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Social Behavior Change in Food Safety

Thank you for joining us. The webinar will begin shortly.

FEED THE FUTURE INNOVATION LAB FOR FOOD SAFETY

June 20, 2024

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SOCIAL BEHAVIOR CHANGE IN FOOD SAFETY:
Levers To Drive Food System Transformation

FEED THE FUTURE INNOVATION LAB FOR FOOD SAFETY

June 20, 2024 | Webinar Series

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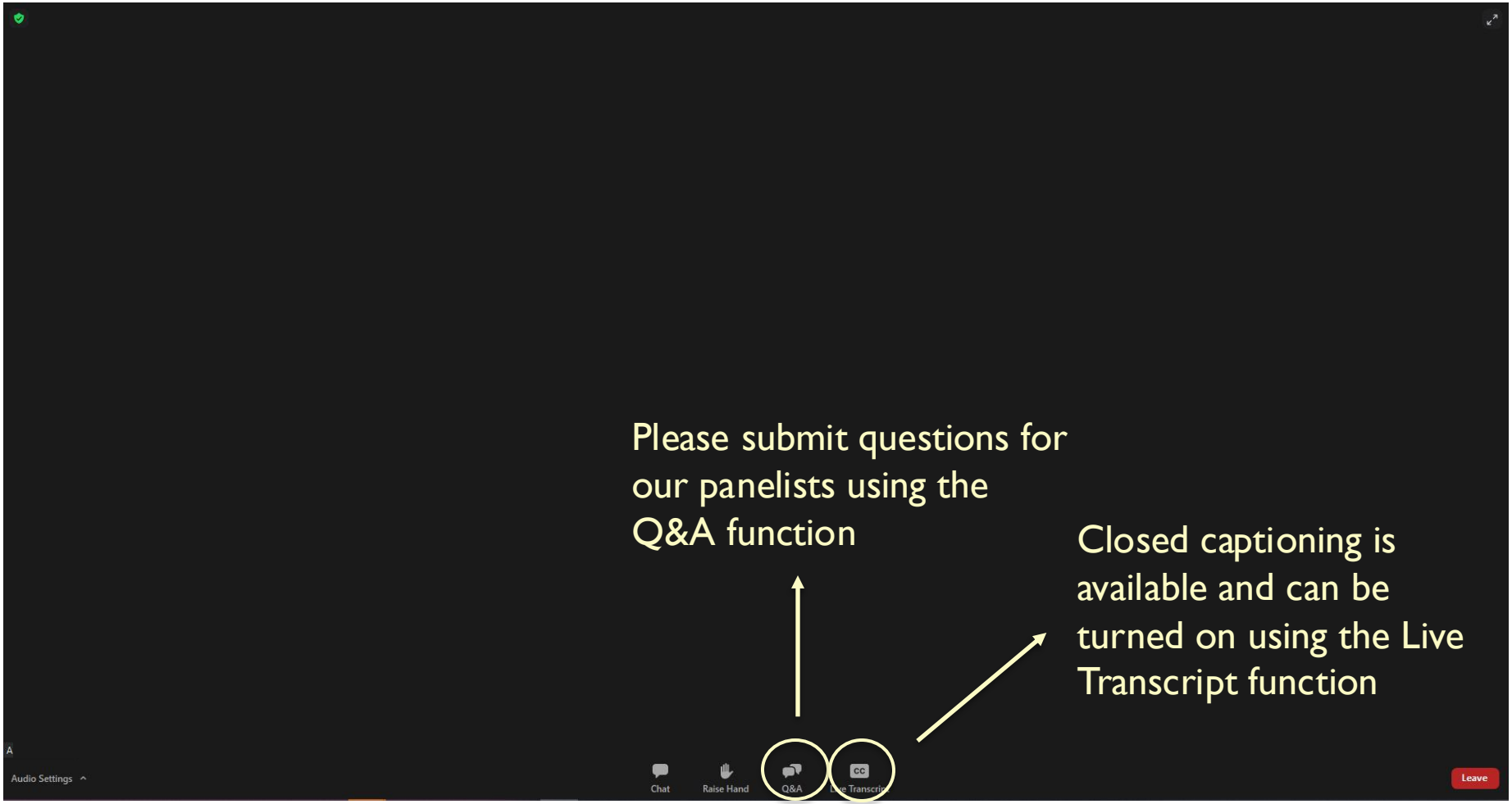
WELCOME



FEED THE FUTURE INNOVATION LAB FOR FOOD SAFETY (FSIL)

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RESEARCH & ENGAGEMENT ACTIVITIES

Increase stakeholder awareness of food safety issues, impacts, and measures to reduce food safety risks.

Build local research capacity and conduct research on regional food safety challenges.

Support translation and dissemination networks to develop policies and engagement structures.

Enhance local capacity to translate food safety research into training, guidelines, & commercialized products.

Cross-cutting themes: Empowerment of women, youth, and other marginalized populations, human and institutional capacity development, and food safety enabling environments.

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RESEARCH **PORTFOLIO**

FSIL research focuses on nutrient-dense, perishable foods, including dairy, poultry, fish, and vegetables.

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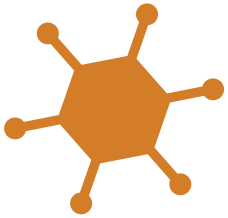
FOOD SAFETY IS **MULTIDIMENSIONAL**



Microbiology & Toxicology

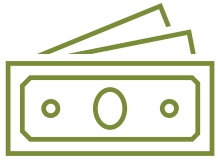
Assessing the risk of foodborne disease from pathogens and contaminants.

Identifying critical control points, effective practices, and data-driven policies.

Social & Behavioral Science

Understanding motivations for and obstacles to the adoption of food safety practices.

Developing effective outreach programs to strengthen food safety practices.



Supply & Demand Economics

Assessing the demand for safer food and the costs/benefits to producers and communities.

Informing market-led food safety policies.

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AGENDA

- **Welcome and introduction**
  Dr. Haley Oliver | 5 min
- **Produce grower behavior and food safety in NEPAL**
  Dr. Aditya Khanal | 10 min
- **Behavior theory and produce safety in CAMBODIA**
  Dr. Paul Ebner | 10 min
- **Private sector behavior change in the dairy value chain in SENEGAL**
  Dr. Jessica Marter-Kenyon | 10 min
- **Fish consumers and food safety economics in BANGLADESH**
  Dr. Madan Dey | 10 min
- **Panel discussion** | 45 min

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Insights from a produce safety economics analysis in Nepal: Priorities for policy and outreach

Dr. Aditya Khanal

FSIL-Nepal PI

Associate Professor of Agricultural and Environmental Sciences

Tennessee State University

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Insights from a Study on Produce Growers and Food Safety in Nepal: Priorities for Policy and Outreach

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ASU Arizona State University

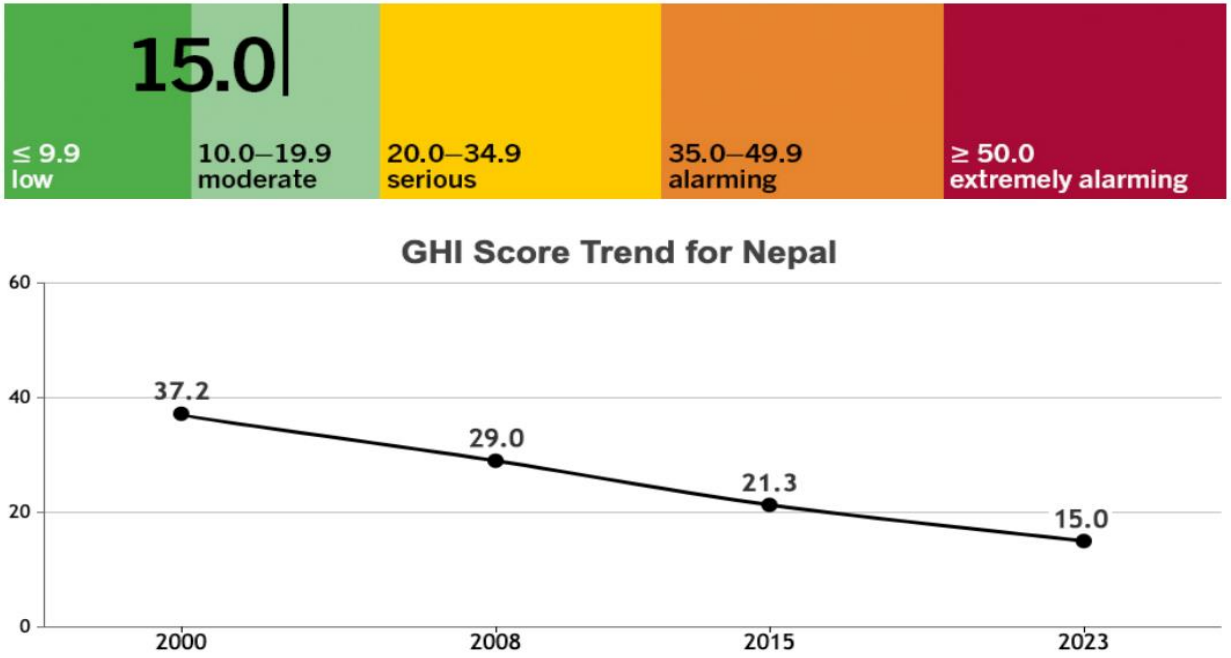
Agriculture and Forestry University, Chitwan, Nepal

सहभागी SAHAVAGI

FOOD SAFETY AND NEPAL

- Access to sufficient, safe, and nutritious food is essential (UN, 2020).
- Food safety is an emerging priority in Nepal.

Global Hunger Index of Nepal
(www.globalhungerindex.org)



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FOOD SAFETY AND NEPAL

- Overall, there has been limited understanding of food safety across sectors
  - Consumers
  - Producers
  - Government and extension stakeholders
- Fresh produce, consumed raw, is at risk of causing foodborne illnesses when contaminated with harmful microorganisms

BACKGROUND

Consumer household surveys and Willingness to Pay (WTP) experiments in five major metropolitan areas of Nepal revealed potential for a positive price premium for safety attributes of fresh produce.

Questions for producer studies:

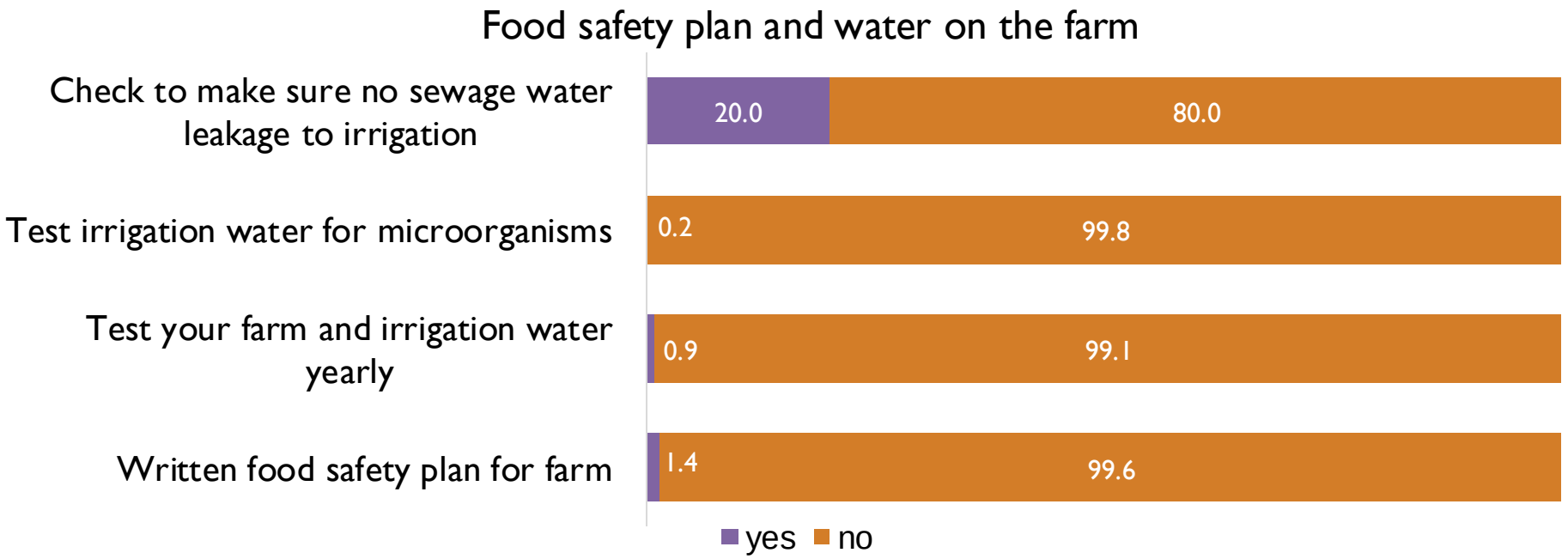
- Have fresh produce growers adopted Good Agricultural Practices (GAPs) that meet food safety needs? If not, why not? What are the obstacles?
- What is their level of understanding of different aspects of food safety (e.g., microbial contamination, chemical contamination, foodborne illness)?
- Are produce growers willing to incur costs to maintain food safety? How much?

DERIVE INSIGHTS: FRESH PRODUCE GROWER SURVEY

- 1,052 randomly selected commercial vegetable growers (farm households) representing 10 districts of 7 provinces of Nepal
- Sampled areas included major vegetable production pocket areas of these districts; 29 local administrative units
- In-person interviews and experiments among farmers using trained enumerators

ADOPTION OF GOOD AGRICULTURAL PRACTICES (GAPS)

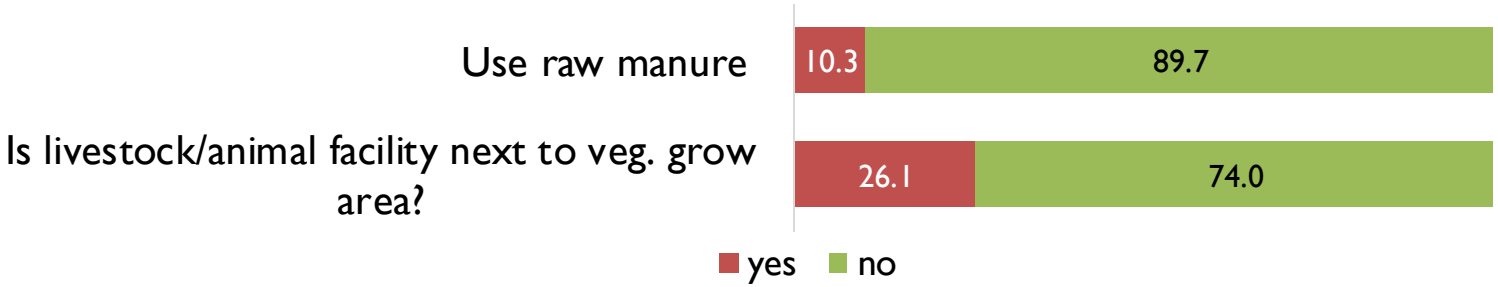
A critically low number of farms have food safety plans and safer water plans for the farm



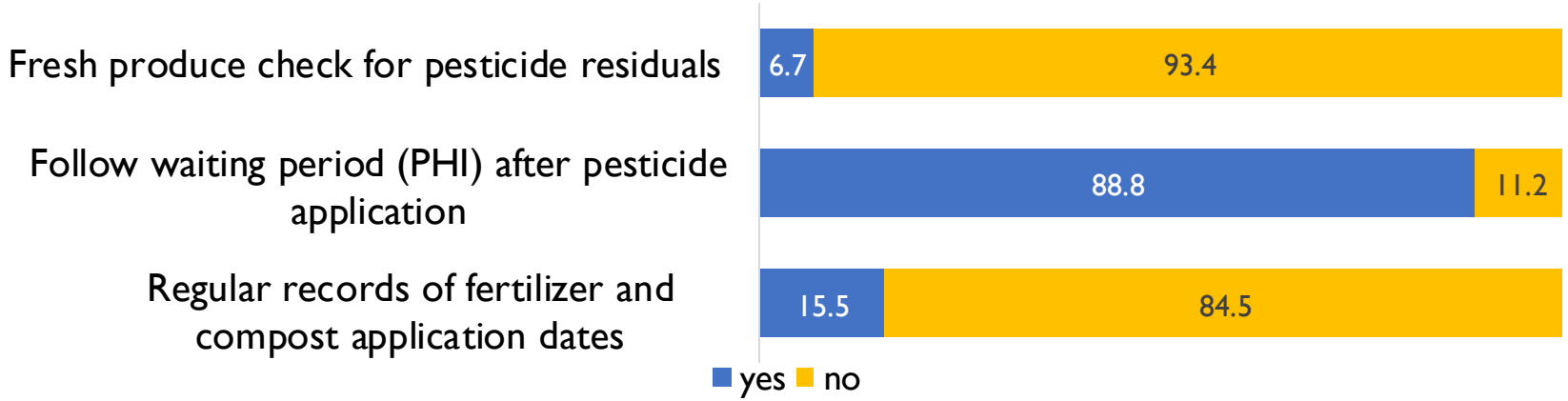
(numbers are % of the sampled farms)

ADOPTION OF GOOD AGRICULTURAL PRACTICES (GAPS)

- Manure use and animal interaction

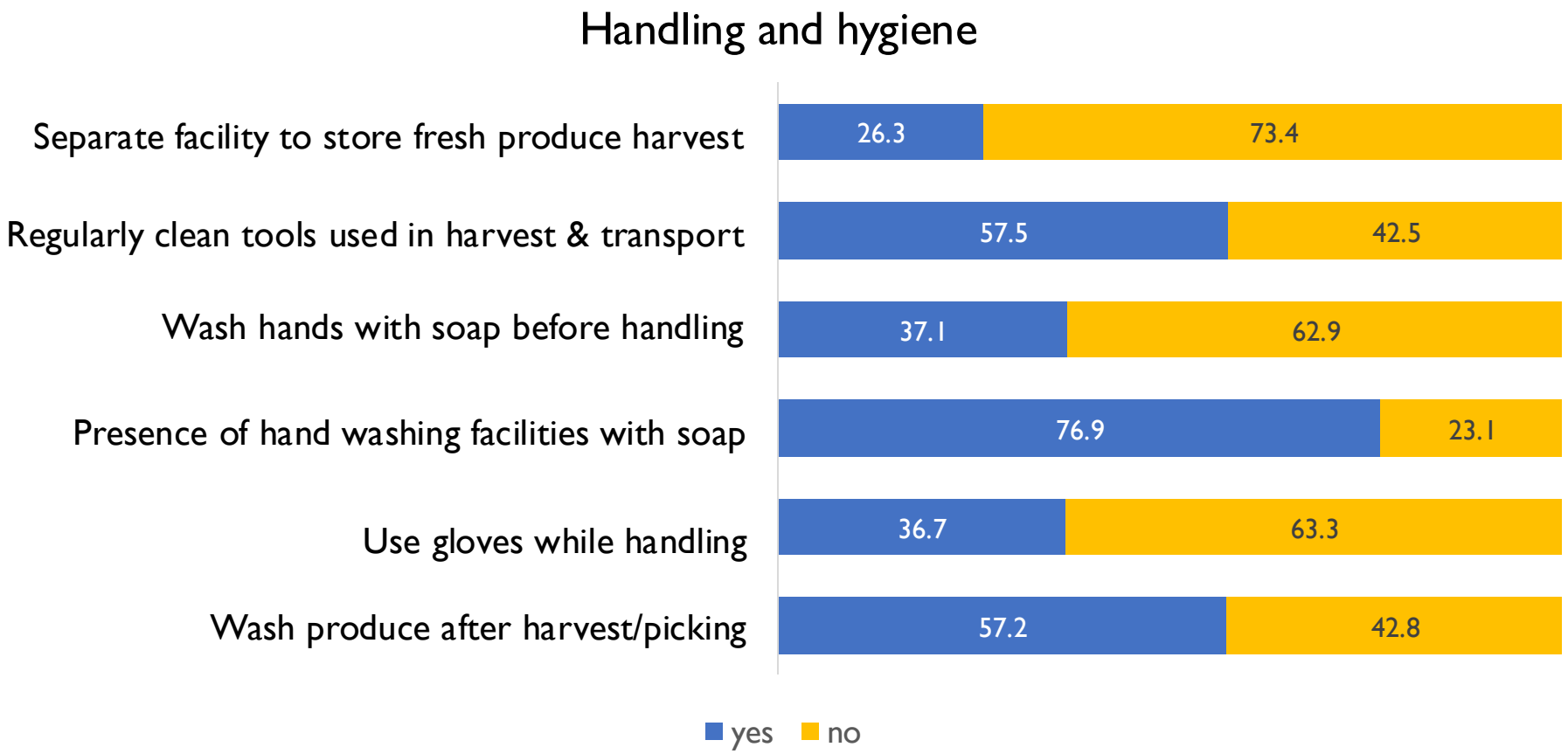


- Chemical safety and record keeping practices on the farm



FARM EQUIPMENT & TOOLS; WASHING & HYGIENE

- Needs improvement



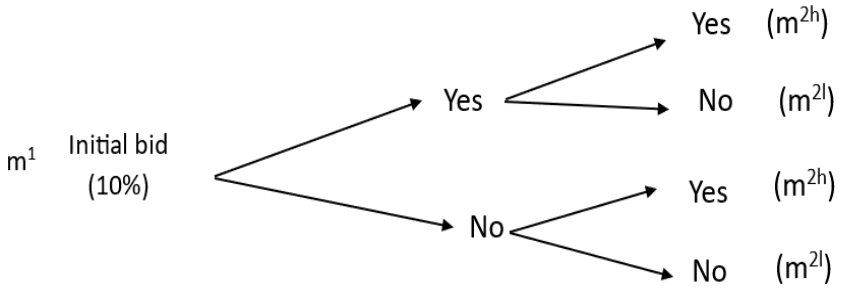
HYPOTHESES: WHY LOW OR NO ADOPTION OF GAPS?

- Implementing safety measures increases the cost of producing and marketing safe foods (Adalija and Litchenberg 2018; Ivey et al., 2012; Schmit et al., 2020)

- Possible obstacles:
  - Expense of adopting these safety measures (Schmit et al., 2020; Astil et al., 2019)
  - Low awareness, lack of understanding of food safety
  - Difficult procedures for certification, ambiguity
  - Gaps in policy and outreach

WILLINGNESS TO ACCEPT (WTA) ADDITIONAL COSTS FOR FOOD SAFETY

- Bidding experiment eliciting WTA using Double Bounded Dichotomous Choice (DBDC), Contingent Valuation framework



$$\sum_{i=1}^{N}\left\{D_i^{YN} ln\left[\phi\left(x_i\frac{\beta}{\sigma}-\frac{m^1}{\sigma}\right)-\phi\left(x_1\frac{\beta}{\sigma}-\frac{m^{2h}}{\sigma}\right)\right]\right.$$
$$+ D_i^{YY} ln\left[\phi\left(x_1\frac{\beta}{\sigma}-\frac{m^{2h}}{\sigma}\right)\right] + D_i^{NY} ln\left[\phi\left(\frac{\beta}{\sigma}-\frac{m^{21}}{\sigma}\right)-\phi\left(x_i\frac{\beta}{\sigma}-\frac{m^1}{\sigma}\right)\right]$$
$$\left.+ D_i^{NN} ln\left[1-\phi\left(x_i\frac{\beta}{\sigma}-\frac{m^{2l}}{\sigma}\right)\right]\right\}$$

- For example, If a response is "Yes" to first, "Yes" to the follow up higher bids, $m^{2h} \leq WTA < \infty$. The probability of this case (Yes, Yes) is:

$$\Pr(y_i^1 = 1, y_1^2 = 1 | x_i) = \varphi\left(x_i\frac{\beta}{\sigma} - \frac{m^{2h}}{\sigma}\right)$$

- D_i^{YY}, D_i^{YN}, D_i^{NY} and D_i^{NN} represent the relevant cases for each respondent;

- With probability for each in likelihood function, model using interval regression

$$E(WTA) = X_i^* \hat{\beta}$$

FACTORS INFLUENCING GROWER'S WTA ON FOOD SAFETY

- WTA is significantly (positively) influenced by education, land holdings, risk attitude, and credit access
- WTA is significantly (negatively) influenced by grower's use of an intermediate marketing channel (compared to direct-to-consumer) and household member's foreign employment
- Our model prediction shows that producers are willing to incur an additional cost of 13% to maintain food safety

APPROACHES TO DRIVING CHANGE

- Some positive behavioral changes are needed: awareness, knowledge, incentives, and support policies

Interventions initiated for positive behavioral changes

- Grower's manual in English and Nepali (local) language
- Trainings for growers, ensuring participation of women
- Outreach (peer-reviewed publication in Nepal's national journals: *NPPR, ADJ*; policy brief with evidence-based recommendations)
- Presentations in government stakeholder meetings
- Policy consultation workshop including multiple stakeholders

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Using Behavior Theory to Understand Adoption of Food Safety Practices

Dr. Paul Ebner

FSIL-Cambodia Co-Lead PI and Technical Expert

Professor of Animal Sciences

Purdue University

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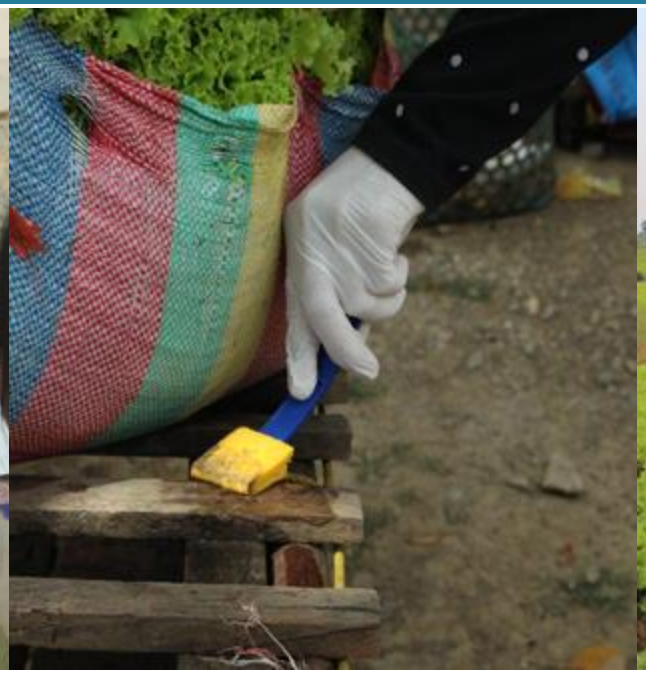


Using Behavior Theory to Understand Adoption of Food Safety Practices

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Institut Pasteur du Cambodge
I.T.C.
PennState

PROJECT OBJECTIVES

Foodborne illnesses are largely preventable

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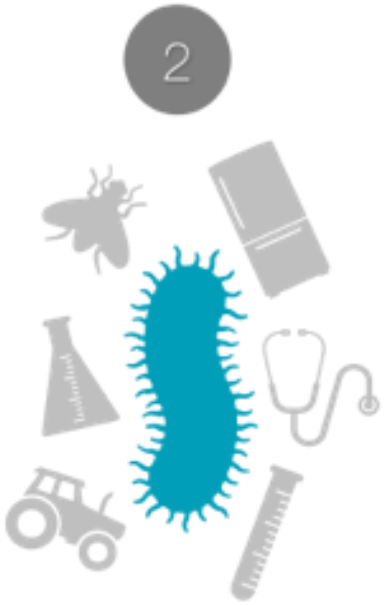
PROJECT OBJECTIVES

What is the *cause* of the illness?



What can reduce the *cause* of the illness?

What *will people do* to reduce the cause of the illness?

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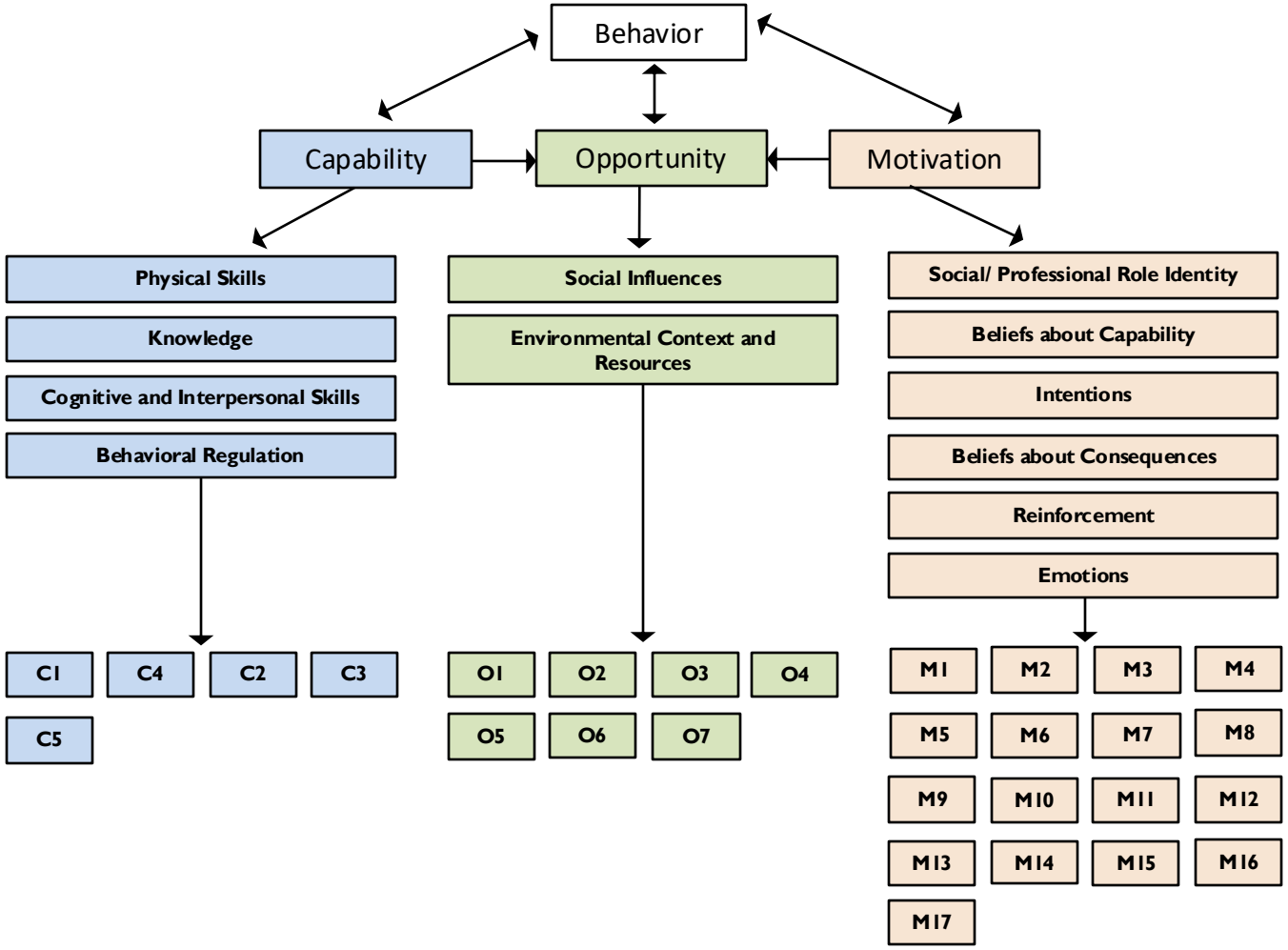
INSTRUMENT DESIGN

COM-B Constructs

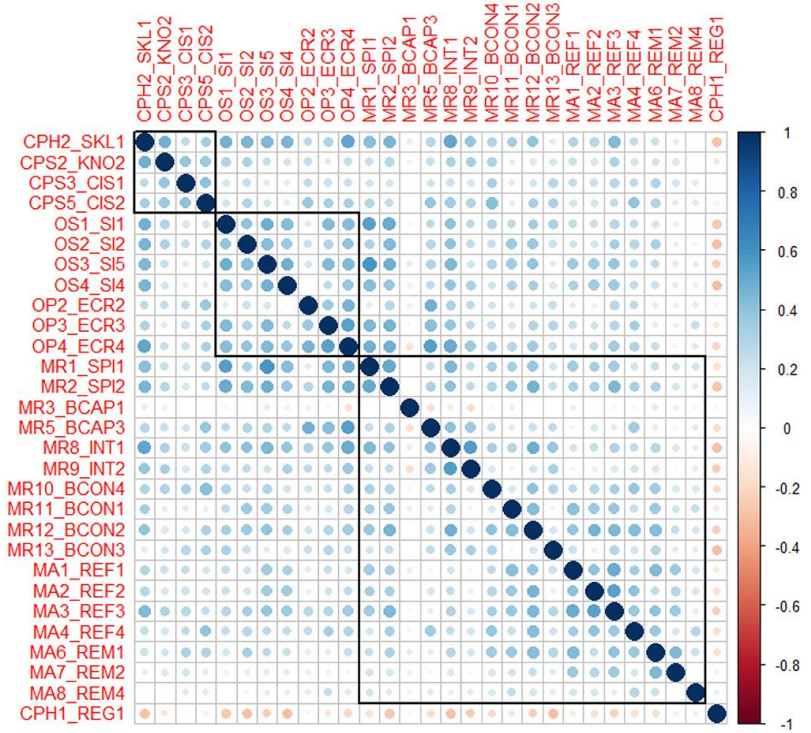
Total Domains Framework

Survey items



INSTRUMENT VALIDATION

- Piloted with vegetable vendors in Phnom Penh
- Revised
- Assessed fit using CFA: The final nine-factor model had a comparative fit index of 0.91, a Tucker-Lewis index of 0.89, and a root mean square error of ~0.05.

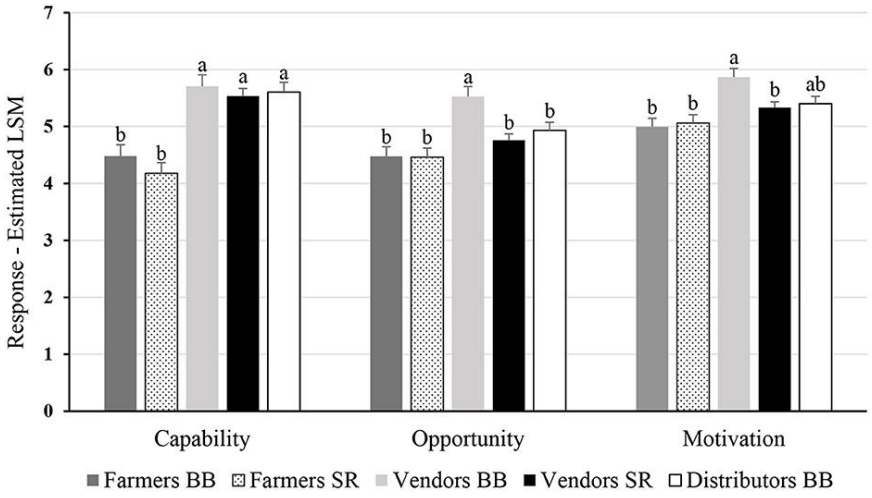


Correlation plot of response data collected from vegetable farmers, vendors, and distributors in Battambang and from vegetable farmers and vendors in Siem Reap. Question codes (e.g., CPS1_KNO1) indicate the COM-B construct and TDF domain in which the question falls.

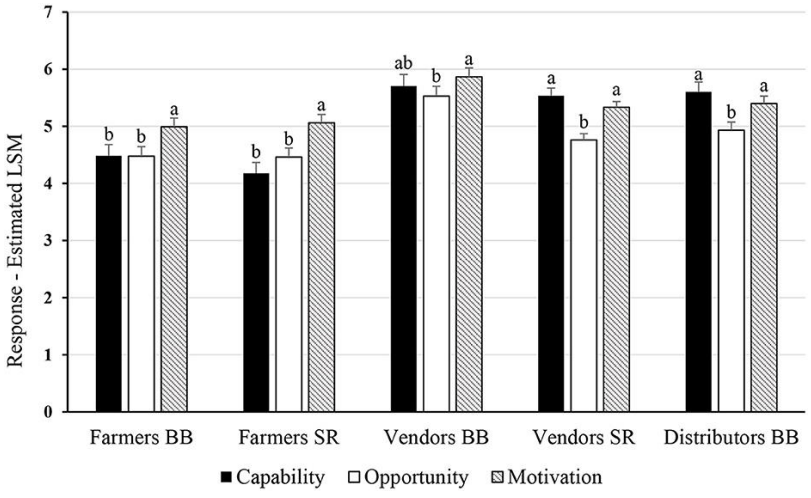
INSTRUMENT IN ACTION

- Used to measure likelihood of adoption of food safety practices in vegetable farmers, distributors, and vendors in Siem Reap and Battambang
- 1:1 interviews
- n = 169

SAMPLE DATA



Estimated mean responses (and corresponding SE) to the sets of questions comprising the behavioral constructs of capability, opportunity, and motivation for each functional group. Different letters indicate significant differences ($p < 0.05$) between functional groups within a behavioral construct.



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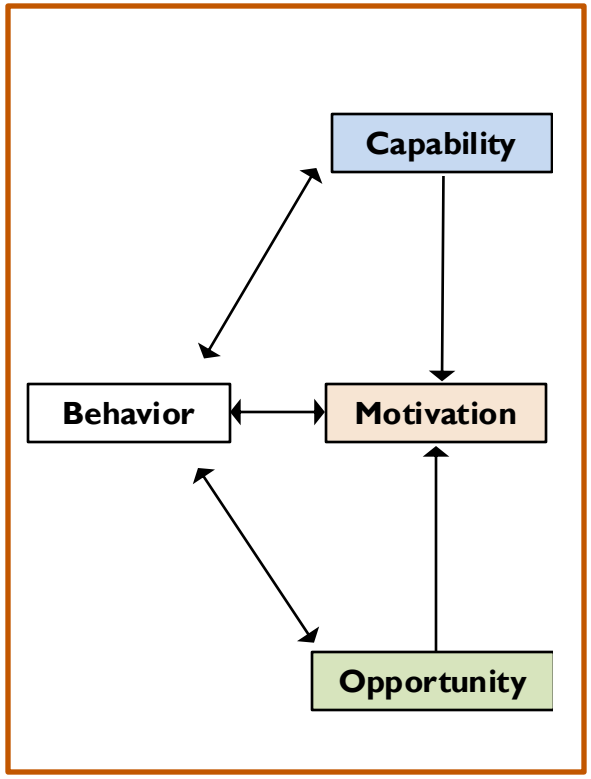
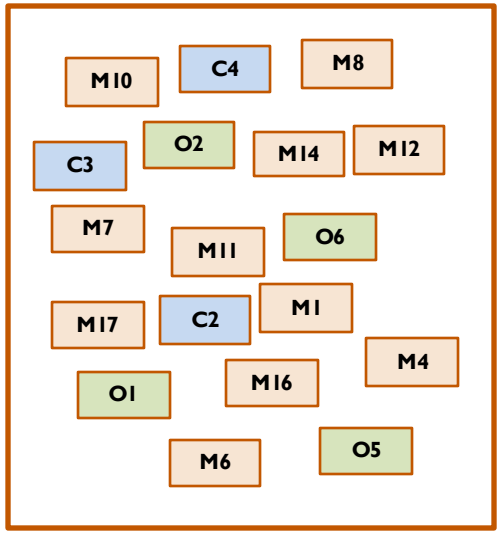
LEARNING NETWORK STRUCTURE FROM ORDINAL DATA

Vrinda Ambike

COM-B Constructs





- 18 survey items selected (total 29)
- Ordinal data: 1-to-7 Likert scale
- 169 survey participants with complete records
- Spearman rank correlation coefficients
- Inductive causation

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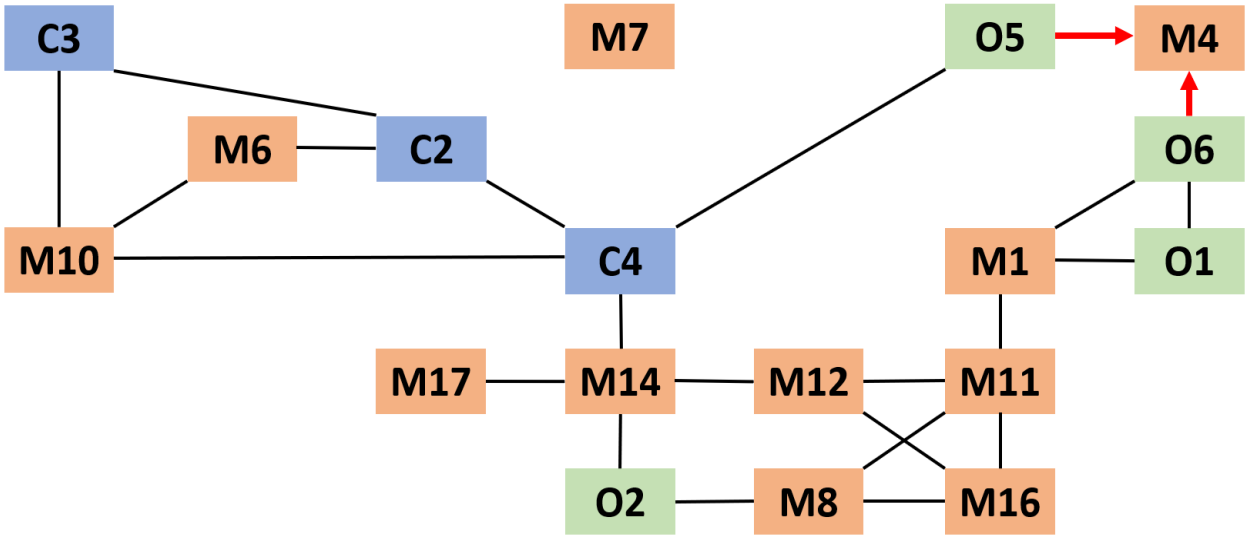
DATA-LEARNING NETWORK STRUCTURE

Vrinda Ambike



M4: It would be **easy** for me to wash surfaces…
O5: I have **enough money** to wash surfaces…
O6: I have **enough time** to wash surfaces…

- Learned network consistent with COM-B theoretical framework
- Limited directionality

SAMPLE CONCLUSIONS

- The COM-B model is a legit framework – learned networks
- Identified a host of potential barriers to adoption (i.e., deficiencies in conditions that drive behavior adoption). For example:
  - Almost all conditions are lower in farmers
  - Motivation is generally high, but (perceived) capability is generally lower – i.e., people are motivated to improve safety of their products, but feel they do not know how to do so
  - This information should inform the design of education programs that improve these deficiencies and facilitate food safety practice adoption
- Hope to grow the instrument into a diagnostic tool to be used prior to research or outreach focused on food safety practices, e.g., comparing adoptability of practice X vs. practice Y.

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Opportunities for private sector behavior change in the dairy value chain in Senegal

Dr. Jessica Marter-Kenyon

FSIL-Senegal Co-PI and Gender Specialist

Assistant Research Scientist

University of Georgia

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Opportunities for Private Sector Behavior Change in the Dairy Value Chain in Senegal

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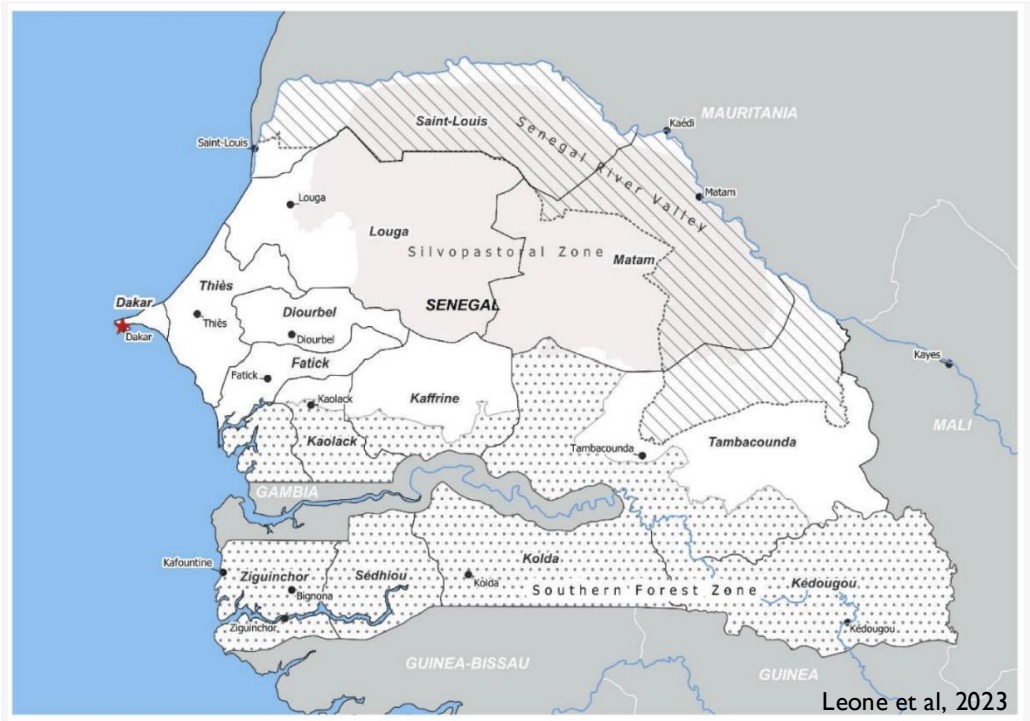
ITA
ISRA
CONSEIL NATIONAL DE DEVELOPPEMENT DE LA NUTRITION

CONTEXT


Natur'lait
expert en qualité
PRODUCED IN FRANCE
INSTANT
Fat Filled
Milk Powder
28%
Lait en poudre
Réengraissé 28%
Exporter : FIT
20 avenue Henri Fréville
35202 Rennes
FRANCE
info@fitsa-group.com
www.fitsa-group.com
FR
29.209.090
CE
25kg
Net
Fat Filled
Milk Powder 28%

DATA COLLECTION AND ANALYSIS

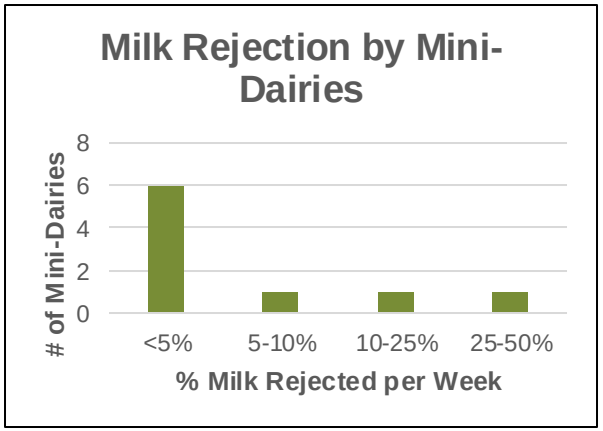
- 9 mini-dairies: in Matam, Louga and Saint Louis (3 each)
- 428 individuals in 162 associated producer households

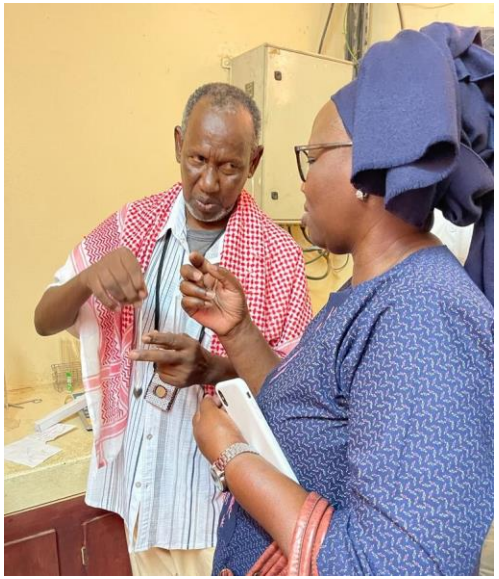


Leone et al, 2023

RESULTS: MINI-DAIRIES

- Interest is high
- Existing structure re: rejection for quality
  - Producer milk more often rejected than collector milk
- Awareness and (apparent) implementation of many food safety practices
  - 7 of 9 dairies trained in food safety





RESULTS: MINI-DAIRIES

- Constraints associated primarily with:
  - Institutional environment
  - Transport/energy infrastructure
  - Social context
  - Weak influence over + support for producers

Contaminated raw milk is a major problem		9/9
Source =	Producer practices	7
	Producer transport	5
	Collector practices	5
	Collector transport	5
Contaminated processed milk is a major problem		9/9
Source =	Electricity cuts	7
	Dysfunctional energy systems	7
	Untrained processors	7
	Lack of cold chain	5
	Lack of pasteurization resources	3
	Unsuitable packaging	3
What would improve the safety of your products?		
	Training for producers	8
	Financing for producers	8
	Training for mini-dairy staff	7
	Financing for mini-dairy	6
	Acquiring materials (refrigeration, packaging)	6
	Training for collectors	5

RESULTS: PRODUCER HOUSEHOLDS

- Food safety knowledge, access to information very low
- Concern re: milk borne illness low
  - 5% report incidence in family
  - Higher re: impact of quality on sales
- Room for significant improvement

Do you…?	Yes
Think animal health impacts milk quality	21%
Test milk before sale	19%
Treat milk before consumption	58%
Belong to a professional organization	30%
Have access to info re: dairy production	38%

RESULTS: PRODUCER HOUSEHOLDS

- Primary obstacles to increased production capacity and commercialization:
  - Access to finance
  - Cold chain
  - Transport infrastructure

DISCUSSION AND CONCLUSIONS

- Institutional and policy environments are significant roadblocks

- Creative solutions for resolving financing and training barriers
  - Collective organizing?
  - Mobilizing CSR, channeling funds?
  - Leveraging TV, phones, radio?

- Tension between what's good for food safety (and at what scale) and what's good for livelihoods, empowerment, etc.

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Harnessing consumer food safety perceptions and willingness to pay for safer fish in Bangladesh

Dr. Madan Dey

FSIL-Bangladesh PI

Professor and Department Chair of Agricultural Business and Economics

Texas State University

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Harnessing Consumers' Food Safety Perceptions and Willingness to Pay for Safer Fish in Bangladesh

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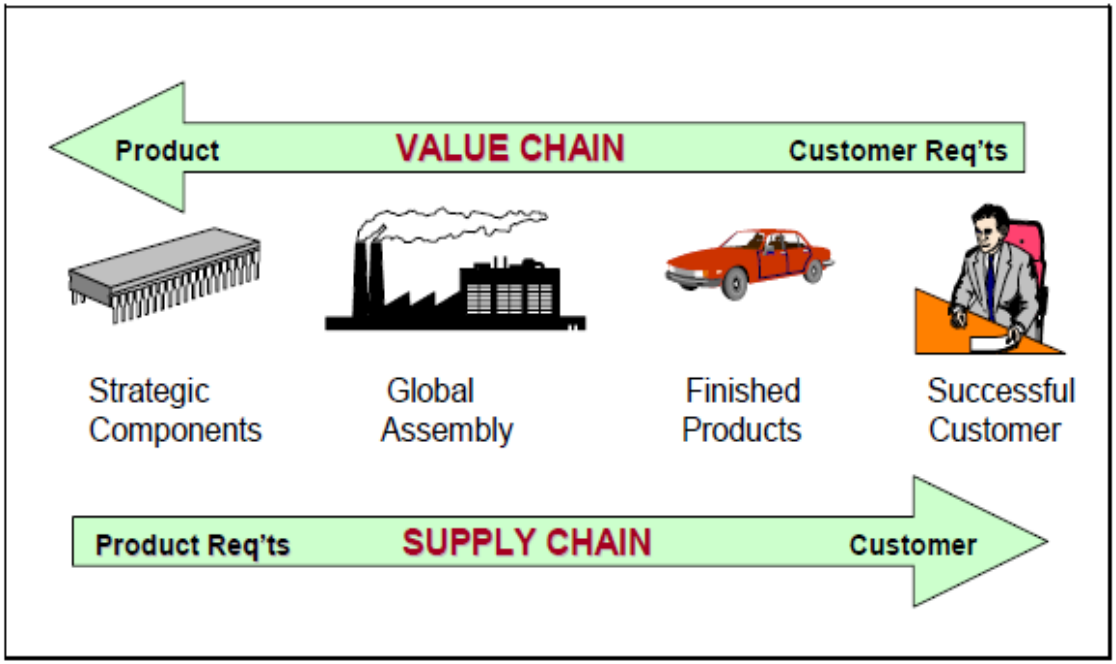
PRESENTATION OUTLINE

1. Role of consumers' behavior in product development (value chain)
2. Brief overview of our project activity
3. Experimental auctions
4. Choice experiments
5. Consumers' Willingness to Pay (WTP)
6. Market segmentation
7. Bringing producers into the "picture" (costs & returns from safer fish)
8. Take home messages

ROLE OF CONSUMERS' BEHAVIOR IN PRODUCT DEVELOPMENT

Value Chain Era

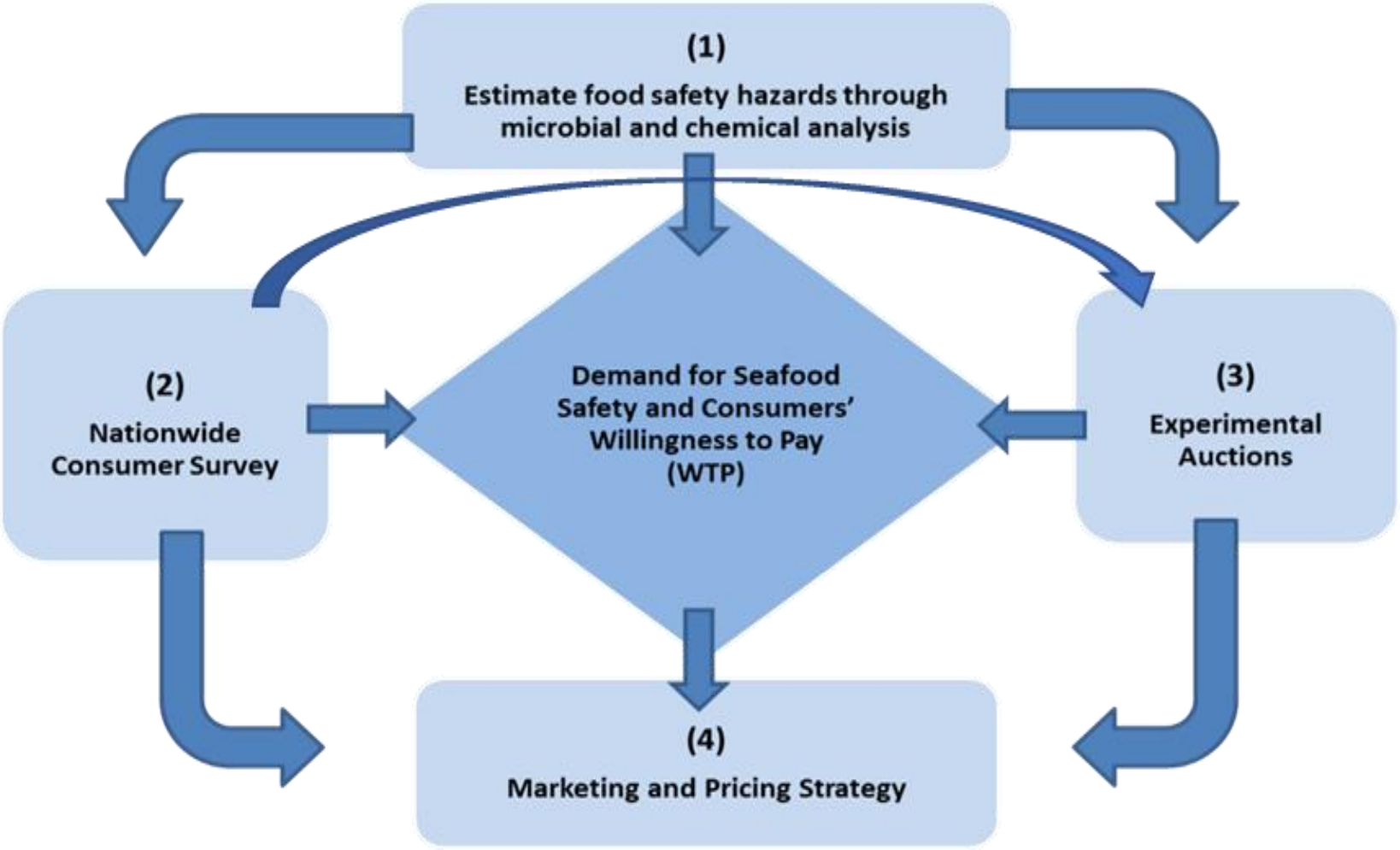
- Start with consumer requirement
- Integration of supply and demand chains
- Proactive, K-based relationships



STEPS FOLLOWED/RESEARCH ACTIVITIES

- Review of existing literature
- Growing of fish in safer environments, where controlled feed and management are provided, and no/minimum antibiotics are used during fish rearing
- Analysis of fish samples for antibiotic residues, bacterial pathogens, and heavy metals
- Knowledge, Attitude, and Practice surveys and focus group discussions (FGDs)
- Experimental auctions and choice experiments
- Dissemination and institutionalization of results

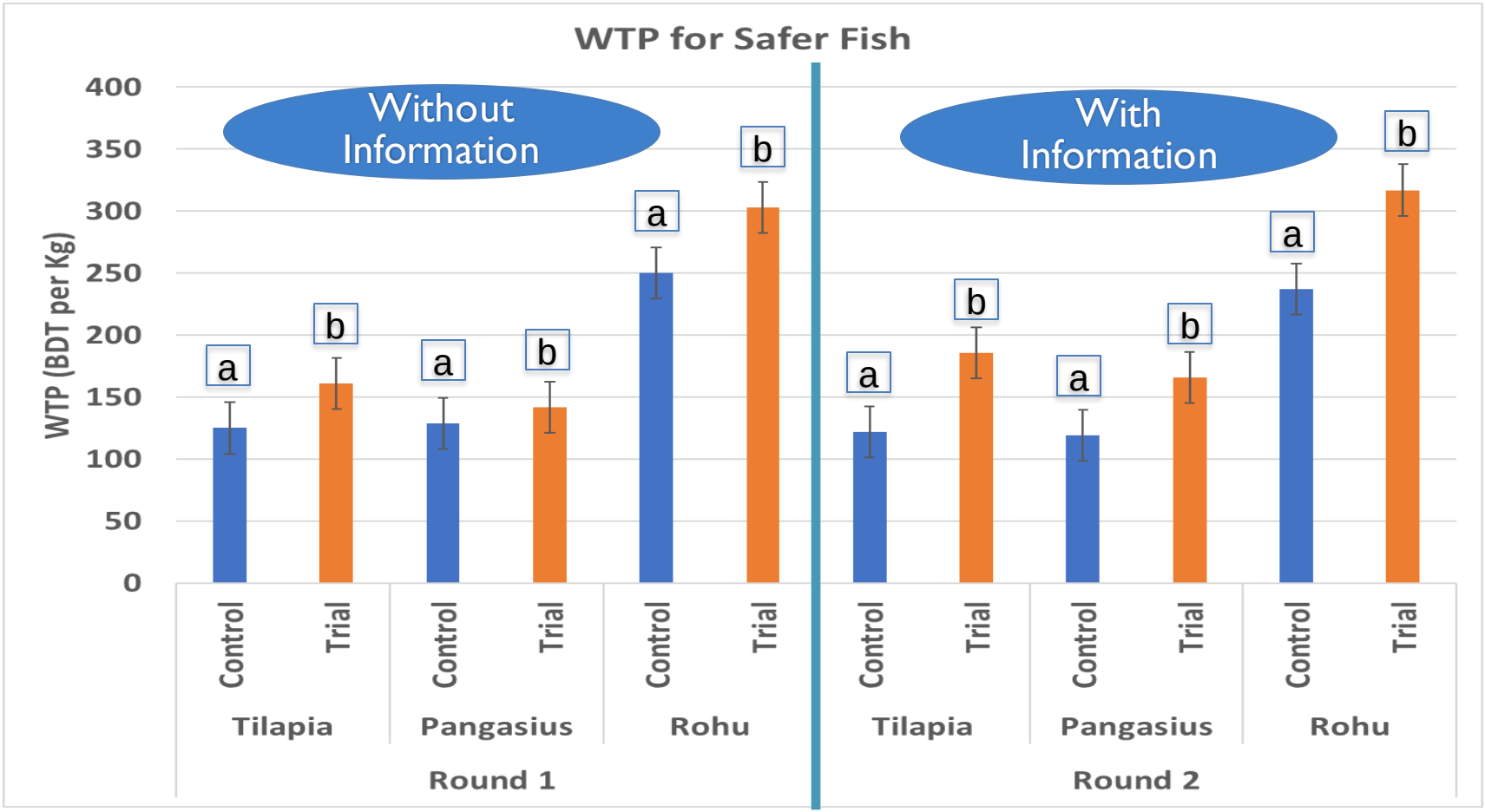
CONCEPTUAL FRAMEWORK



EXPERIMENTAL AUCTIONS

- **Auction participants for Tilapia & Pangasius**
  - **Total: 135** (Mymensingh: 44; Patuakhali: 46, Narayanganj: 45) from different income and gender groups
- **Auction participants for Rohu**
  - **Total: 94** (Mymensingh: 50; Narayanganj: 44) from different income and gender groups

CONSUMERS' WTP FOR TILAPIA, PANGASIUS & ROHU



AVERAGE WTP: EXPERIMENTAL AUCTION

- Fish cultured following Good Aquacultural Practices (GAqPs) were more appealing to consumers than locally available conventional fish.
- Despite being unaware of specific invisible attributes and production practices, consumers were willing to pay a substantial premium for safer fish. On average, this premium was 29%, 10%, and 21% for Tilapia, Pangasius, and Rohu, respectively.
- The premium consumers were willing to pay for safer fish increased significantly after the disclosure of lab test information. This premium reached 52%, 39%, and 34% for safer Tilapia, Pangasius, and Rohu, respectively. Female consumers demonstrated a greater WTP.

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IMPACT OF FOOD SAFETY INFORMATION

DID Regression Model: Y_i

$$= \alpha_0 + \alpha_1 D_{Control\_After\_i} + \alpha_2 D_{Trial\_Before\_i} + \alpha_3 (D_{Control\_After\_i})(D_{Trial\_Before\_i}) + \sum_i^n \beta_i X_i + \mu_i$$

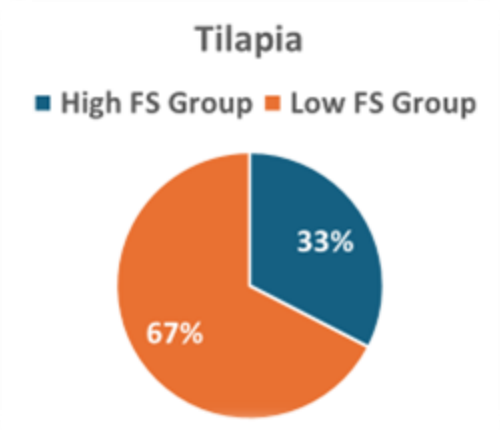
	Tilapia		Pangasius		Rohu	
Y (Price)	**Coef.**	**Robust Std. Err.**	**Coef.**	**Robust Std. Err.**	**Coef.**	**Robust Std. Err.**
Constant	75.78***	13.49	94.69***	10.08	249.10***	23.37
$D_{Control\_After\_i}$ (WTP for control fish after information)	-3.19	3.35	-10.26***	2.71	-13.24***	4.49
$D_{Trial\_Before\_i}$ (WTP for trial fish before information)	25.83***	5.18	9.96	3.61	38.73***	6.41
$D_{Control\_After\_i} \times D_{Trial\_Before\_i}$ (Average Treatment Effect on WTP)	27.81***	5.39	33.93***	4.39	28.03***	7.01
Size	4.09	2.77	6.33***	1.98	5.80*	3.00
Color	5.32**	2.49	1.78	1.96	1.39	3.32
Appearance (Glossiness)	1.10	2.00	3.74**	1.83	4.42	3.35

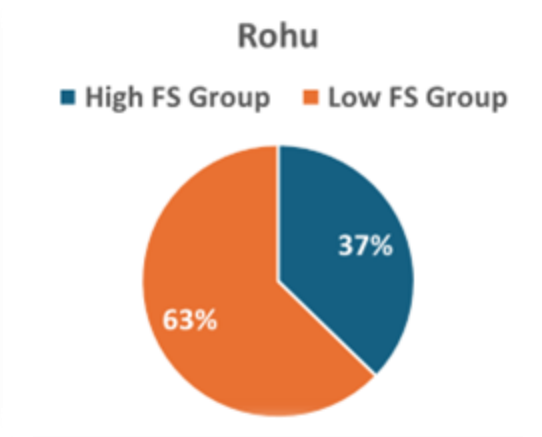
- Consumers are willing to pay 28 Tk/kg more to purchase safer Rohu than the control Rohu when they were informed about safety information and management practices.

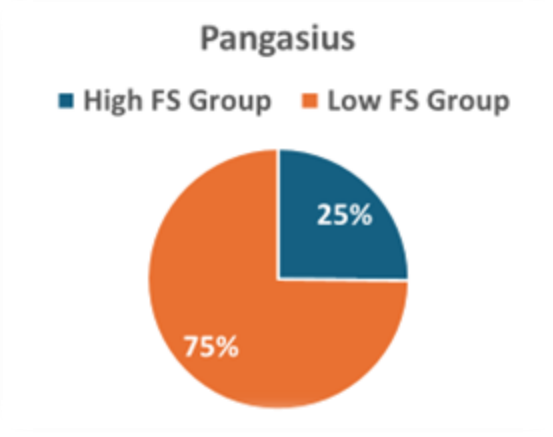
MARKET SEGMENTS FOR SAFER FISH PRODUCED THROUGH GAqP

- A "market domain" or "market segment" represents a group of fish buyers with a similar level of food safety concerns about fish products where a similar pricing strategy will increase the profit of farmers producing safer fish.
- Performed a cluster analysis with 10,000 iterations.
- Identified two types of fish consumers having:

  (1) High Food Safety (HFS) concerns, (2) Low Food Safety (LFS) concerns







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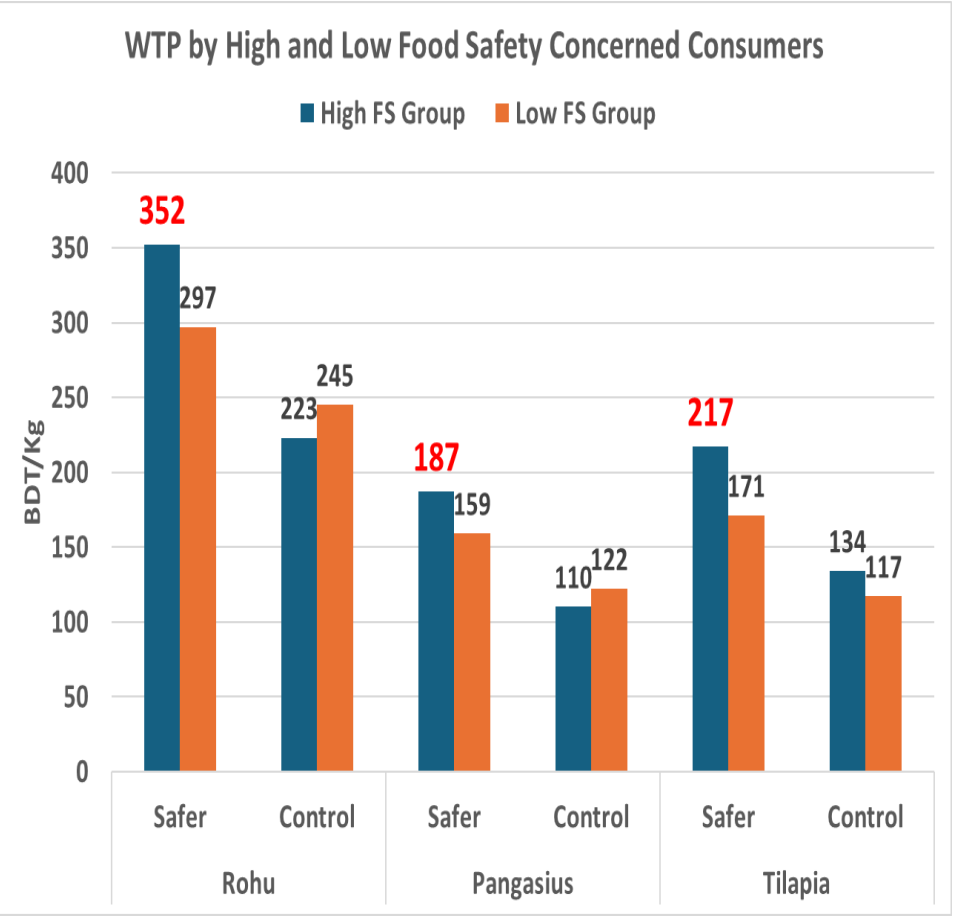
MARKET SEGMENTS: WILLINGNESS TO PAY (WTP) FOR SAFER FISH



Consumers with high food safety (HFS) concerns were WTP higher prices:
Tilapia: 27% higher
Rohu: 19% higher
Pangasius: 18% higher

Implications: Fish farmers and traders can earn higher profits with a price equal to the WTP of the HFS group until the total supply of safer fish reaches **33% of Tilapia** demand, **37% of Rohu** fish demand, and **25% of Pangasius** demand in the market.

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CHOICE EXPERIMENT: ESTIMATING FACTORS AFFECTING CONSUMERS' WTP FOR SAFER FISH

10 attributes and
25 levels of attributes

Factorial Design
1,024 product profiles

Fractional Factorial Design
50 product profiles

Version 1 Consumer Group 1	Version 2 Consumer Group 2	Version 3 Consumer Group 3	Version 4 Consumer Group 4	Version 5 Consumer Group 5
10 profile - Rohu	10 profile - Rohu	10 profile - Rohu	10 profile - Rohu	10 profile - Rohu
10 profile - Pangas	10 profile - Pangas	10 profile - Pangas	10 profile - Pangas	10 profile - Pangas
10 profile -Tilapia	10 profile - Tilapia	10 profile -Tilapia	10 profile -Tilapia	10 profile -Tilapia

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CHOICE EXPERIMENT:
FACTORS AFFECTING THE PROBABILITY OF CHOICES

Rohu: Product environment, gill color, microbial contamination, heavy metal concentration, antibiotic residue, selling condition, certifications, and price.

Tilapia: Gill color, other visible attributes, microbial contamination, heavy metal concentration, antibiotic residue, selling condition, inspections, certifications, and price.

Pangasius: Product environment, gill color, other visible attributes, microbial contamination, heavy metal concentration, antibiotic residue, selling condition, inspections, certifications, price, and gender.

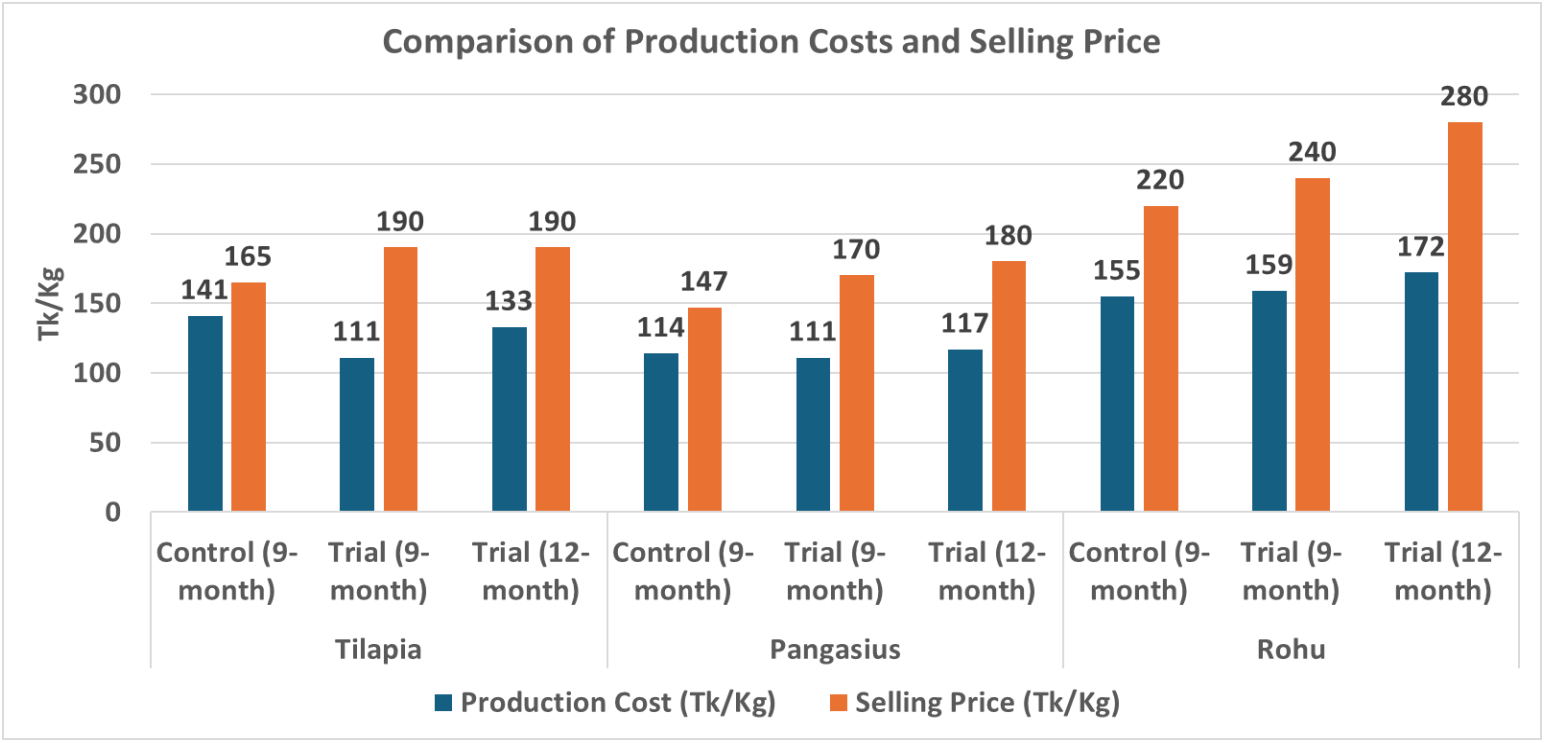
TWO MAIN INTERVENTIONS

1. Following Good Aquaculture Practices (GAqPs), farmers can produce better and safer fish.
   - Government agencies can develop certification programs for farms that are following GAqPs.

2. Awareness building among farmers and educating the feed industry about the potential benefits of safer feed will result in better access to safer feed compared to the existing commercial feed at a lower price
   - Feed cost is one of the major input costs in fish culture.

COST AND RETURNS FROM SAFER FISH

- Per kg cost of production of safer or trial fish (produced using GAqPs) was lower than control/traditional fish
- Per Kg selling price of trial fish was higher than control fish
- Per Kg profit was higher for trial fish than control fish



TAKE HOME MESSAGES

- Consumers are willing to pay higher prices for safer fish produced using GAqPs *(experimental auction and choice experiment)*
- The per unit cost of production does not increase with the adoption of GAqPs *(pond trial)* / Profit increases *(pond trials/model)*
- The market price is higher for safer fish produced using GAqPs
- The market can be segmented
- Institutionalization of food safety policy through the Bangladesh Food Safety Authority (BFSA), Department of Fisheries (DoF), and other government agencies (*agreed in principle, in progress*)
- Further public-private partnership (Mega Feeds, government agencies)
- Broaden the training on GAqPs and extension capacity in DoF, universities, and NGOs

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Social Behavior Change in Food Safety: Levers To Drive Food System Transformation

Madan Dey

Paul Ebner

Jessica Marter-Kenyon

Aditya Khanal

PANEL DISCUSSION

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ACKNOWLEDGEMENT:

This event is made possible by the generous support of the American people through the United States Agency for International Development (USAID). The contents are the responsibility of the authors and do not necessarily reflect the views of USAID or the United States Government. Program activities are funded by USAID under Cooperative Agreement No. 7200AA19LE00003.

NEXT WEBINAR:

June 26, 9 AM EDT
Register through the link in the chat.

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THANK YOU

A link to the recording and presentations will be emailed to attendees.

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