Evidence from Randomized Evaluations in Agriculture: Risk

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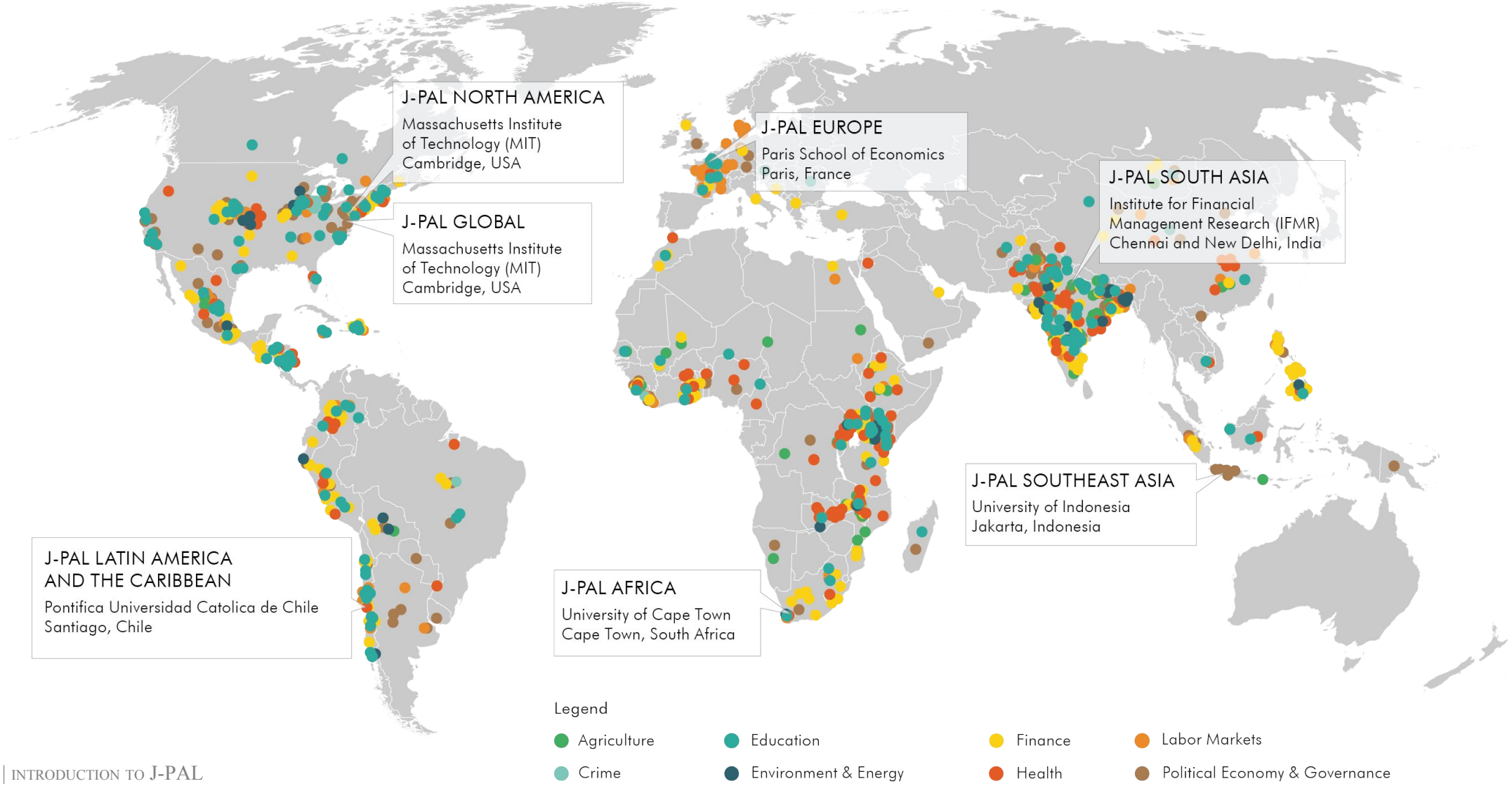
J-PAL has 6 regional offices and over 840 ongoing and completed evaluations in 80 countries



RCTs for Policy

Impact research important to identify "causality"

- Lessons for program and policy design
- Supports results-based management of investments

RCTs have become a widely used methodology

- Not only an academic approach
- Strong demand by development partners (CGIAR, NARS, One Acre Fund, matchmaking exercises)

RCTs in economics help in particular understand the role of **behavior** and **institutions** (agricultural systems) in program/policy outcomes.

atai AGRICULTURAL TECHNOLOGY ADOPTION INITIATIVE

Q: What helps and what hinders smallholder farmers' **adoption** of technologies and access to markets?

Which approaches **impact** farmer profits and welfare?

A: ...well, let's tackle this scientifically

- ➔ Review available evidence: identify key research needs since 2009
- ➔ Mobilize research networks: "clearinghouse" rather than consultant model, fund competitively-selected, high-quality randomized evaluations
- ➔ Share findings: inform relevant decisionmaking

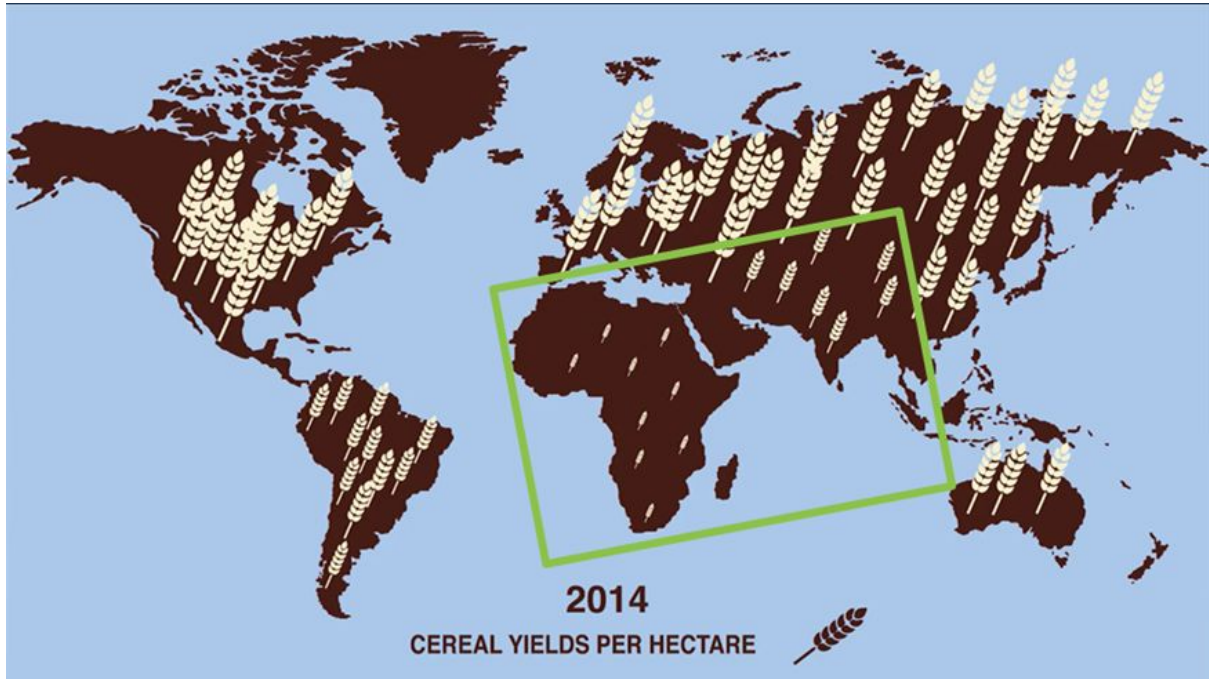
Developing research and policy partners

ATAI PIs have worked with over 50 partners on evaluations

Motivation

Agricultural technologies exist that can

- boost productivity
- increase profits
- fortify the food supply



We've seen a "Green Revolution," yet agricultural productivity was not transformed everywhere.

- When technology adoption fails -- Why? What policy levers can help?
- How can we improve smallholder farmers' profits and welfare?

Data Source: World Development Indicators, FAO via the World Bank

How does risk constrain adoption?

- Agriculture is inherently risky activity
  - Weather and disease risks are aggregate, affecting all farmers in geographic area
- Most investments in improved inputs increase the financial risks of farming
  - Farmers make conservative production decisions to self-insure
- Farmers may lose large portion of harvest to extreme weather event
- Without any way to mitigate or insure risks, investment in crops or technologies appears to be an unsafe gamble
  - Higher-value crops may also be more sensitive to weather
- Exacerbated by risk aversion and ambiguity aversion

Protecting farmers through formal insurance

- Agricultural insurance to hedge risk ubiquitous in developed countries
  - Large number of small farmers, poor regulatory environments make most traditional products ill-suited to smallholders
- Weather index insurance as innovation to insure smallholders
  - Payouts made on observable variable (e.g. rainfall)
  - Avoids some disadvantages of conventional insurance: lengthy claims process, adverse selection, moral hazard
  - But has basis risk: official observation does not accurately predict farmers' losses

A decade of experimentation on weather index insurance

- 10 randomized evaluations in various contexts
  - India, Ethiopia, Ghana, Malawi
  - Differences in crops insured, conditions that triggered payout, etc.
  - Effects of discounts, other encouragements to purchase insurance
  - Effects on production decisions

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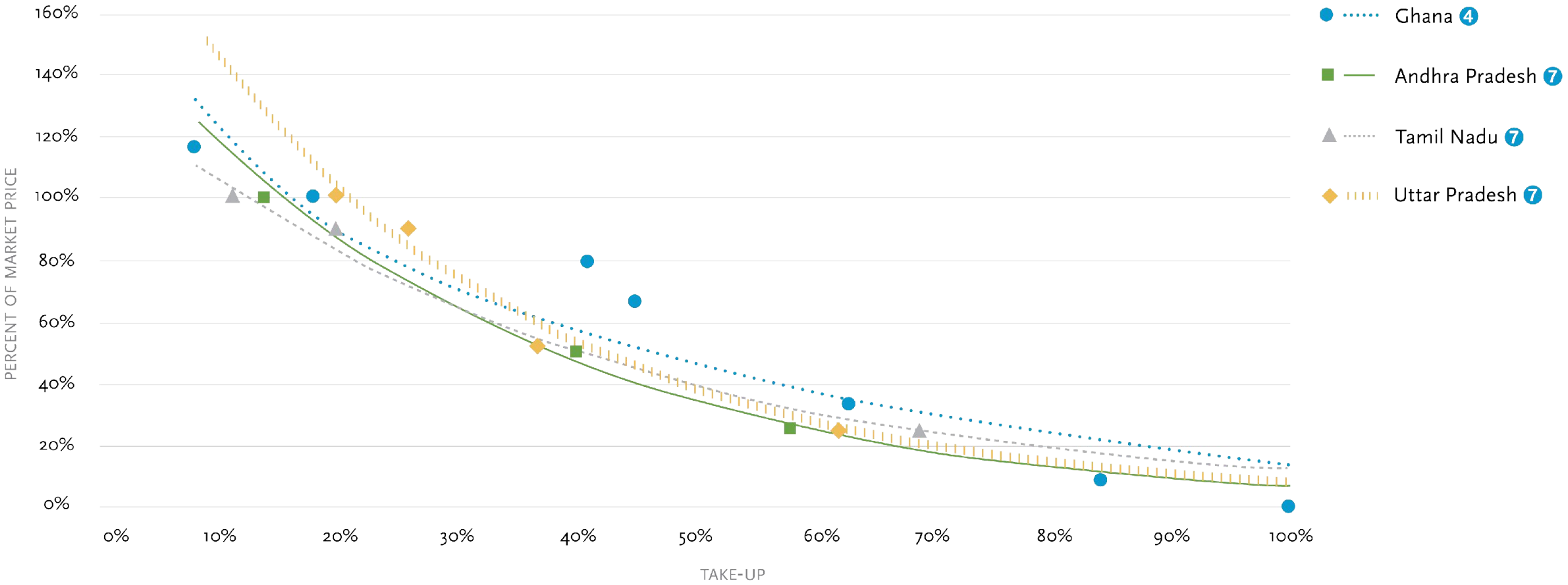
Demand was low at market prices but increased with large discounts



Karlan et al 2013; Mobarak & Rosenzweig 2012; "Make it Rain"

Insured farmers took more risks on their farms

- When given subsidized insurance, farmers took on greater production risks
  - Andhra Pradesh: Fewer subsistence crops, more cash crops
  - Ghana: More land planted to maize, greater fertilizer use
  - Tamil Nadu: Shift from drought-tolerant varieties to high-yield varieties
  - China: Insurance for sows caused farmers to move into this risky but highly profitable crop
  - Mexico (CADENA): insured farmers plant more the year after a shock than non-insured farmers
  - Kenya (IBLI): insurance helps pastoralists avoid decapitalizing livestock in response to drought

Cai et al. 2015; Cai 2013; Cole et al 2014; Karlan et al. 2013; Mobarak & Rosenzweig 2014; de Janvry et al 2016; Janzen & Carter 2013

Downsides of subsidizing risk

- Substantial shift into risky production in several studies when individuals are provided with subsidized WII.
- This means that the agricultural system as a whole has greater sensitivity to rainfall.
- Landless laborers, who are the most vulnerable, see *higher* wage sensitivity to rainfall when farmers are using WII.

Conclusions on WII

- Still clear that risk is a major constraint for smallholder farmers
- However low demand means weather index insurance is unlikely to thrive as a standalone individual commercial product
  - Price, distrust, lack of financial literacy, basis risk
- When farmers have insurance, they take more risks on their farms
  - This is good for average yields but exposes laborers to additional income risk
- So where do we go from here?

An alternative: risk-mitigating crops and technologies

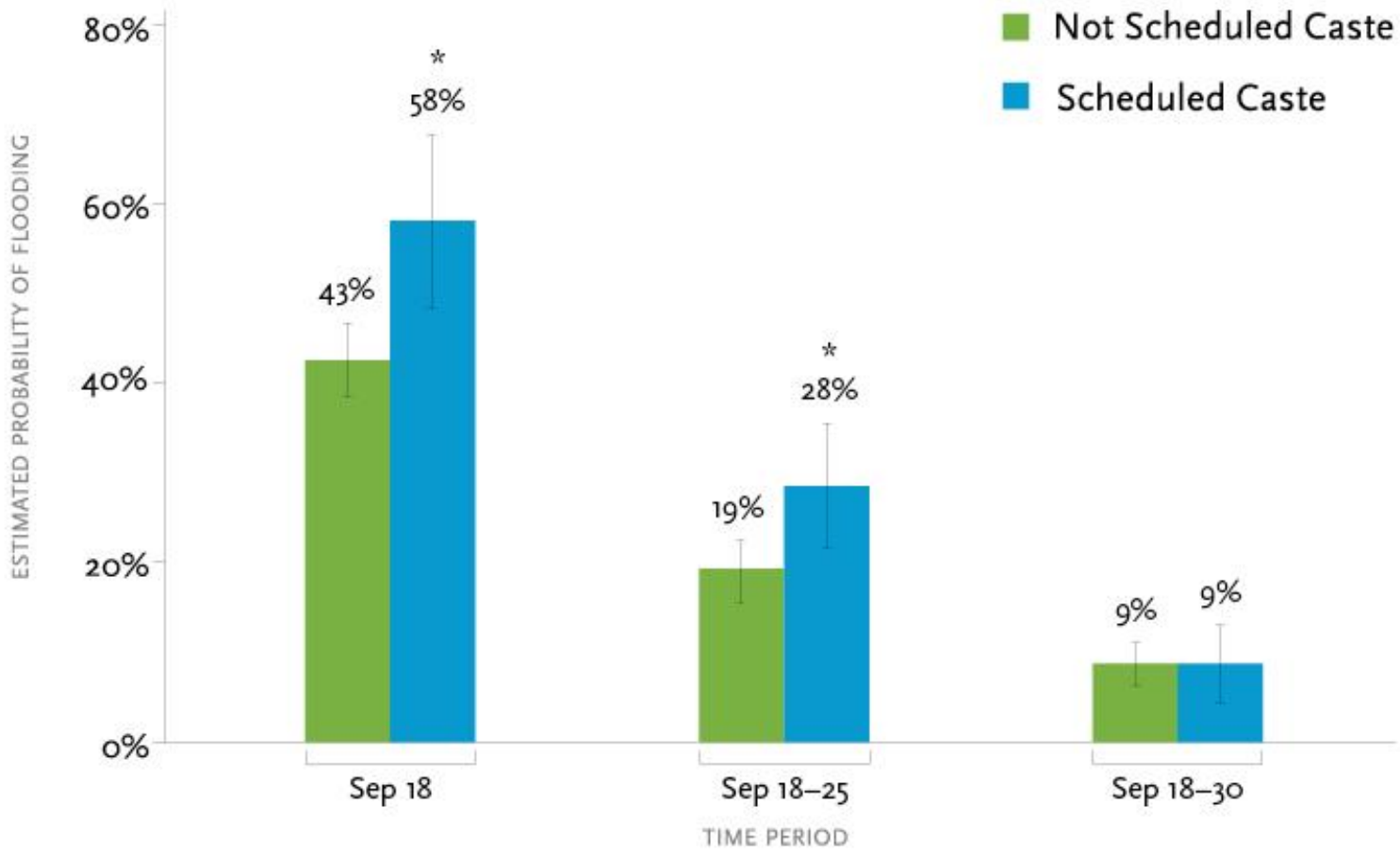
- Agricultural R&D on varieties that tolerate flood, drought, salinity
  - Increasingly important with climate change
- Swarna-Sub1 is a flood-tolerant rice variety
  - No yield penalty in normal conditions
  - Researchers tested effect in real-life conditions in Odisha, India

Dar et al 2015

Farmers given Swarna-Sub1 invested more

- More investment…
  - Cultivated more land
  - Used more fertilizer
  - Adopted improved planting techniques
  - Adjusted their savings and credit decisions
- … led to higher yields and higher revenues.
  - Increased rice yields in years with and without floods
  - Higher yields led to increased revenues and productive investments

Scale-up would benefit marginalized populations the most



Note: Error bars represent 95% confidence intervals.
Stars (*) note statistical significance from control group.

Dar et al 2015

Risk: Evidence-based Insights

- Standalone weather index insurance can increase risk-taking in production decisions, but has limited commercial viability at market prices.
  - Index insurance products suffer from low demand at market prices.
    - Linking credit with insurance has mixed results and suffers from low demand
    - Demand for insurance increases when farmers observe payouts over time
  - Improving financial literacy and understanding of an insurance product increases take-up, but the cost of the training is much higher than the full cost of premiums.
  - Adopting insurance can increase risk-taking in production decisions.
- New risk-mitigating crop varieties provide a promising alternative to insurance that can reduce farmers' risk and produce higher yields
- Evidence from 13 studies

Cai et al. 2010, Cai 2013, Cole et al. 2013, Cole et al. 2014, Dar et al. 2013, Gine & Yang 2009, Gunnsteinson 2014, Janzen & Carter 2013, Karlan et al. 2010, Karlan et al. 2012,, McIntosh et al. 2013, Mobarak & Rosenzwig 2012, Mobarak & Rosenzwig 2014

Risk: Emphasis for Future Research

- Risk-protective seeds and technology
  - Achieve the benefits of insurance to farmers while decreasing aggregate exposure of agricultural system to weather
- Meso-level insurance
  - Focus on supply side by providing insurance to institutions (financial or governmental) that are exposed to weather risk
- Use of free insurance as a form of social protection
  - May be able to achieve a multiplier effect by releasing farmers' production decisions from risk constraints
- Strategies to reduce basis risk in index insurance products
  - Offer index insurance to groups who already provide informal risk pooling for idiosyncratic risks
  - Improving data to more closely align index triggers and experienced losses at the farm level

Carter et al. 2014, Dercon et al. 2012, Mobarak & Rosenzwig 2012