Quantifying the Impacts of Hermetic Bags for Small Farms in India

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Research Question

Can improved storage technology address all four dimensions of food security?

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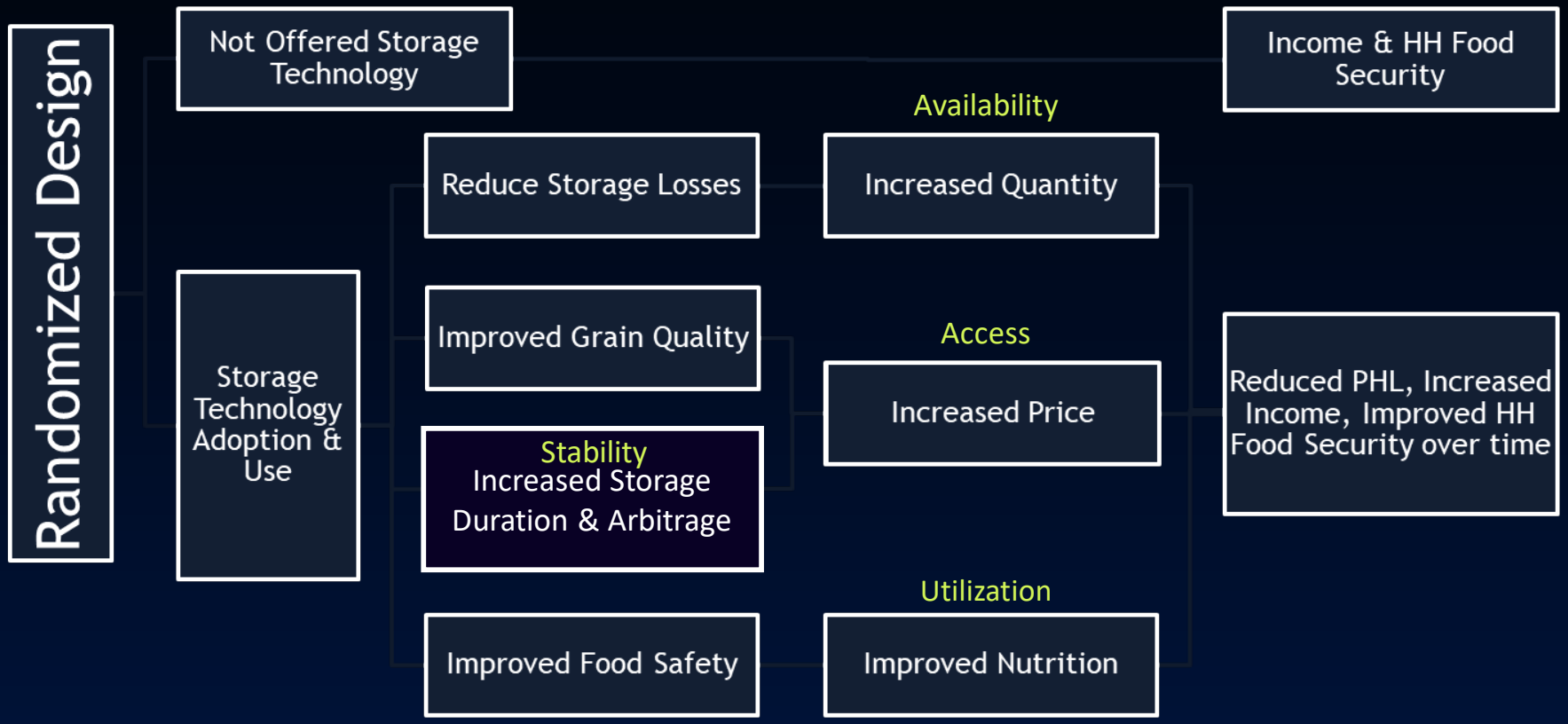
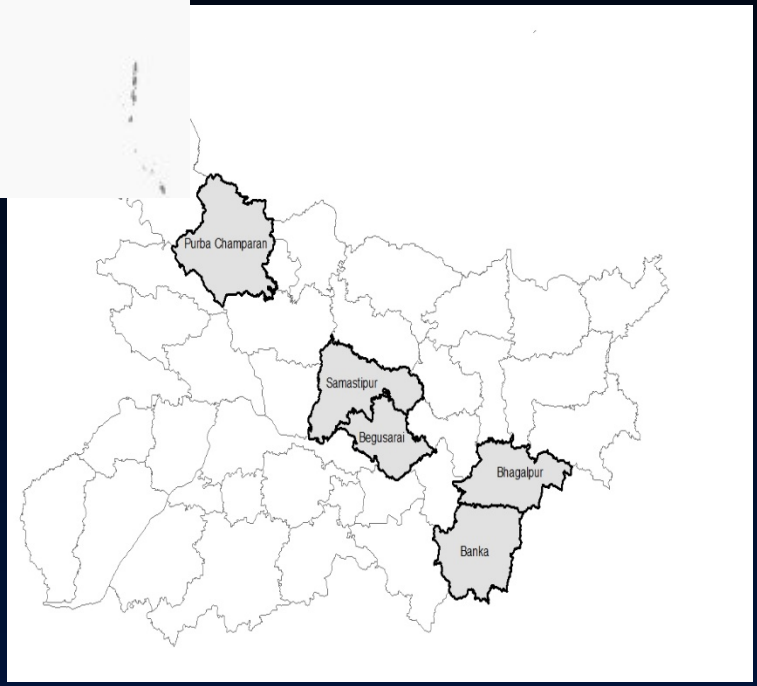
Theory of Change



Project Overview

Key Beneficiaries

- 4000 HHs across 80 villages in 5 districts of the state of Bihar in India
- Annual per capita income of sampled farmers is USD 230
- 90 percent of cropped area is under food grains (rice, wheat, maize)
- 83 percent of farmers have less than 1 hectare land



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What did we do?

1. AVAILABILITY
   a) Physical loss measurements and quality testing
2. Economic and Affordable ACCESS
   a) Storage experiment for price incentives for improved storage
   b) Estimation of quality premia through trader field experiment
   c) Choice experiment on end-users' willingness to pay for quality and certification
3. UTILIZATION
   a) Aflatoxin testing and use of fumigants during storage
4. STABILITY
   a) Comparing storage and use duration

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AVAILABILITY: Physical Losses Measurement

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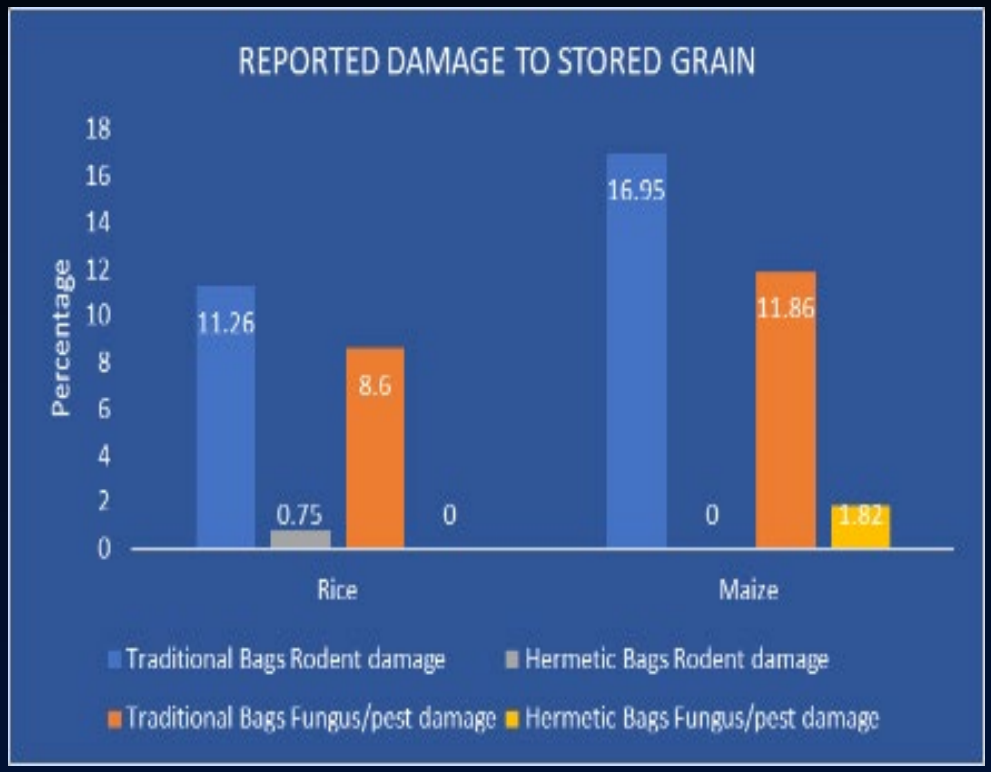
AVAILABILITY: Lower Physical Losses

- Low self-reported losses from farmers (2 to 3%)
- Measured quantity losses
  - 3-4% during harvesting
  - 11% during storage
- Underreporting: Farmers see PHL as ‘cost of doing business’
- Farmers using hermetic bags see a large decline in incidence of rodent, fungi and pest damage (over 90% decrease)



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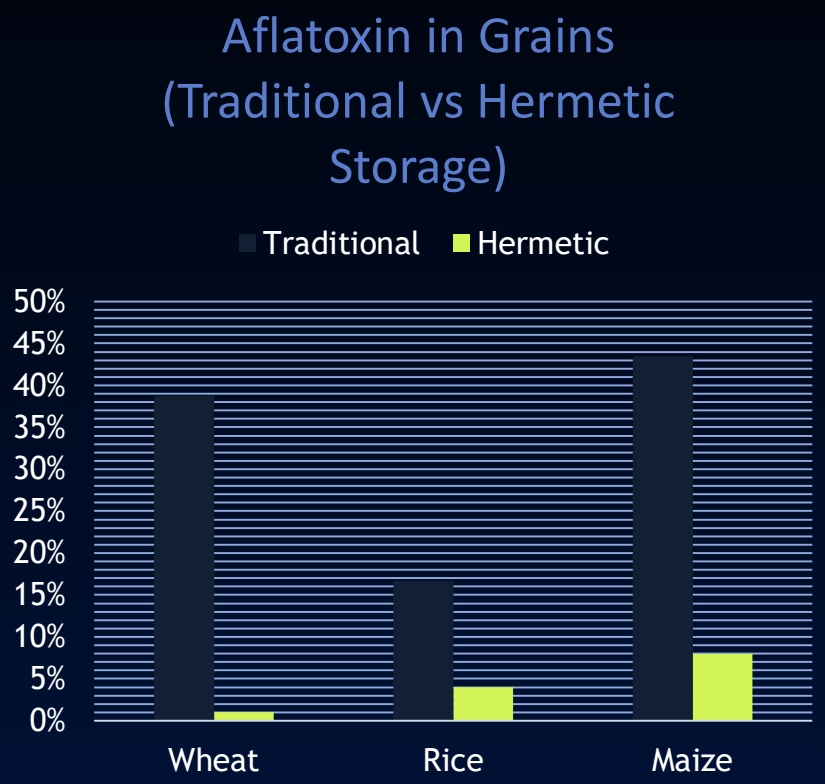
ACCESS: Higher Prices and Income

- Farmers reported receiving ~10% higher prices for hermetically stored grains
- Provides opportunity to sell later when prices are higher; avoid buying at high prices during the lean season
- 30% higher probability of selling grain on the market
- Mystery seller experiment show low, but prevalent quality premia…

…but limited. Many high-value buyers such as large feed manufacturers and exporters refuse to procure in Bihar due to food safety risks

UTILIZATION: Lower Aflatoxin Contamination and Pesticide Use

- At baseline, no farmers were aware of the risks of mycotoxins
- 37% of all samples in traditional bags and 4% in hermetic bags tested positive for aflatoxin contamination
- Reduces need for hazardous fumigants like Aluminum Phosphide (celphos)



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STABILITY: More Grain Stored Longer

- **More store:** 22% increase in likelihood of storing grain for food consumption
- **Store more**: Store 20% more grain
- **Store longer:** Farmers stored their grains for 1.2 months more than those with traditional bags
- **Increased consumption from own stocks**: 25% for rice, 16% for wheat and less likely to buy on market

Choice Experiment with End-Users

- We conducted a choice experiment with traders, and millers, grain exporters, poultry feed packaging companies and retail consumers to understand their WTP for certified high quality, aflatoxin-free grains

- Found consumers WTP 18-30% higher for certified grains
- Low WTP for certified grains by traders

Cost Benefit Analysis (INR per bag per season)

	Per 50 kg bag	**Traditional Storage**		**Improved Storage**	
		Sold	Consumed	Sold	Consumed
a.	Consumable or saleable quantity	45 kg	45 kg	50 kg	50 kg
b.	Value per kg (from local traders)	10.85	22	12.02	22
c.	Total value (a x b)	488.25	990	601	1100
d.	Cost of storage bags	10	10	30	30
e.	Revenue – Cost	478.25	980	571	1070
f.	Additional benefit	-	-	92.75	90
	Including potential aflatoxin control premium				
g.	Value per kg	10.85	22	12.51	22
h.	Total value (a x g)	488.25	990	625.50	1100
i.	Revenue – Cost	478.25	980	595.50	1070
j.	Additional benefit	-	-	117.25	90

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Summary

- Improved ***Availability*** by reducing storage losses
- Improved ***Access*** through quality premia and increased storage time: 10% higher prices
- Improved ***Utilization*** through reduction in aflatoxin (37 to 4%) and large reduction in pesticide use
- Improved ***Stability*** through longer and more storage for home consumption
- Bags pay for themselves in one season

Thank You

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