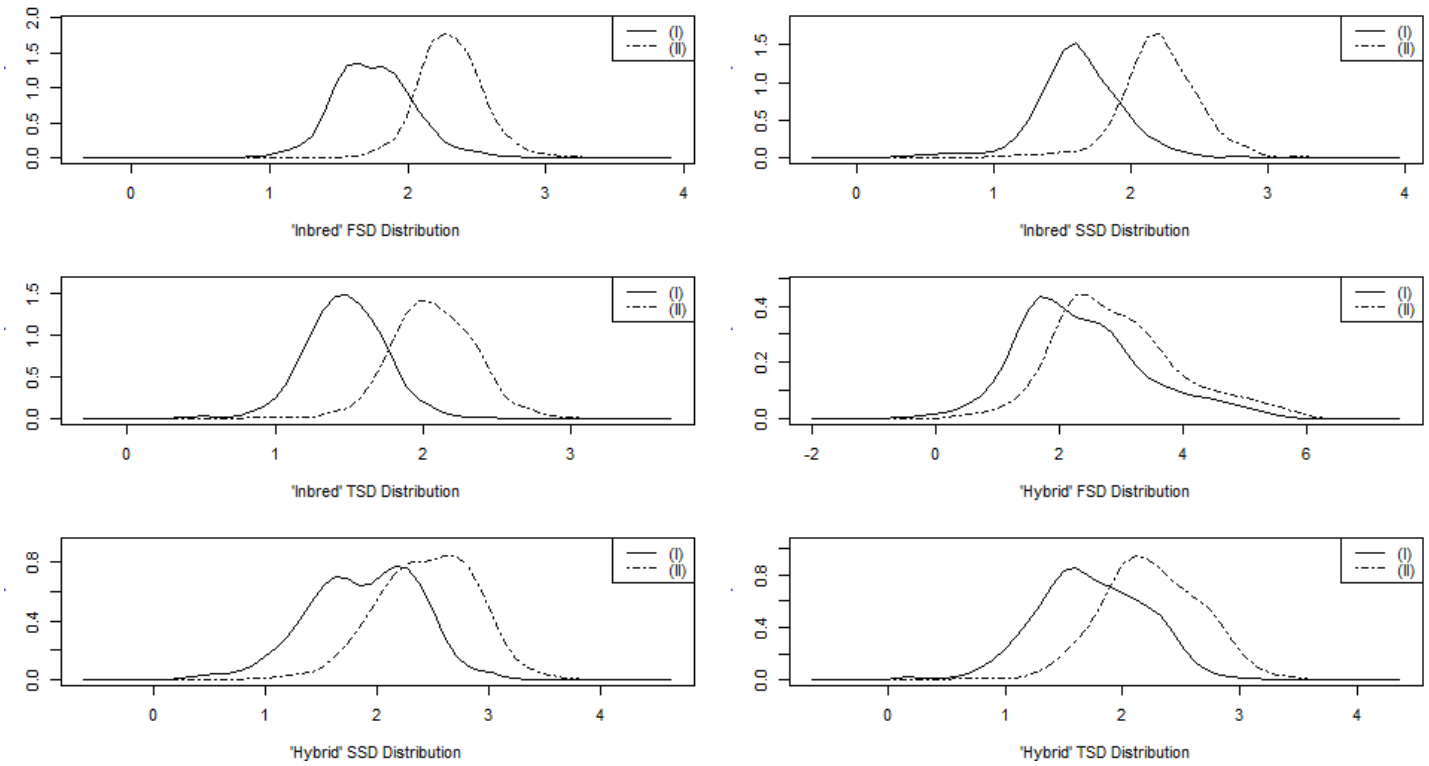


Results: Willingness to pay for rice seed characteristics



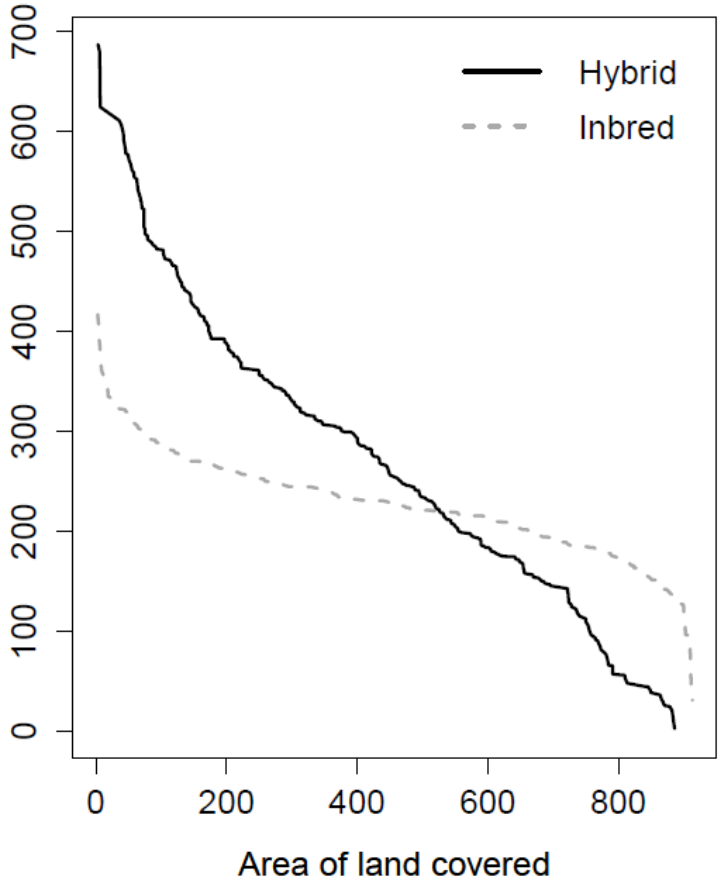
Preference heterogeneity

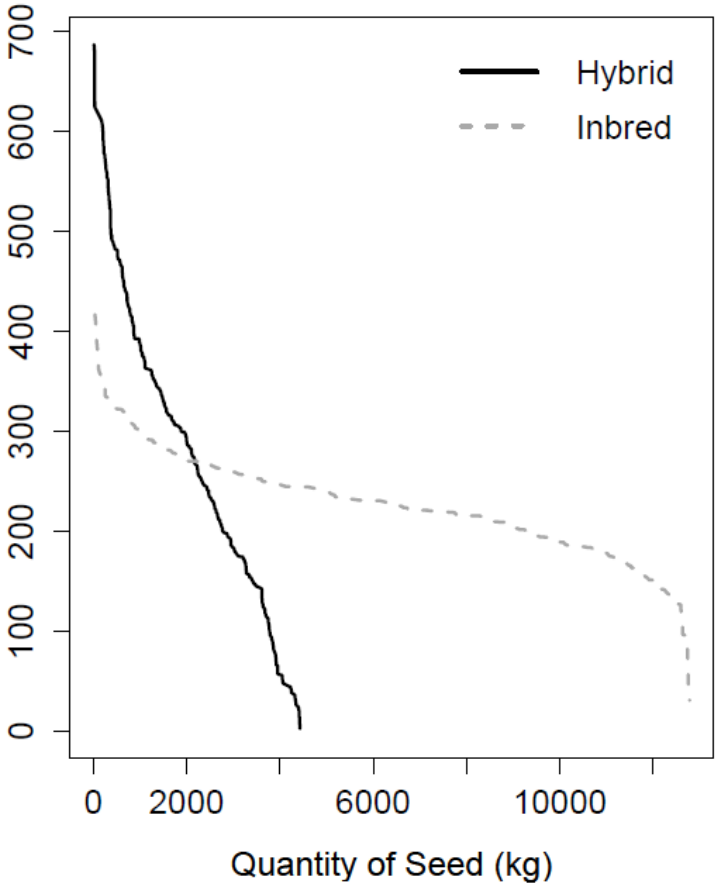
- Wide variation in farmers' preferences for seed characteristics
- Controlling for risk aversion increases valuation of DT yields



Demand for DT Hybrid and DT Inbred

Attribute WTPs can be summed to generate WTP for seeds that represent bundles of attributes





Observations

- Demand for DT hybrid far less sensitive to price than demand for DT inbred
  - Small reduction in price for DT hybrid not likely to have a large effect on DT hybrid demand
- Significant differences in demand patterns for two seeds
  - Demand for DT hybrid reveals much greater variation
  - Demand for DT inbred does not vary a great deal
- Potential market segmentation
- Roles for both public and private sector engagement in discovery, development and delivery of DT seeds

Conclusions

- Farmers in our sample prefer reduction in yield variability offered by DT seeds.
- They are also willing to pay more for seeds that offered yield advantage even under normal conditions (no yield penalty).
- A significant segment of the market values the yields and lower seeding rates conferred by hybrid seeds, and the market for inbreds and hybrids can coexist.
- Results imply a role for both private sector DT hybrids and low-cost DT inbreds through public sector R& D.

Thank you!

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Microlinks MPEP Seminar Financing Africa's Farmers | February 28

#AskAg Twitter Chat: Gender in Ag | March 20

Agrilinks and the AG Sector Council Seminar Series are products of the USAID Bureau for Food Security under the Feed the Future Knowledge-Driven Agricultural Development (KDAD) project.