Biofortification, crop adoption and health information:

Impact pathways in Mozambique and Uganda

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Outline

1. Introduction
   - Project Details
   - Impact Evaluation Design
2. Basic Findings
   - Crop Adoption
   - Dietary Intakes
3. Causal Mechanisms
   - Conceptual Framework
4. Marketing
5. Conclusion

REU Project: Biofortification

- Took place between 2006 and 2009 in Zambézia Province, Mozambique, and Uganda
- Vitamin A deficiency a large concern in both countries
- The REU used an *integrated* approach to promote OFSP adoption with goal of reducing vitamin A deficiency among mothers and young children
  - Seed Systems Component (Production)
  - Demand Creation Component (Consumption)
  - **Market/Product Development Component (Exchange)**
- Large research component, many partners

Objective of Presentation

- Understand impacts on major outcome goals: Adoption and Vitamin A Consumption
  - Unfortunately, could not randomize in, for example, the consumption component
- Therefore a technique called *causal mechanism analysis* to determine which factors were important in determining:
  - Adoption, and
  - Vitamin A Consumption
- Consider how marketing should be integrated into future biofortification programs

Impact Evaluation Design

- Model 1, Model 2, Control Groups
  - Villages were stratified approximately by district in both countries
  - Control group only got vines in 2010 after evaluation component was complete
- Impact Evaluation Surveys
  - Socioeconomic Survey : Included information on household demographics, agriculture, and knowledge gains from program
  - Nutrition Survey: Included 24 hour recall module to measure individual dietary intakes of vitamin A and other nutrients among young children and their mothers

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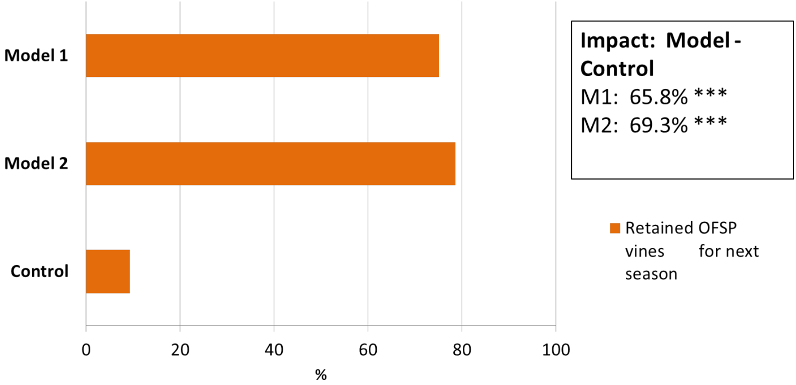
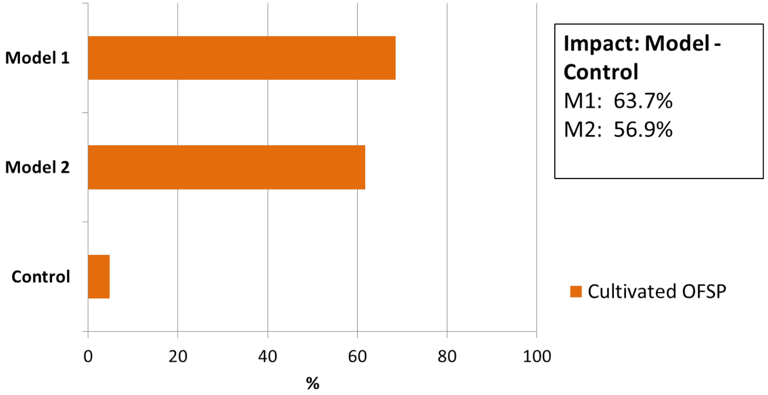
Measures of OFSP Adoption

- Primary measure, Adoption, defined as:
    - In Uganda, whether farmers were growing OFSP in fourth season after receiving vines
    - In Mozambique, answer to question: Do farmers keep vines for 2010?
- Secondary measure (not presented here): Share of OFSP in total area planted in sweet potato

Proportion of Households Adopting OFSP, Mozambique



Proportion of Households Adopting OFSP, Uganda



Summary: Adoption and Nutritional Knowledge

- Large impacts on OFSP adoption
- No difference between Models 1 and 2
- But only modest impacts on knowledge of messages about vitamin A
- Most (almost all) mothers reported knowing of vitamin A at end of project (not shown)
  - Strong impact on mothers knowing that OFSP is a source of vitamin A at endline (30-40% of mothers)

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Impacts: Dietary Intakes

- Main measure: micrograms of vitamin A in diet
  - Computed from foods consumed, which are converted into nutrients
- Can also predict the impact on vitamin A deficiency after controlling for intraday variation in intakes (BLUPs)
- Children in Mozambique aged 6-35 months at baseline; children in Uganda 4-6 years old at baseline

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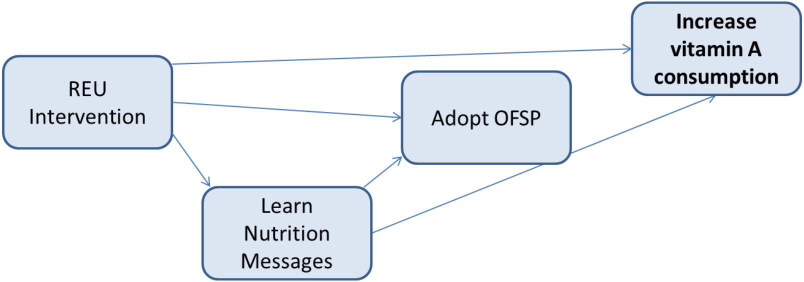
Results: Dietary Intakes, Reference Children

	Mozambique		Uganda	
Group	Impact, DI	Impact, BLUPs	Impact, DI	Impact, BLUPs
Model 1	243.0**	203.8**	308.3**	338.8**
	(85.8)	(35.0)	(148.3)	(38.3)
Model 2	211.8**	208.4**	677.1**	377.5**
	(96.3)	(26.3)	(222.0)	(78.0)
Average	226.0**	206.4**	449.7**	274.7**
	(81.6)	(22.5)	(145.7)	(42.9)

Summary: Impacts on Dietary Intakes

- Average vitamin A consumption increase about the USDA RDA level (210 μg per day)
- But no other significant changes to diet
- Again, no significant differences between Models 1 and 2

Mechanisms


REU Intervention
Adopt OFSP
Increase vitamin A consumption
Learn Nutrition Messages

Estimation

Sequentially estimate two equations of the form (Imai et al., 2011):

$$M_i = \alpha_1 + \beta T_i + \gamma_1 Z_i + u_i$$

$$A_i = \alpha_2 + \eta T_i + \zeta M_i + \gamma_2 Z_i + \varepsilon_i$$

Under assumptions of *sequential ignorability* and linear effects, $\hat{\beta}\hat{\zeta}$ is the amount of adoption caused by **mediating** variable

Summary: Causal Mechanism Results

- We find that demand creation messages – narrowly defined– did not affect adoption or consumption
- Adoption behavior largely explains the amount of vitamin A consumed by young children, whether or not they are reference children
- Some unexplained variation in Uganda r.e. dietary intakes– could be general health messages of project

Implications for Creating Value Chains: Biofortified Products

- For orange sweet potato to be part of value chain, really need two components:
  - Market for vines
  - Market for output (sweet potatoes) and marketable surplus
- In both countries:
  - People tend to obtain vines through neighbor exchange, not through markets
  - Farmers tended to grow small amounts of orange sweet potato
  - Not enough produced by households for lots of marketed surplus
  - "Medium term" surveys demonstrate that output markets have not really developed

Improved (?) Design to Promote Markets for Biofortified Products

- Continue integrated design with seed systems, light demand creation approach
- Begin to try to build markets after the product is already being grown
- Markets should cover both sides (vines and output markets)

Conclusion

- Large impacts of project, but no differences in impacts between Models 1 and 2 (heavy and light treatments)
- Little adoption attributable to detailed nutrition messages
- So hypothetical scale up of Model 2 could delay or eliminate marketing component, scale back demand creation with little effect on primary impacts (vitamin A consumption)
- Can decrease costs substantially in hypothetical scale-up (larger reductions in Uganda than in Mozambique)