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

Aquaculture and Horticulture:

Pathways to improved income, diet diversity and nutrition outcomes?

*Dr. Patrick Webb,
Feed the Future Nutrition Innovation Lab,
Tufts University*



**HORTICULTURE
INNOVATION LAB**

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GERALD J. AND DOROTHY R.
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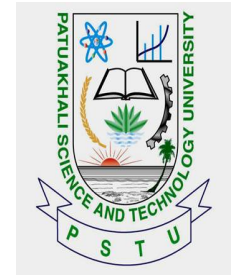
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>8000 studies reviewed:

- Focus on access and consumption of *high-quality diets* rather than on reducing childhood stunting.
- *Markets* need to be taken into account, not just own-production.
- There are still important knowledge gaps to be filled on *scale-up and cost-effectiveness*.

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Nutrition-sensitive agriculture: What have we learned so far?

Marie T. Ruel^{a,*}, Agnes R. Quisumbing^a, Mysbah Balagamwala^b

^a International Food Policy Research Institute (IFPRI), USA
^b Oxford Policy Management, Oxford, UK

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ABSTRACT

A growing number of governments, donor agencies, and development organizations are committed to supporting nutrition-sensitive agriculture (NSA) to achieve their development goals. While consensus exists on pathways through which agriculture may influence nutrition-related outcomes, empirical evidence on agriculture's contribution to nutrition and how it can be enhanced is still weak. This paper reviews recent empirical evidence (since 2014), including findings from impact evaluations of a variety of NSA programs using experimental designs as well as observational studies that document linkages between agriculture, women's empowerment, and nutrition linkages. The paper summarizes existing knowledge regarding impacts, but also pathways, mechanisms, and contextual factors that affect where and how agriculture may improve nutrition outcomes. The paper concludes with reflections on implications for agricultural programs, policies, and investments, and highlights future research priorities.

1. Introduction

A growing number of governments, donor agencies, and development organizations are committed to supporting nutrition-sensitive agriculture to achieve their development goals. Nevertheless, nutrition-specific interventions alone, even if implemented at scale, will not meet global targets for improving nutrition (Shatta et al., 2013; WHO, 2014). Other sectors need to contribute as well, and agriculture has strong potential due to the many ways in which it can influence the underlying determinants of nutrition outcomes (Black et al., 2013), including through improving global food availability and access and through enhancing household food security, dietary quality, income, and women's empowerment. Globally, the need for agriculture to support better nutrition and health has been recognized and was reflected in the discussions leading up to the United Nations' 2030 Agenda for Sustainable Development (United Nations, 2017), and regionally, it is reflected in the growing number of initiatives to support countries in integrating nutrition interventions into their agricultural investment plans, as illustrated by the Comprehensive Africa Agriculture Development Programme investment plans (Rampa and van Seters, 2013). Countries like Nigeria and Ethiopia, for example, have recently developed nutrition-sensitive agricultural plans, a clear manifestation of the greater political priority being given to improving the nutritional impact of investments in the agricultural sector.

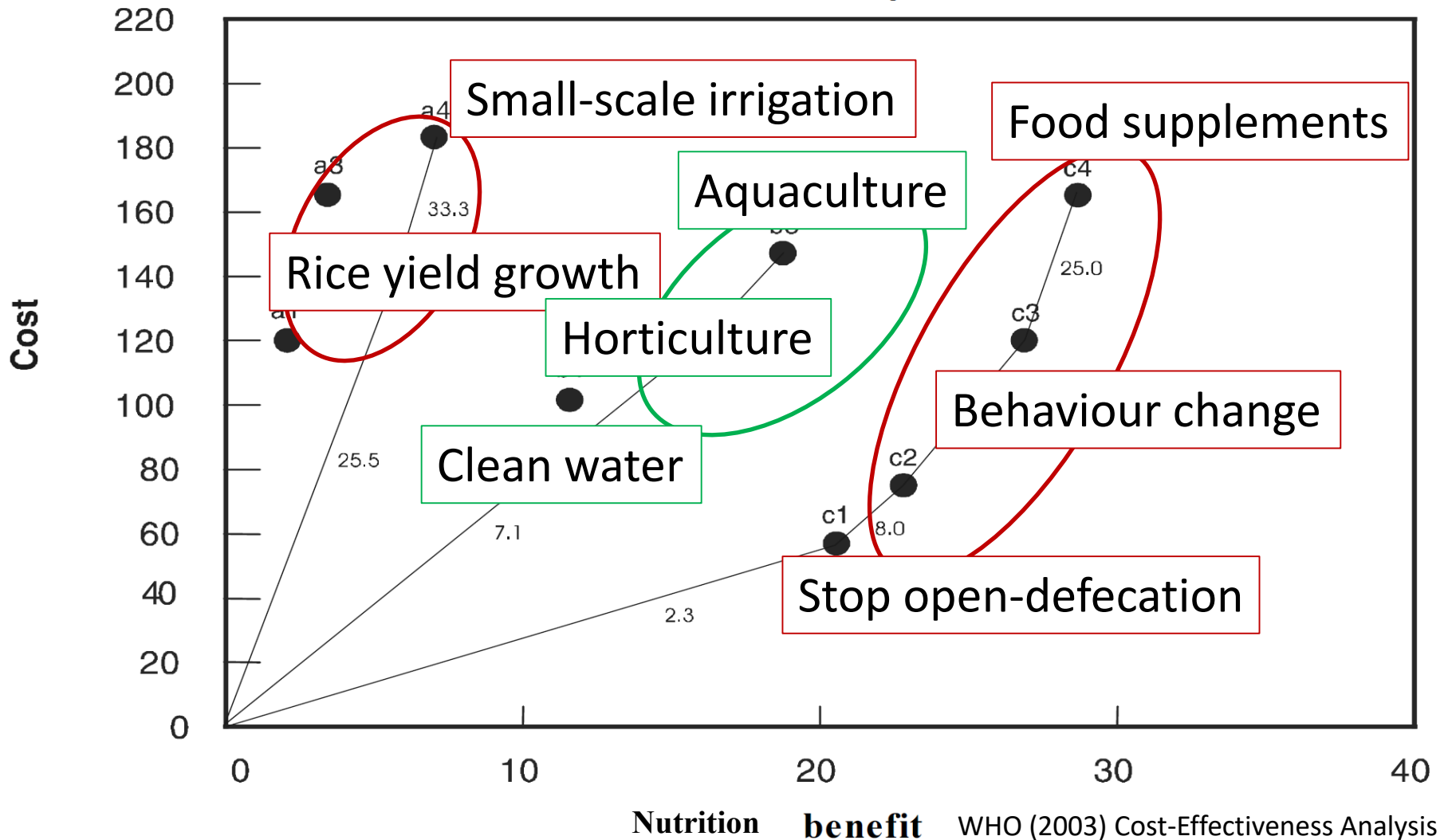
Making agriculture more nutrition-sensitive (See Box 1 for definitions of nutrition-specific and nutrition-sensitive interventions or programs), however, requires a new way of thinking, planning, implementing, and partnering, as well as the active engagement of a variety of stakeholders from multiple sectors. It also requires identifying critical entry points where nutrition goals can be incorporated into agro-food systems (Jensen and Virchow, 2013). Some of the initial steps undertaken to bring the relevant stakeholders and sectors together include designing and agreeing on conceptual frameworks that identify the multiple pathways by which agriculture can impact nutrition. This topic has been the subject of an extensive body of work including the development of several conceptual frameworks that highlight the dynamic and multifaceted linkages between agriculture, health, and nutrition (Headey et al., 2012; Herforth and Harris, 2014; IFPRI, 2011; Jensen and Virchow, 2013; Kadiyala et al., 2014; Pinstrup-Andersen, 2012; World Bank, 2007). Ruel and Alderman (2013) identified six pathways through which agricultural interventions can impact nutrition: (1) food access from own-production; (2) income from the sale of commodities produced; (3) food prices from changes in supply and demand; (4) women's social status and empowerment through increased access to and control over resources; (5) women's time through participation in agriculture, which can be either positive or negative for their own nutrition and that of their children; and (6) women's health and nutrition through engagement in agriculture, which also can have either positive or negative impacts, depending on exposure to toxic agents and the balance between energy intake and expenditure. The characterization of the pathways by which agriculture and nutrition are linked and of the unequivocal mediating role of

* Correspondence to: Poverty, Health and Nutrition Division, International Food Policy Research Institute (IFPRI), 1201 17th Street, NW, Washington, DC 20005, USA.
E-mail address: m.ruel@cgiar.org (M.T. Ruel).

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Costs and benefits of three sets of mutually exclusive interventions





GEOGRAPHIC INTEGRATION OF ACTIONS TO INCREASE SUPPLY OF NUTRIENT-RICH FOODS: DOES IT WORK?

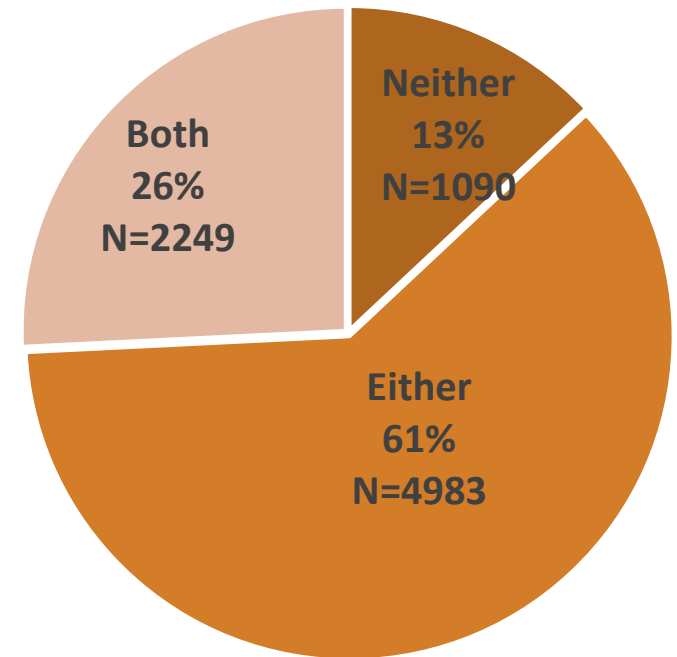
1. Impacts on income, diet quality and nutrition from *exposure to multiple agriculture interventions?*
2. Do aquaculture and/or horticulture impact consumption of fish and fruit/veg. *in non-producing households?*
3. Is there potential to introduce and scale-up innovative drying and storage interventions?





RESEARCH APPROACH

- Longitudinal panel survey in 3,060 households located across 102 unions of the FTF zone of influence.
- Respondents interviewed 3 times over 2 years on diets, livelihoods, aqua/hort, marketing, food safety.
- Embedded sub-studies on technology innovation adoption.

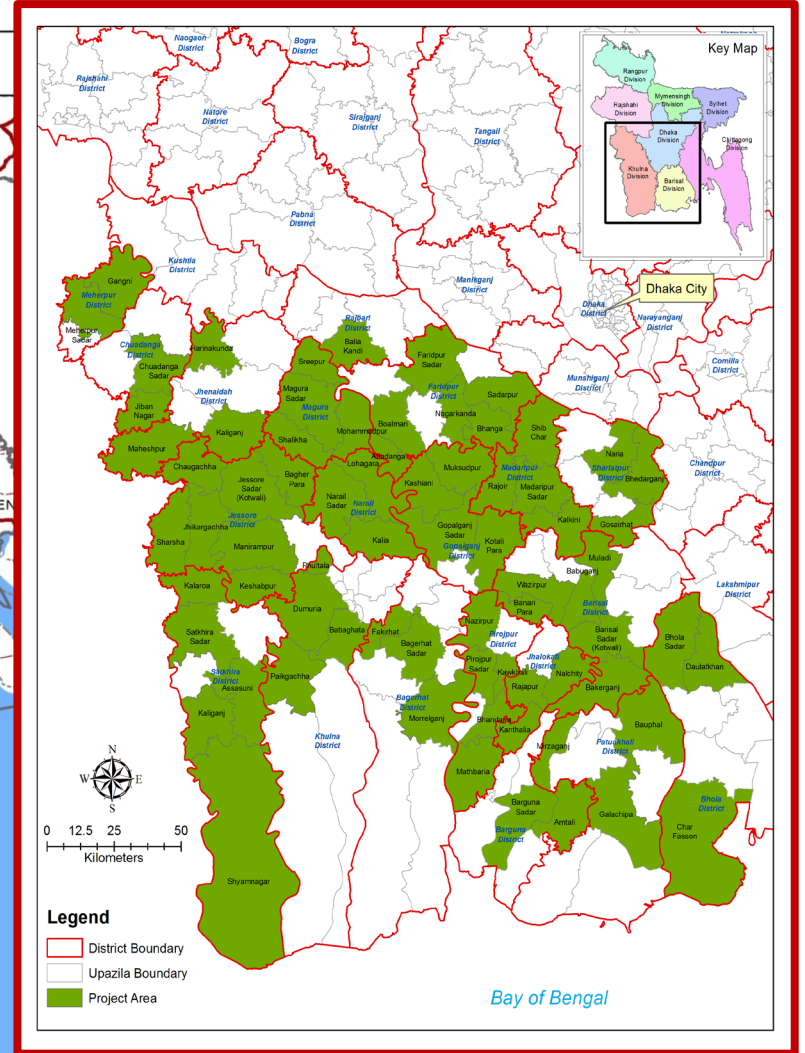
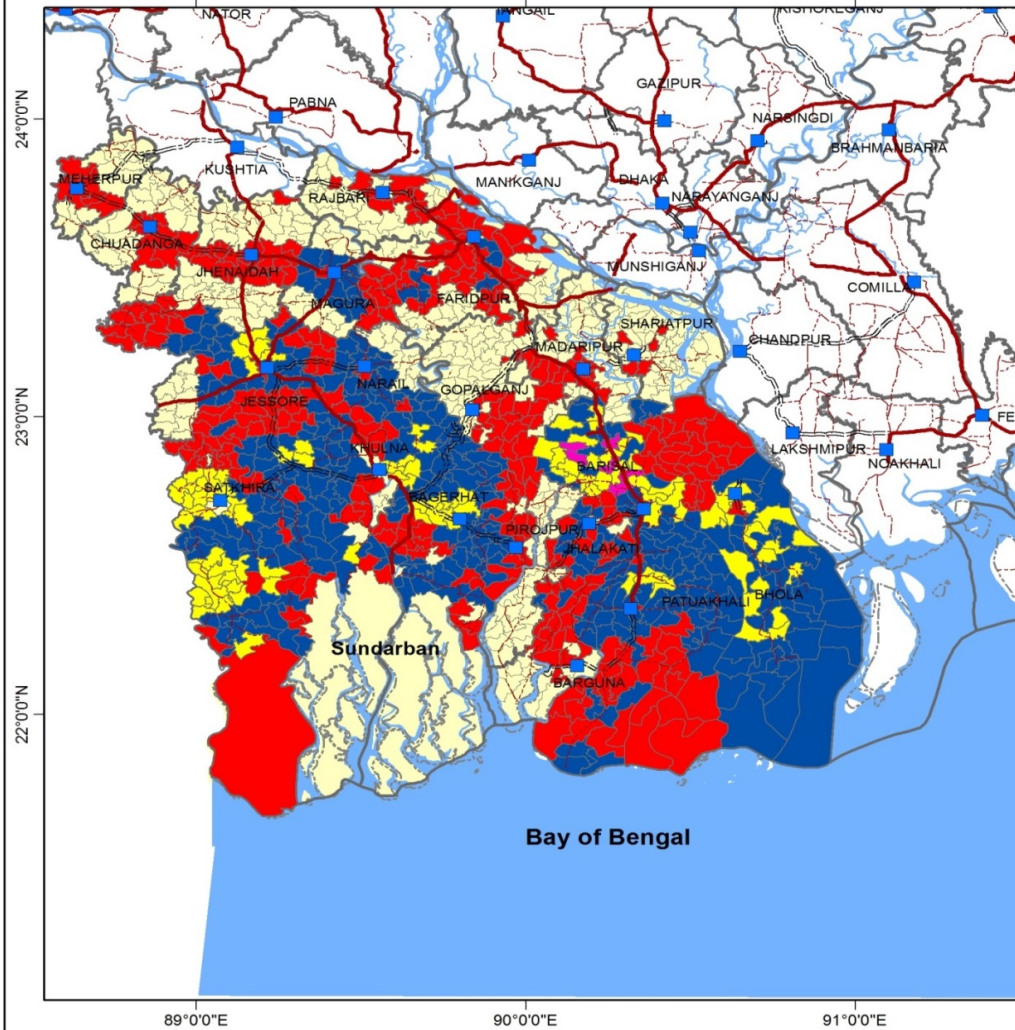




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Overlapping Working Areas (AIN, FAO, CIP, AESA, SHIKHA, SPRING Projects)

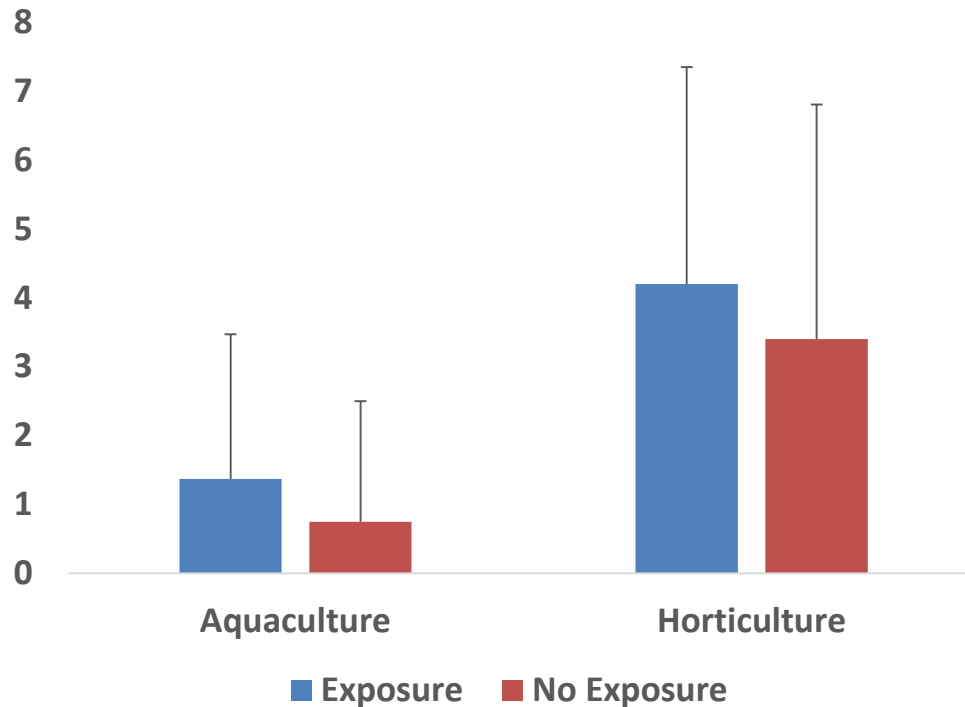




MORE EXPOSURE = MORE FARM DIVERSITY

Mean Production Diversity by Exposure to USAID program (all households)

Number of species farmed



...AND HIGHER NET INCOME FROM AGRICULTURE



CHANGE IN HOUSEHOLD EXPENDITURE

US\$/capita	Total household expenditure	Household food expenditure
No USAID program exposure	Reference	Reference
Exposed to one USAID program	0.040	0.024
Exposed to multiple USAID programs	0.348**	0.366*
N	2802	2802

β -coefficients are shown in the table above; * $p < 0.05$

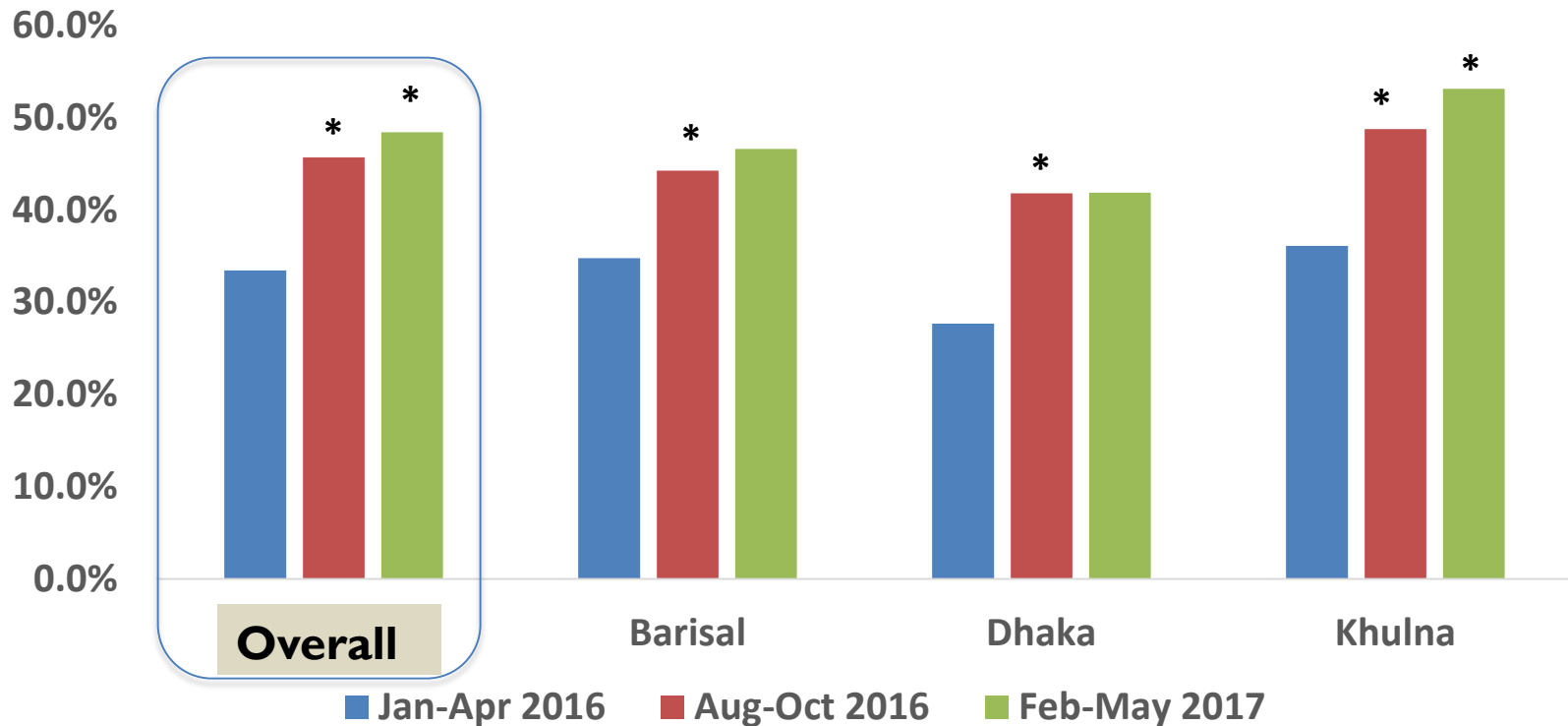
*Models adjust for engagement in aquaculture and horticulture, baseline dietary diversity/fish consumption, female caregiver's education level, household food insecurity access score (HFIAS)





Fish intake rose in children under 24m

* Significantly higher compared to Round 1 $p < 0.05$ (logistic regression, controlling for wealth, education, gender of head, etc.)





CHANGE IN *SMALL FISH* CONSUMPTION

Diff R3-R1 (grams)	Child	Female caregiver
No USAID program exposure	Reference	Reference
Exposed to one USAID program	-0.308	0.154
Exposed to multiple USAID programs	3.736*	7.041*
N	2791	2801

β -coefficients are shown in the table above; * $p < 0.05$

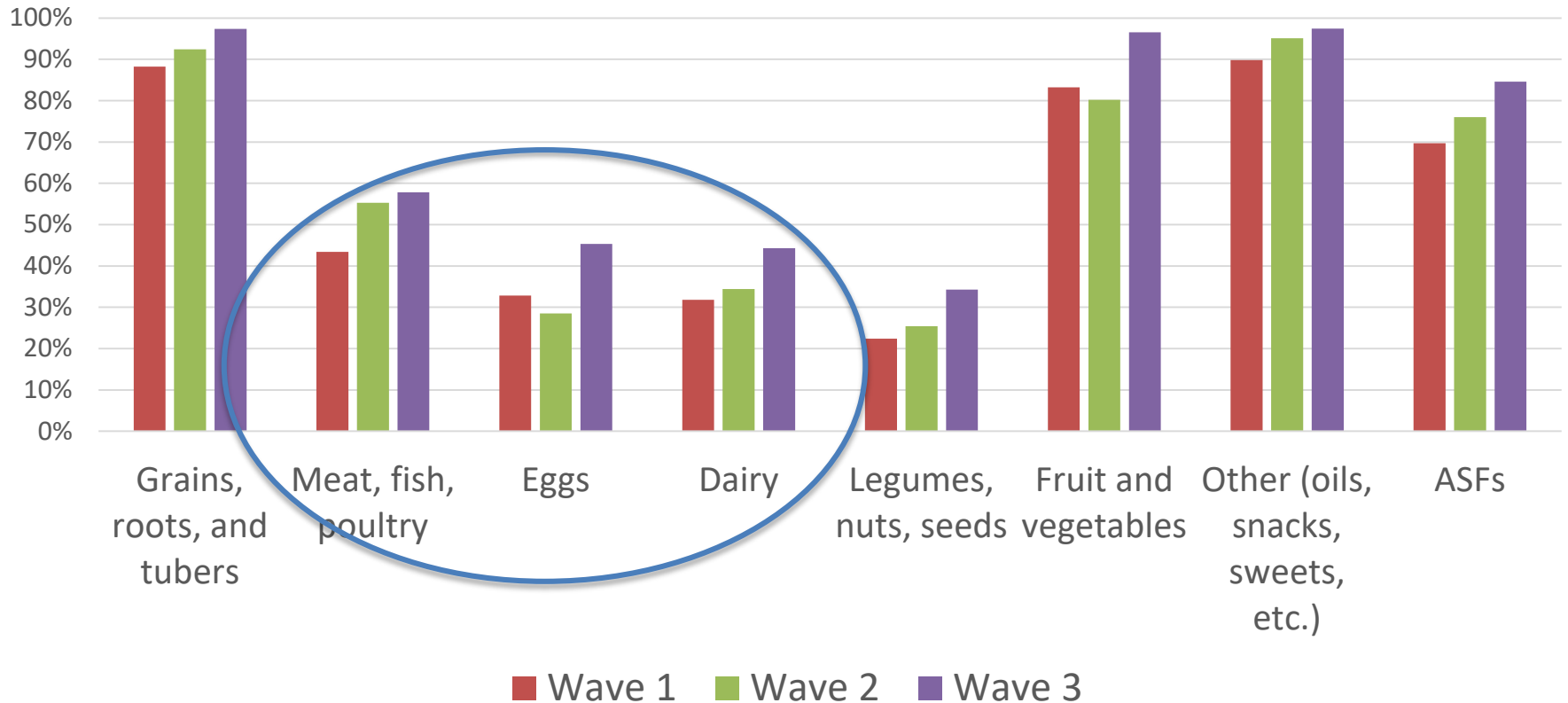
Models adjust for engagement in aquaculture and horticulture, baseline fish consumption, female caregiver's education level, HFIAS



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Share of children consuming given food groups – including non-producers



Contemporary and lagged ASF intake matters for stunting

Length-for-age Z-score	Age group: 12-24 months		
Child consumed 1 type of ASF yesterday	0.060		0.058
Child consumed >2 ASFs yesterday	0.245**		0.221**
Child consumed 1 type of ASF 6 months ago		0.095	0.084
Child consumed 2 types of ASF 6 months ago		0.231**	0.192**
N	1,381	1,381	1,381

Reported estimates are from OLS regressions. * $p < 0.05$; ** $p < 0.01$.

Model controls for starchy staples, consumed any fruit and vegetables, consumed legumes nuts and seeds, age, age², age³, gender, child had diarrhea in the past 2 weeks, caregiver's education, caregiver's height, type of latrine. Regressions include district x survey round fixed effects.



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Exposure to multiple programs on aqua., hort., clean water, market access, behaviour change, etc.

>diversity of farm output

>market engagement

>diet diversity (hh, mother, child)

>net income growth (sales)

>net food expenditure

>intake of small fish, fruit, ASF

<<risk of child stunting (if eggs or meat/dairy in a >diverse diet) controlling for wealth, educ., water, etc.



FINDINGS

1. Positive multipliers from concentrating investments by geography *and over time* – not one-and-done.
2. Value of SBCC clear on fish and OFSP. More to do.
3. Success in aquaculture (and adoption of drying technologies):
i) more educated, ii) less poor, iii) more labor, iv) more investable cash, v) self-trading (to more distant markets).
4. Innovation adoption is feasible; but scale-up driven by market access, finance access, and increasingly specialized technical knowledge. Role for private sector?



POLICY IMPLICATIONS

1. Agriculture's role in nutrition is +ve: but i) goes beyond home gardens; ii) needs multiple actions to improve diet.
2. Link to child stunting confirmed. But diet quality (maternal and >24m) requires *sustained* change. Single project=limited impact.
3. We must calibrate expectations. Multiple programmes take time to generate multipliers, impact non-producers; but can in time.
4. Markets matter! Not just roads, but credit access (making it feasible to adopt risk), and improved information and inputs.
5. Yet, public sector critical for service provision: water/health/educ.

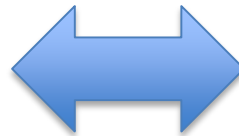




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