



**FEED THE FUTURE**

The U.S. Government's Global Hunger & Food Security Initiative

# **Feed the Future Innovation Lab for Nutrition:**

## **Research supporting nutrition-sensitive programming**

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May 2018

Kampala, Uganda



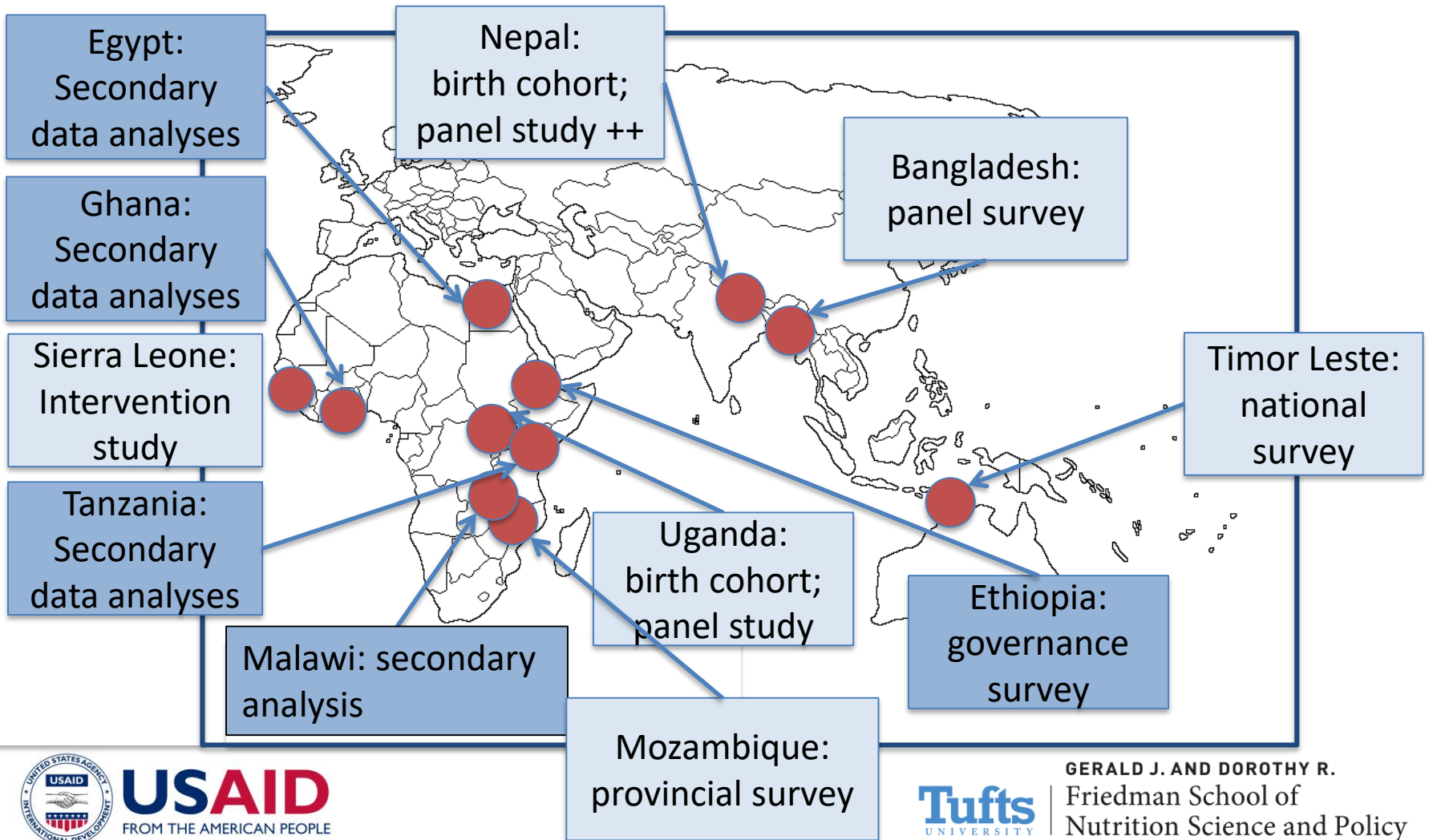
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## NUTRITION INNOVATION LAB study sites





## CAN ANIMAL SOURCE FOODS IMPROVE BIRTH OUTCOMES, NUTRITION? (NEPAL)

**YES!**

➤ *Peri-urban (Bhaktapur):*

➤ Hh owning livestock =  ASF intake =  risk of stunting



## Can Promotion of Aquaculture and Horticulture Improve Diet Quality? (Bangladesh)

Statistically significant, positive linear associations:

- 1 unit increase in *diversity* in **fruits/veg** production = + 0.2 in diversity of fruits/veg units consumed [R<sup>2</sup>=0.997; p<.0001]
- 1 unit increase in *diversity* in **fish species** produced = + 0.87 in diversity of **fish species consumed** [R<sup>2</sup>=0.83; p<.0001]

YES!





**YES!**

## Can multisector programming raise production diversity? (Uganda)

| Treatment group | CC effect on production diversity (species count) | CC effect on production diversity (species count) |
|-----------------|---|---|
|                 | 2014  | 2016  |
| all CC programs | 1.268***  | 0.784**   |
| Ag/Nutr/WASH    | 0.589**   | 1.102***  |
| Ag/Nutr         | 0.244   | 0.569   |
| Ag only         | 0.468   | 0.790   |
| Nutr only       | 0.898   | 1.347   |

- ✓ Effects accumulate over time
- ✓ Households adopting multiple innovations do better



**YES!**

## Can multisector programming improve women's diets? (Uganda, N=>3000 hhs)

| Food category     | Effect in 2014 (over 2012) | Effect in 2016 (over 2014) |
|-------------------|----------------------------|----------------------------|
| Cereals           | 1.201527                   | .9040405                   |
| Tubers/roots      | 1.077021                   | 1.328351                   |
| <b>Legumes</b>    | <b>.6867968*</b>           | .8352416                   |
| Oilseeds          | .8575654                   | .8747842                   |
| <b>Vegetables</b> | <b>1.386811**</b>          | 1.095166                   |
| <b>Fruits</b>     | <b>.6084369***</b>         | <b>.5977029***</b>         |
| <b>Meats</b>      | 1.269184                   | <b>1.478184*</b>           |
| Dairy             | .6477301                   | 1.509644                   |
| <b>Fats/oils</b>  | <b>1.514287**</b>          | <b>1.359578*</b>           |

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ , **Odds ratios** estimated by fixed effects logit models



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# BUT...!!



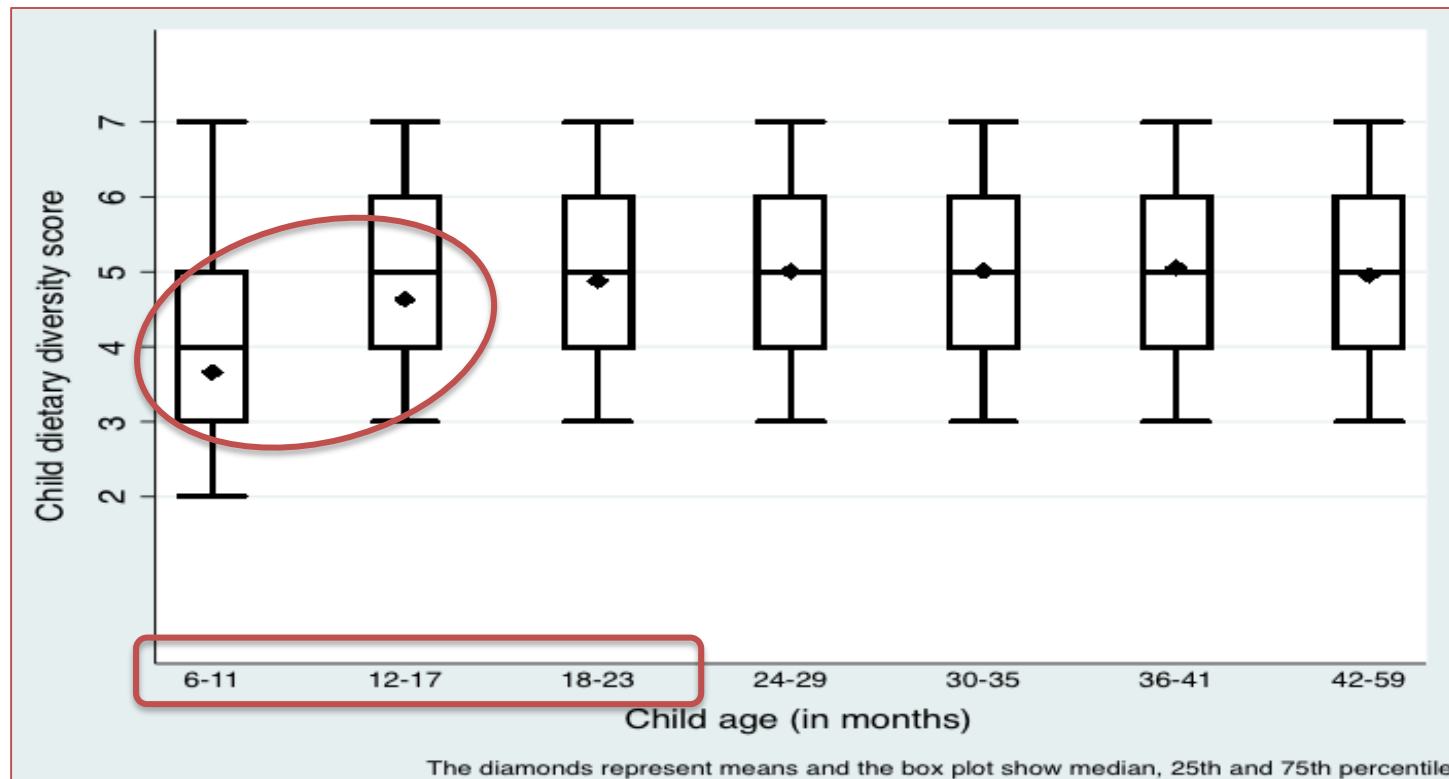
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## Farm production raises DD only for older children, (as they can consume family foods) (NEPAL)



... own production raises DD only in poorer households remote from markets (N=>3,500hhs)





## High levels of **blood aflatoxin** during pregnancy impacts birth outcomes (Uganda N=238)

|                           | Unadjusted Model                                | Adjusted Model                                  |
|---------------------------|---|---|
| <b>Weight</b>             | -0.06 (-0.13, 0.002)<br>p=0.059                 | <b>-0.07 (-0.13, -0.002)</b><br><b>p=0.045*</b> |
| <b>Length</b>             | -0.09 (-0.42, 0.23)<br>p=0.566                  | -0.12 (-0.44, 0.21)<br>p=0.476                  |
| <b>WAZ</b>                | <b>-0.16 (-0.31, -0.01)</b><br><b>p= 0.032*</b> | <b>-0.16 (-0.30, -0.03)</b><br><b>p=0.021*</b>  |
| <b>WHZ</b>                | -0.13 (-0.39, 0.12)<br>p=0.301                  | -0.14 (-0.40, 0.11)<br>p=0.274                  |
| <b>LAZ</b>                | -0.07 (-0.24, 0.10)<br>p=0.444                  | -0.08 (-0.25, 0.09)<br>p=0.357                  |
| <b>Head circumference</b> | -0.23 (-0.47, 0.003)<br>p=0.053                 | <b>-0.27 (-0.51, -0.03)</b><br><b>p=0.028*</b>  |
| <b>HCZ</b>                | <b>-0.19 (-0.37, -0.007)</b><br><b>p=0.042*</b> | <b>-0.23 (-0.41, -0.04)</b><br><b>p=0.016*</b>  |
| <b>Gestational age</b>    | -0.10 (-0.43, 0.23)<br>p=0.561                  | -0.08 (-0.42, 0.26)<br>p=0.642                  |



## High levels of maternal EED impacts birth outcomes (Uganda N=238)

|                    | Length at birth (cm)                | Length-for-age Zscore               | Gestational age at birth            |
|--------------------|-------------------------------------|-------------------------------------|-------------------------------------|
|                    | Adjusted                            | Adjusted                            | Adjusted                            |
| Anti-flagellin IgG | -0.97<br>(-1.79, -0.14)<br>p=0.022* | -0.52<br>(-0.95, -0.08)<br>p=0.020* | -1.35<br>(-2.64, -0.07)<br>p=0.039* |
| Anti-LPS IgG       | -0.45<br>(-0.87, -0.02)<br>p=0.041* | -0.25<br>(-0.48, -0.03)<br>p=0.029* | -0.89<br>(-1.52, -0.25)<br>p=0.006* |

\* p<0.05





## RESEARCH ON NUTRITION-SENSITIVE AGRICULTURE - CONFIRMING AND CAUTIONING

- Promoting agric. diversity **does** raise production diversity, which is linked to improved diet quality for women.
- It also helps child nutrition, **but** only in poorer households, more remote from markets, and >24m of age (>1000 days). More is needed than agric. for 1000 days programming.
- Multisector programming combining Ag/Nutr/WASH **can** have positive impact on prod. DD, and women's DD [*as well as narrowing gap between poor and less poor*].





## ANIMAL SOURCED FOODS +ve; ANIMALS IN HOME -ve

- More **ASF** consumption improves birth outcomes [*and child growth and cognition. Eggs special, regardless of wealth*].
- **But**, children grow. One measure not enough; ASFs have +ve effects in pregnancy and <24m; diet diversity +ve >36m. Time frame of pathway (and when measured) matters!
- **But** poultry/ruminants in home linked to **maternal EED**, which is linked to birth outcomes (shorter gestation, LAZ at birth).
- Poor **EED in child** associated with wasting and stunting [**not mediated by diet diversity**].





## AFLATOXINS IN BLOOD - NOT GOOD!

- **AF in mother's blood = impaired birth outcomes** (weight, height and head circumference).
- Higher **production diversity** and **diet diversity** *not* protective.
- In Nepal, no **clear association with on-farm management/storage practices/knowledge**. [*Major source of contamination is market supply rather than own farm*].
- Need to understand **cumulative effects of multiple mycotoxins**, and impact of simple techniques/awareness in **moisture management**.





## KEY ROB AND NORA THEMES

- Pathways for Impact: *Pray, **Masters**, Ayoub (2017) Impacts of Agricultural Research on Poverty, Malnutrition and Resilience* report.
- Field studies (huge sample sizes) **empirically** documenting **impact pathways of agric.** (via diets/income) on nutrition. Agriculture programs serve as viable platforms for multisector transfers (services/inputs). ✓
- Field studies (huge sample sizes) **empirically** documenting impacts of **multisector programming** (via agric. packages) on diets/nutrition. ✓
- **Resilience**: 2015 earthquake in Nepal, smallholder agriculture bent but didn't break. Buffer for food security among poorer hhs. ✓





## Huge potential for *MUCH MORE COLLABORATION ACROSS INNOVATION LABS* for solving defined problems!!

outcomes takes time (a generation?)

- **Animal source foods** matter for nutrition: More needed when intake low, not less.
- Animals can impact **EED and water quality**, -ve for nutrition.
- **Food safety** huge impact for nutrition (ecoli, mycotoxins).
- **Post-harvest losses** - huge potential for diet quality/nutrition.





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