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Developing Country Consumers' Acceptance of Biofortified Foods: A Synthesis

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Overview

To better understand consumer preferences:

- Do target consumers in developing countries like biofortified crops?
 - Are consumers willing to pay a price premium for **biofortified crop varieties** compared to local varieties?
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What are the strategies to market and promote biofortified crops?

- Should we provide nutrition information?
 - In which way? (information content: scare vs. motivational tactics, long vs. short messages)
 - How should we give the information? (Radio, community leaders)
 - At what frequency should the information be provided?
 - Should we include political leaders' endorsement?
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Minimize Cost | Maximize Impact
7 Countries | 8 Studies | 5 crops





Vitamin A Crops



**Vitamin A Orange Maize:
Zambia, Ghana, Nigeria**



**Vitamin A Yellow Cassava:
Nigeria, DRC**



**Orange Fleshed Sweet Potato:
Uganda, Mozambique**



Iron Crops



Iron Pearl Millet: India



Iron beans: Rwanda, DRC, Guatemala





Methods

- **Experimental Economics** – Incentive compatible mechanisms such as:
 - Revealed choice experiment: real good | choice
 - BDM: real good | real money in simulated market
 - Nth price auction: $n - 1$ highest bidder pays n th highest bid (market price)
- **Food Sciences:**
 - Hedonic testing
 - Sensory Evaluation

Key attributes tested include color, taste, texture, aroma, cooking time, overnight keeping quality and overall liking



Summary of Hedonic testing & WTP Studies

Country	Biofortified food	Sample size	Test setting*	WTP method**	Treatments	Participation fee	Year
Uganda	OSP	467	CLT - Rural	RCE	Nutrition information	Given	2006
		467	CLT - Rural	HCE	Nutrition information Nutrition information and cheap talk	Given	2006
Zambia	vitamin A maize <i>nshima</i>	273	HUT - Rural	RCE	Nutrition information through simulated radio message Nutrition information through community leader	Given	2007
		205	CLT - Rural	RCE	Nutrition information through simulated radio message	Given	2007
Ghana	vitamin A maize <i>kenkey</i>	288	CLT - Rural	RCE	Nutrition information	Given - varied	2008
		128	CLT - Rural	nth price auction	Nutrition information	Given	2008
		289	CLT - Rural	BDM	Nutrition information	Given - varied	2008
Nigeria	vitamin A cassava <i>gari</i>	671	CLT - Rural	BDM	Nutrition information and delivery by federal authority Nutrition information and delivery by international authority	Not given- out of pocket payment	2011
India	Iron pearl millet <i>bakhri</i>	452	CLT - Rural	BDM	Nutrition information and state level certification and branding	Not given- out of pocket payment	2012
Rwanda	Iron beans	578	HUT - Rural	BDM	Nutrition information – short and positive Nutrition information – short, positive and endorsement Nutrition information – long positive Nutrition information – long, positive and endorsement	Not given- out of pocket payment	2013
		572	HUT - Rural	BDM	Nutrition information – motivate, listen once Nutrition information – motivate, listen thrice Nutrition information – scare, listen once Nutrition information – scare, listen thrice	Not given- out of pocket payment	2013
		399	CLT – Urban retail market	BDM	Nutrition information – motivate Nutrition information - scare	Not given- out of pocket payment	2013
		261	CLT – Urban wholesale market	BDM	Nutrition information	Not given- out of pocket payment	2013
Guatemala	Iron beans	360	HUT - Rural	BDM	Nutrition information – listen once Nutrition information – listen thrice	Not given- out of pocket payment	2013



WTP/Premium Estimations

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- Simple difference
 - OLS/D-I-D
 - Random parameter logit model
 - Conditional logit model
 - Random effect GLS/Tobit model
 - Interval censored model
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- Accounted for: nonpayment, lexicographical preferences, endowment effect, convergent validity between RCE & experimental auction, etc.



Summary of Hedonic Testing Results

Country	Biofortified food	Control hedonic comparison of food products	Treatment hedonic comparison of food products
Uganda	OSP	OSP preferred to local varieties	No additional effect
Zambia	vitamin A maize <i>nshima</i>	No difference in preferences in both HUT and CLT	Vitamin A maize preferred in both HUT and CLT
Ghana	vitamin A maize <i>kenkey</i>	Variation in preferences across districts	No additional effect
Nigeria	vitamin A cassava <i>gari</i>	Local preferred in Imo and light yellow vitamin A cassava preferred in Oyo	Deep yellow preferred in Imo and both vitamin A cassava varieties preferred in Oyo
India	Iron pearl millet <i>bakhri</i>	Iron pearl millet preferred to local varieties	Preference for iron pearl millet increases No difference of certification and branding authority
Rwanda	Iron beans	One iron bean variety is preferred to local and local is preferred over another iron bean variety	Overall increased preference for iron beans, effect size and significance differs across treatments
Guatemala	Iron beans	Iron bean preferred	No additional effect



Summary of WTP Results (1)

Country	Biofortified food	Control WTP for biofortified products	Treatment WTP for biofortified products	Effect of treatment
Uganda	OSP	No significant difference	25% premium for OSP compared to white local variety	Information: Yes
Zambia	vitamin A maize <i>nshima</i>	No significant difference	8-23% (depending on the test setting, information source and estimation model) premium for vitamin A maize compared to white local	Information: Yes Source of Information: Yes
Ghana	vitamin A maize <i>kenkey</i>	15-20% discount for vitamin A maize compared to white local variety	25-50% (depending on WTP method) premium for vitamin A maize compared to white local variety	Information: Yes
Nigeria	vitamin A cassava <i>gari</i>	In Imo state 14-28% (depending on variety) discount for vitamin A cassava compared to local In Oyo state 9% discount to 6% premium (depending on variety) for vitamin A cassava compared to local	In Imo state 10-19% (depending on variety and delivery method) premium for vitamin A cassava products compared to local variety In Oyo state 20-28% (depending on the variety and delivery method) premium for vitamin A cassava products compared to local	Information Yes: Planting Material Delivery method: No



Summary of WTP Results (2)

Country	Biofortified food	Control WTP for biofortified products	Treatment WTP for biofortified products	Effect of treatment
India	Iron pearl millet <i>bakhri</i>	6% premium for iron pearl millet compared to local	29-32% (depending on the certification authority and branding) premium for iron pearl millet compared to local	Information: Yes Certification authority: Yes Branding type: Yes
Rwanda	Iron beans	In rural areas, 13% discount to 8% premium (depending on the variety and location) for iron beans compared to local In urban area, 10% premium for iron beans compared to local	In rural area, 9-17% (depending on information content, frequency and length) premium for iron beans compared to local In urban area, 6-20% (depending on the variety and information content) premium for iron bean compared to local	Information: Yes Information Frequency: Yes Information Length: No Scare vs. Motivate Info: No District Officer's Endorsement: No
Guatemala	Iron beans	No significant difference	No significant difference	Information: No Information Frequency: No



Summary of key findings

- **Acceptance:**

- (1) In several cases, biofortified varieties are preferred to local varieties even without information
- (2) Nutrition information is key (effect size: 5 – 34%)

- **Breeding**

- Experimental field production data + sensory evaluation (consumption) data are pivotal to most recent crop releases

- **Targeted Delivery, Marketing & Promotion are required**

Context specific implications for crop development, marketing and delivery activities

- Dissemination: Which region? partner? What branding may work?
- In Zambia: it is potentially less costly to go with radio
- In Rwanda: Repeated messaging increases impact & reduces discount for the white bean variety by 84%
- Endorsement by local political leader - not significant



Thank You!!

Biofortification-breeding food crops
that are more nutritious





Looking Forward

- Dynamic valuation (repeated behavior)
- Gender aspects of consumer acceptance (beliefs, aspiration, ability to pay)
- Consumer acceptance studies for zinc crops in Asia: Bangladesh, etc.
- Urban poor: Biofortification in homestead agriculture for acceptance, gender, nutrition and income
- Value of 'naturalness' – fortification vs. supplementation vs. biofortification (Sandra Ngo – University of Alberta)