



Evaluating the Long-term Impact of Agricultural Technologies in Bangladesh: Looking within the household

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Overview

- Despite impressive reductions in poverty prior to food crisis, malnutrition remains a serious problem in Bangladesh
- Rice-based diets may not provide all necessary micronutrients, particularly for women and children
- Possibility that vegetable and polyculture fish technologies can improve micronutrient status through: (1) increasing supply of micronutrients to general population; (2) directly improving incomes and intakes of producing households
- Different implementation modalities have been used to disseminate these technologies—some targeted to households (husbands by default) and others through women's groups

Why pay attention to gender and nutrition in Bangladesh?

- There is a strong link between gender and malnutrition in Bangladesh
- Women and children are vulnerable to micronutrient deficiencies owing to higher biological needs and pro-male bias in food distribution
- Similar to South Asia, low status of women contributes to poor nutritional status of women and children



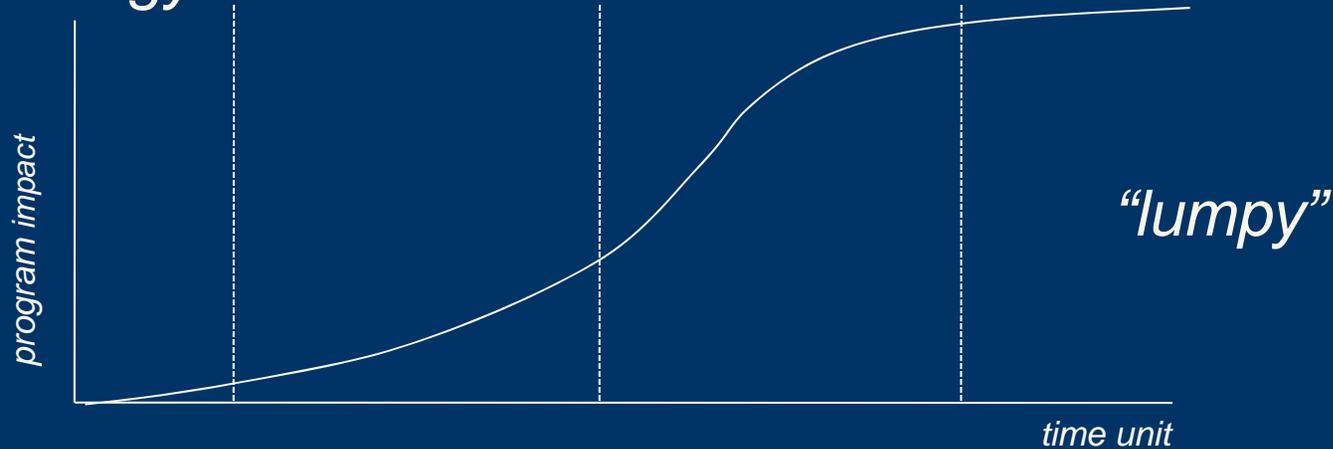
Research questions

- What are the long-term impacts of improved vegetable and fish technologies on household and individual-level outcomes?
 - Household level outcomes (per capita and per adult equivalent consumption, assets, hh nutrient availability)
 - Individual-level outcomes (nutritional status of men, women, boys, girls)
- How have different implementation modalities affected the asset portfolios of husbands and wives?
- What factors explain the differential impact of the interventions on household-level and individual outcomes?

Long-term vs. short-term impact evaluations

- Timing of evaluations—how long after the program is introduced, and the duration of exposure of the target group to the program—matters (King and Behrman 2008)
- Estimated impacts from short-term impact evaluations may be different from long-term or sustained impact
- In the case of agricultural technologies, type of technology also matters

Technology 1



Technology 2

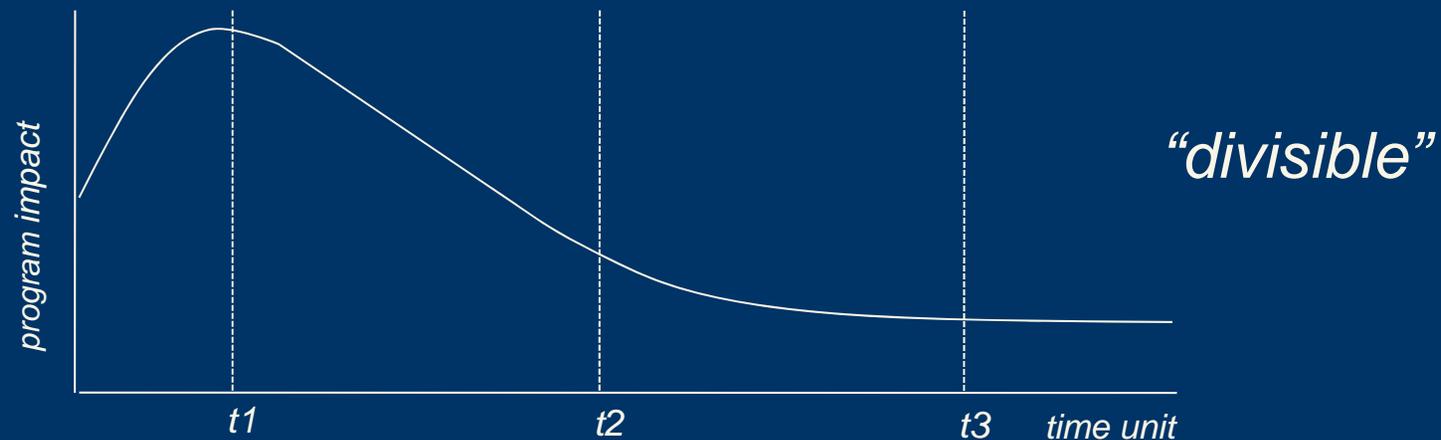


Fig 1. Type of technology AND timing of evaluation affects impact estimates

Revisiting agricultural technology sites after 10 years

- Panel data set based on 957 households surveyed in 1996/7 and 2006/7 in study sites examining impact of new agricultural technologies in rural Bangladesh
- 3 technologies/implementation modalities:
 1. improved vegetables for homestead production, disseminated through women's groups (Saturia)
 2. fishpond technology through women's groups (Jessore)
 3. fish pond technology targeted to individuals (Mymensingh)



Survey Design in 1996/7

-3 sites, 47 villages, 957 HHs

-comparison group takes advantage of program roll-out

<i>IN EACH SITE</i>	<u>Type of NGO village</u>	
<u>HH type</u>	“A” technology had been introduced	“B” technology had not yet been introduced
“A” - NGO member adopters	A (n=110/site)	
“B” - NGO member likely adopters		B (n=110/site)
“C” - others	C1 (n=55/site)	C2 (n=55/site)

Agricultural technology data

- 1996-97: 4-round quantitative household survey
- Qualitative work on gender conducted between rounds 3 and 4 (Naved 2000)
- 2001: Qualitative work and further quantitative analysis to look at impact of new technologies on poverty, empowerment, vulnerability in 2000 (Hallman, Lewis, Begum 2007)
- 2006-2007: Qual-quant chronic poverty study
 - Focus groups
 - Household survey
 - Life histories

Information collected at household and individual levels in 1996-97 and 2006-7 rounds

Household

- Per capita expenditures (food, nonfood consumption)
- Household assets and landholdings
- Household income, by source
- Detailed production module

Individual

- HH roster information (age, sex, education, relationship to hh head)
- Schooling, labor and employment
- Land and assets
- Individual food consumption, 24-hour recall (and then converted to nutrient equivalents), all individuals
- Hemoglobin (via Hemocue), all children and women up to age 65
- Height, weight for all hh members

Impact Assessment Methodology

- Evaluating impacts of each program on various outcomes (e.g., per capita consumption, food consumption, assets, schooling, nutritional status, etc.)
- Construct a counterfactual measure: **What would outcomes have been without the program?**
 - Requires “control group” - a group that differs from participant group ONLY in that they don’t participate
 - Comparisons: early adopters vs. late adopters (based on roll-out)
- Use propensity score matching and covariate matching to create this control group
- “Difference-in-difference” analysis allows us to control for unobservables that don’t change over time

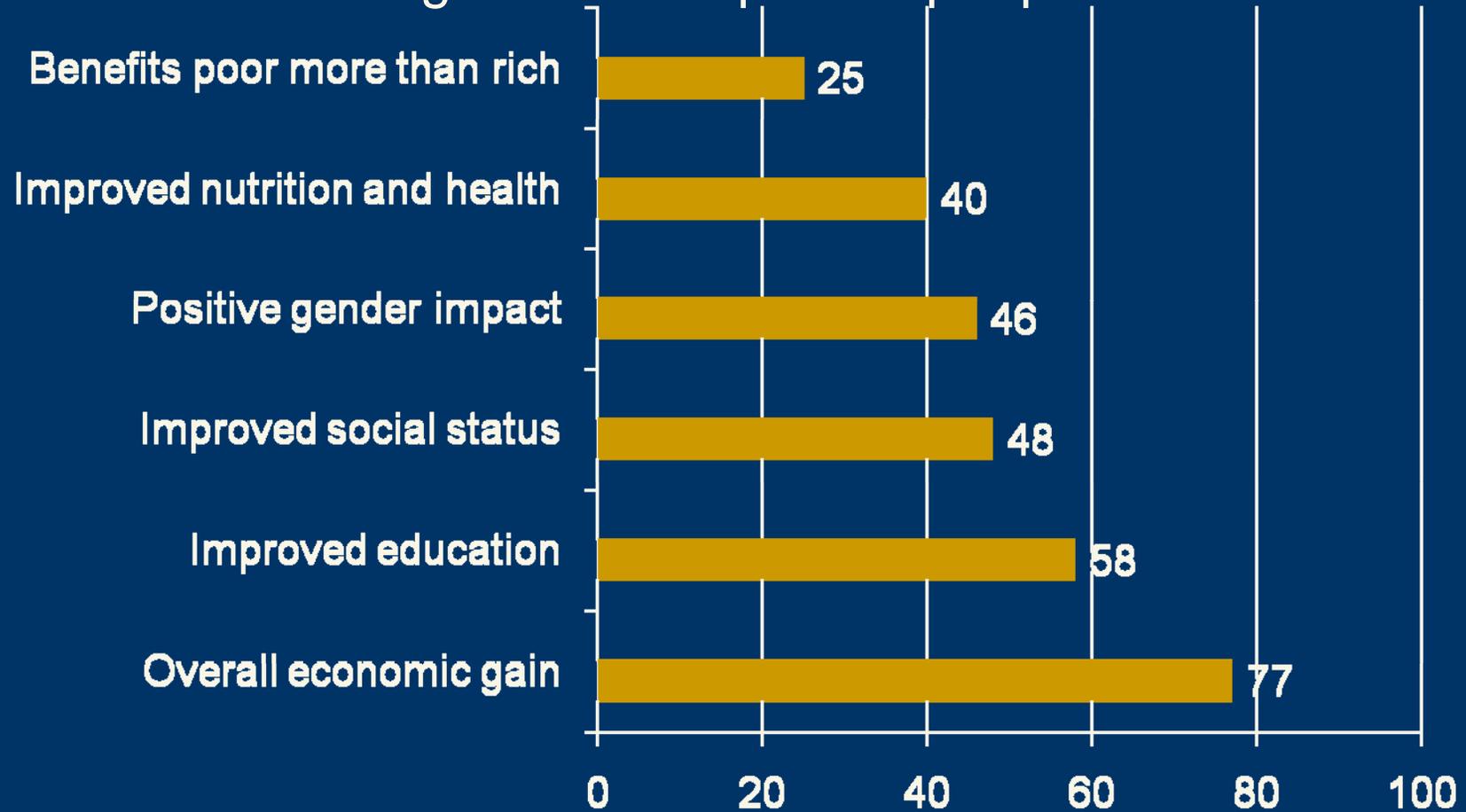
Many of the changes over the last 10 years are quite visible. Understanding these is the challenge!



Overall, many households have moved out of poverty

Poverty head count and transitions	Agricultural technology (1996-2006)
Poverty headcount	
Poverty in baseline survey	70%
Poverty in 2006/2007	18%
Poverty transitions	
Chronic poor	16%
Falling into poverty	2%
Moving out of poverty	54%
Never poor	28%

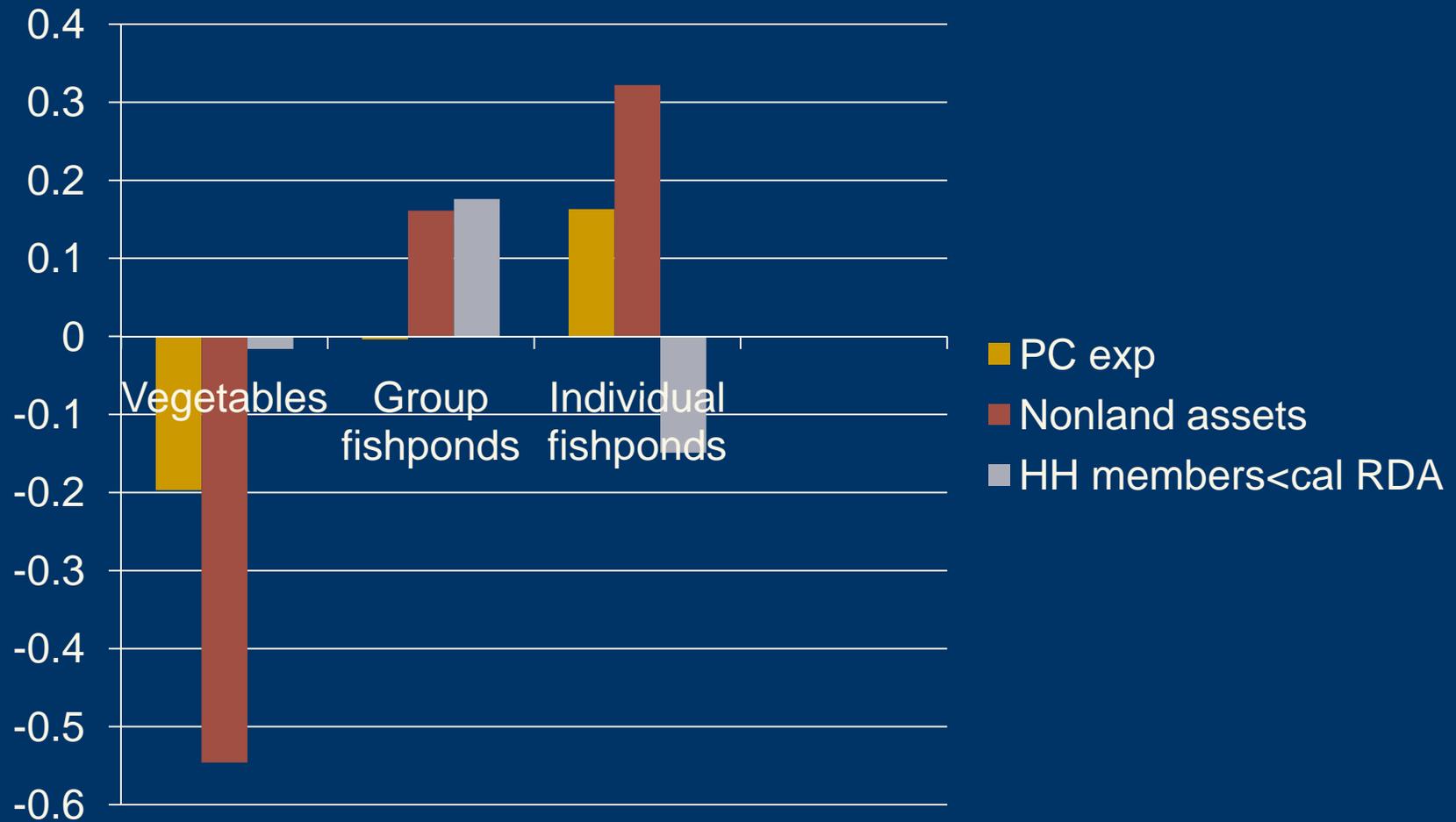
Focus group discussions show that agricultural technologies have improved people's lives



Impact estimates



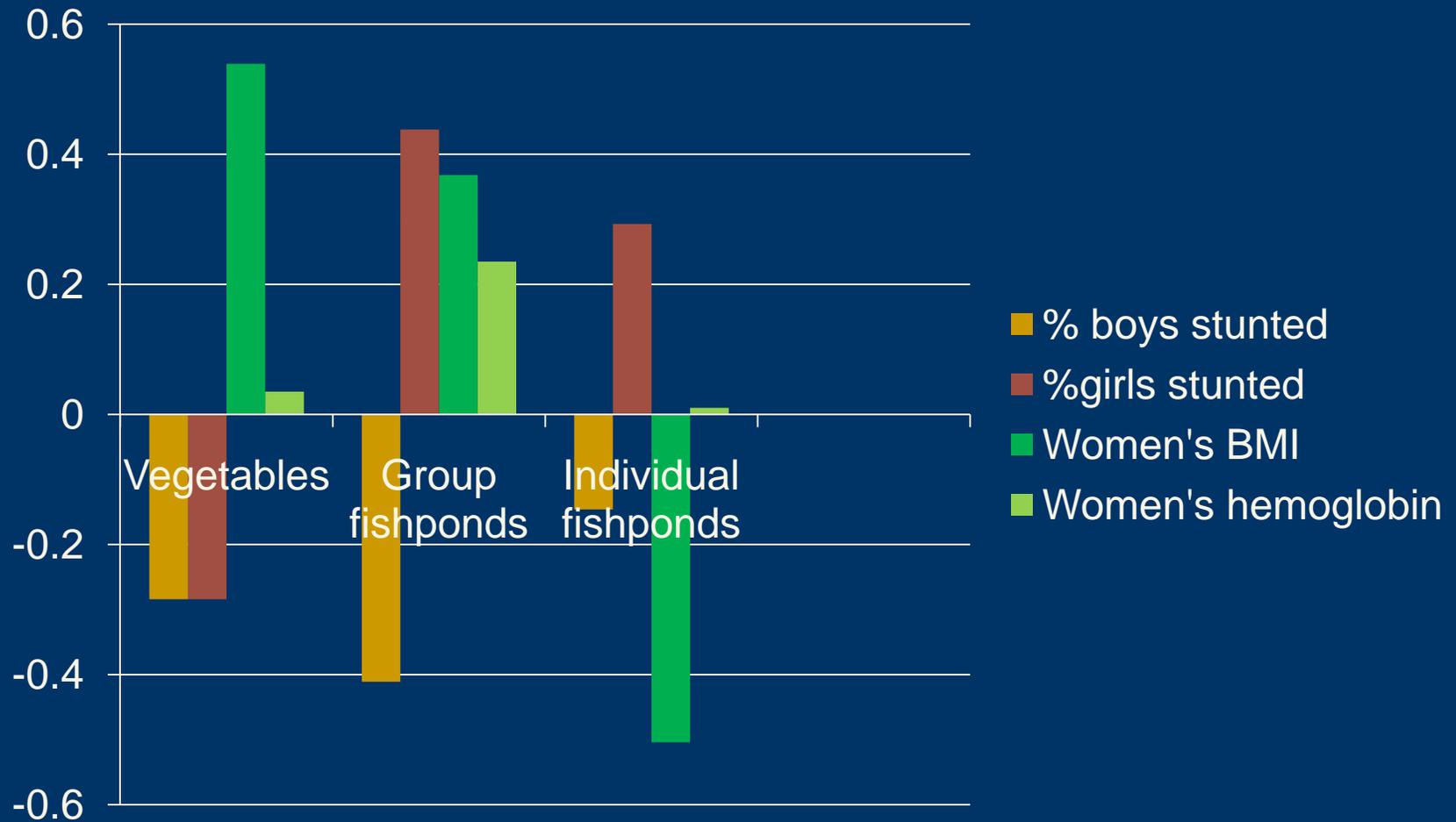
Household level impacts (difference-in-difference in % change)



Summary of long-term impact at the household level from matching exercises

- Biggest gains to early adoption are in the individual fishpond sites, significant positive impacts on hh-level consumption, assets, calorie availability. Quasi-rents maintained.
- Short-term positive impact of early adoption in vegetables site dissipated in long run; technology is divisible and easy to adopt. Quasi-rents dissipated
- Short-term positive impact of group fishponds also dissipated over long run; income gains have to be shared by many families
- Note that absence of impact or negative impact does not mean that early adopters lost, but rather that the **later adopters did better**

Impacts on nutritional status (difference-in-difference in % change)



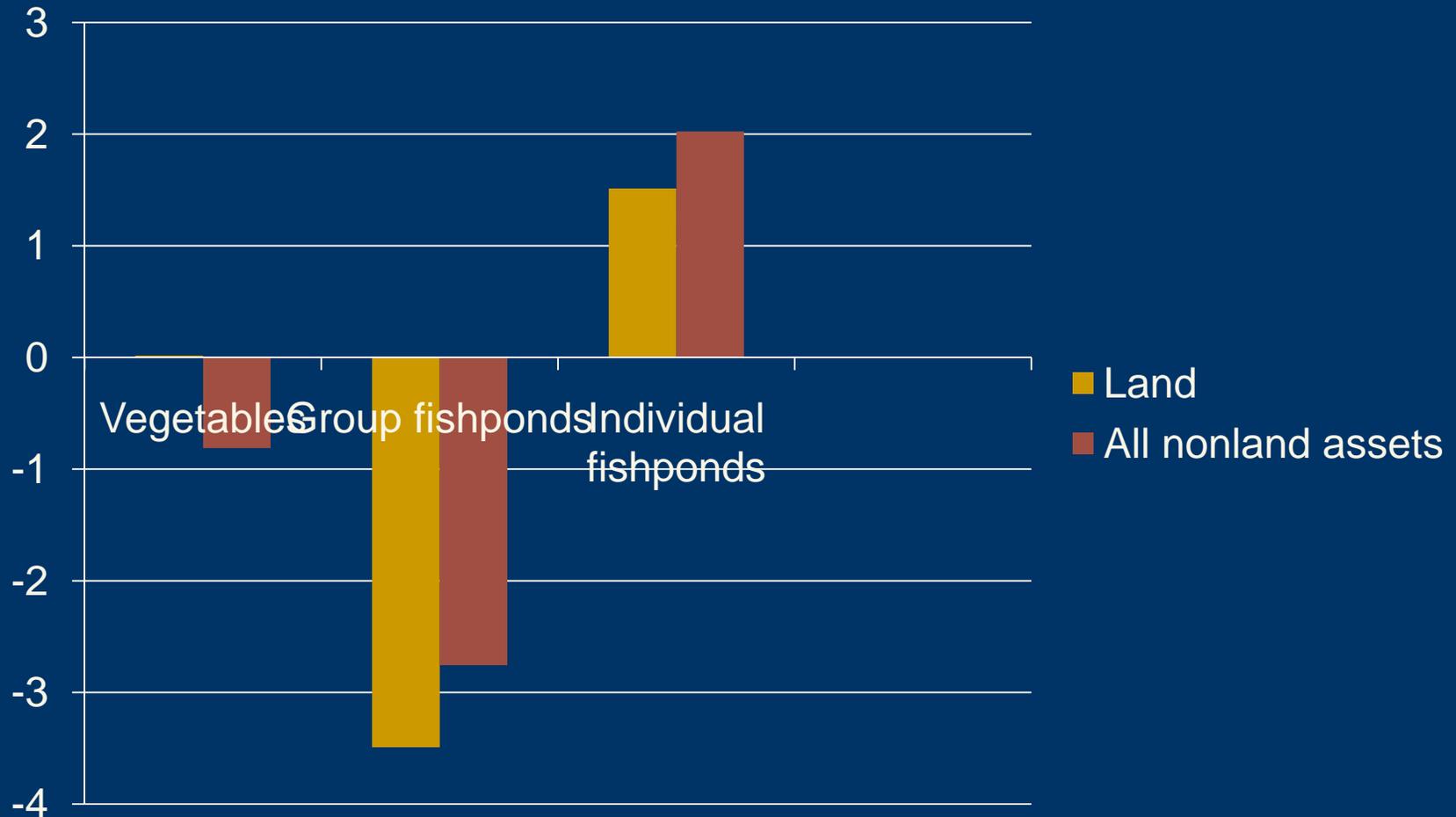
Summary of impacts at the individual level: Nutrient intake and nutritional status

- In **individual fishpond** sites, stunting rates for girls increased more for early adopters
- In **group fishpond** sites, stunting rates for girls increased more for early adopters
- In the **homestead vegetables** sites, despite small income gains, **stunting rates of girls decreased, women's BMI increased**
- Stunting rates for boys decreased in all sites, though not statistically significant
- **Did emphasis on vegetables (iron- and vitamin-A rich food) and targeting to women improve nutrition (particularly of girls) even if income gains were small in the vegetables sites?**

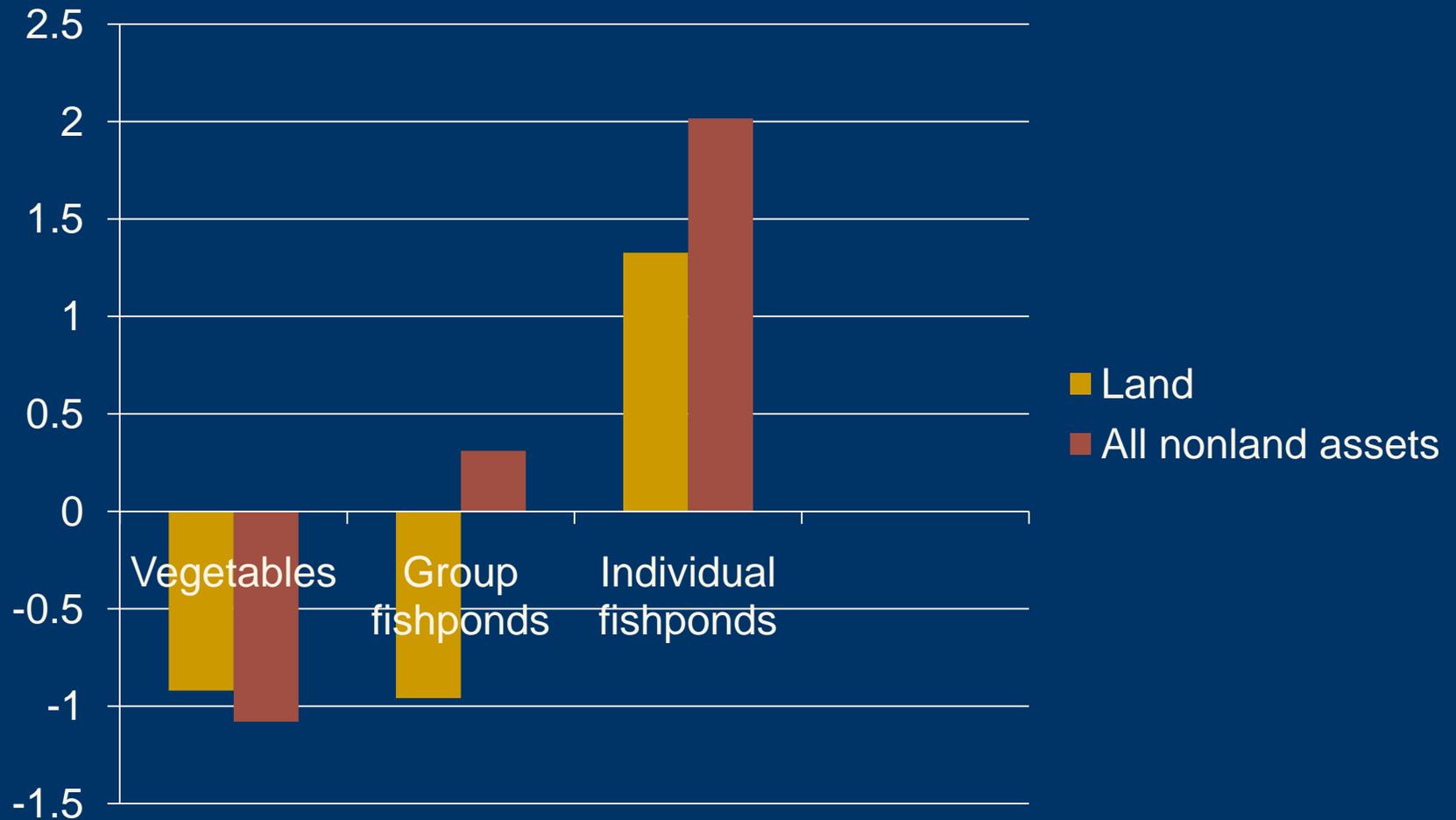
Impact of agricultural technology on men's and women's assets

- How have the agricultural technology programs contributed to: (1) asset growth of men and women; (2) reduction of the gender asset gap?
- Again, use **matching methods** to examine impact of the agricultural technology program over time on men's and women's assets on average, and men's and women's assets within the same household.
- Two comparisons:
 1. Early adopters vs. late adopters
 2. NGO members vs. non-NGO members
- We look at changes in husband's assets relative to changes in wife's assets **within the same household**, focusing on exclusively owned assets

Impact of early adoption on differential growth of husband's vs. wife's assets (H-W, difference in difference)



Impact of NGO or program membership on differential growth of husband's vs. wife's assets (H-W, difference-in-difference)



Several factors affect long-term impact of agricultural technologies

- Differences in dissemination and targeting mechanisms may affect what kinds of households—and individuals within households—adopt and benefit from technologies
- **Type of technology**: degree to which technology is divisible and easily disseminated
- **Implementation modalities**: women's assets , nutritional status improved more by programs that targeted technologies through women's groups
- **Intrahousehold allocation process**: who within the household benefits from the technologies
- **This reinforces the need to look within the household when evaluating impacts of programs and policies**

Looking within the household

- It is possible that interventions that yield high household-level gains do not necessarily improve intrahousehold or gender impacts (or, conversely, interventions that yield good nutritional/gender outcomes may not necessarily increase incomes the most)
- There may be tradeoffs among development objectives
- What is the metric by which interventions are going to be judged? Cost-effectiveness?

Figure 2: Impact on monetary measures of well-being per dollar spent

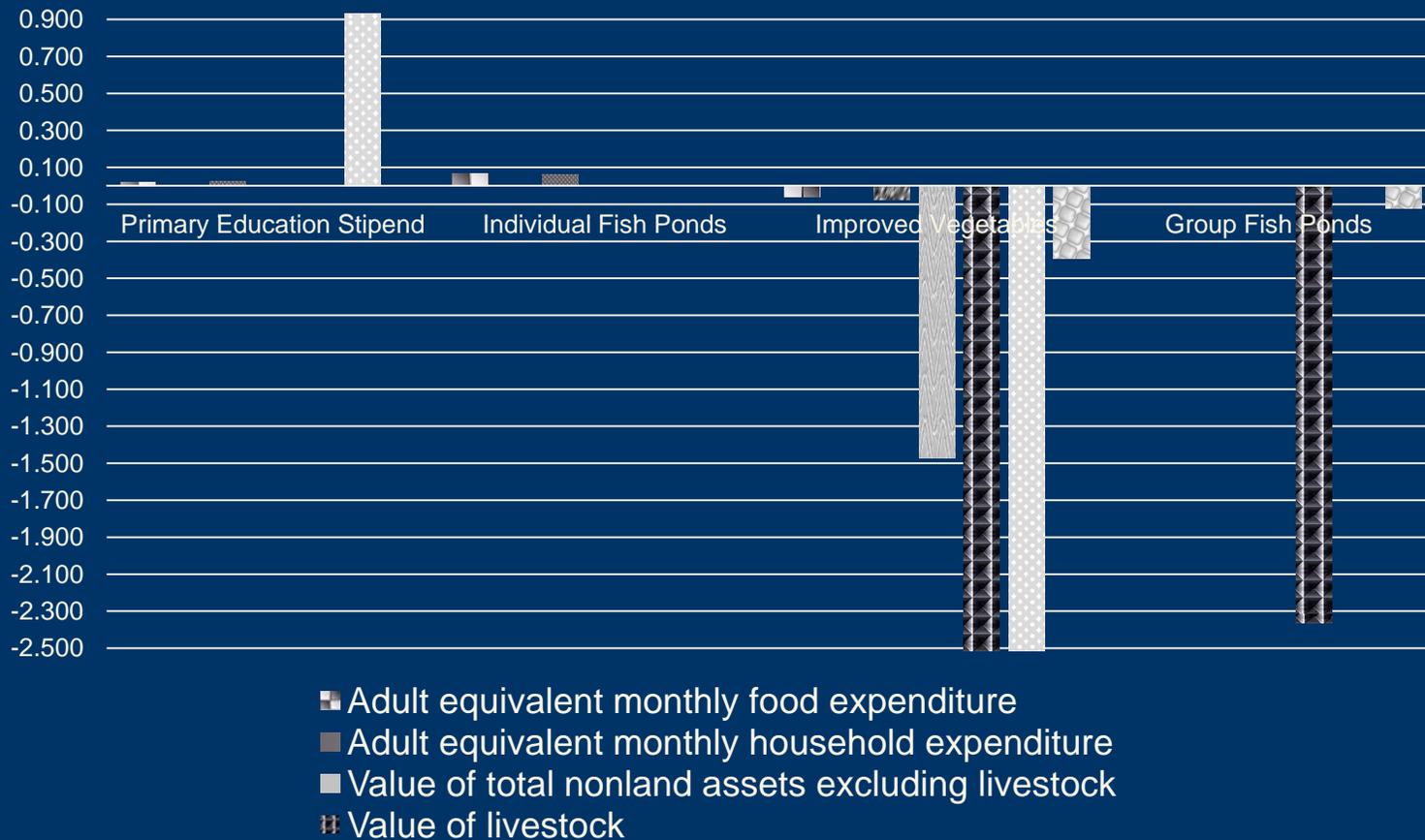
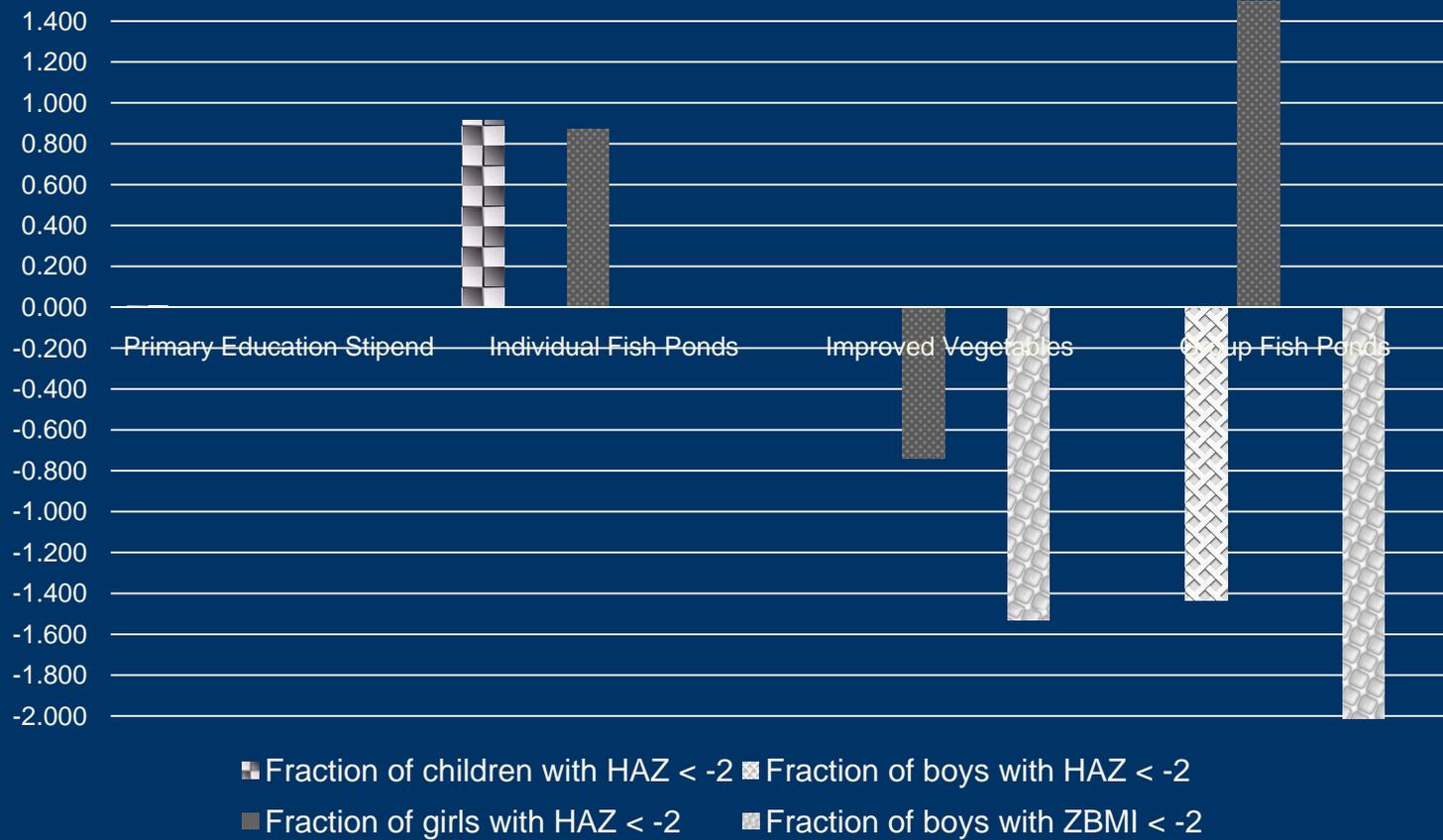


Figure 3: Impact on Anthropometric measures per Dollar Spent

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A cautionary note--1

- Results of comparing impacts on monetary versus non-monetary measures of well-being are mixed—can we really use cost-effectiveness to rank anti-poverty interventions?
- Some interventions (such as the Primary Education Stipend and individual fish ponds) do well in terms of increasing per capita expenditures or assets, but do poorly in terms of improving nutritional status=> tradeoffs between hh and individual objectives?
- Addressing gender issues makes these tradeoffs more explicit and visible

A cautionary note--2

- Anti-poverty programs have a range of objectives, and spill-over effects are present; difficult to adopt a single measure of impact because poverty and well-being are multidimensional
- Assessing the long-term impact and cost-effectiveness of development interventions will involve trade-offs between objectives
- This may result in some “creative tension” in development agencies

Additional slides

Long-term impacts on household level outcomes

	Improved vegetables	Group fishponds	Individual fishponds
Household expenditures (pc and per ae)	Decrease: food expenditures	No significant impact	Increase: food expenditures
Household land and assets	Decrease: land value	Increase: value of trees Decrease: value of livestock	Increase: value of nonagricultural durables, cultivable land, total land, livestock
Household incomes	No significant impact	Increase: share of fish income	Increase: per capita hh income, per capita fish pond income

Long-term impacts on hh calorie availability

	Improved vegetables	Group fishponds	Individual fishponds
Household calorie availability	Decrease: per capita calorie availability	No significant impact	Increase: per capita and per adult equivalent calorie availability

Long-term impacts on nutrient intake

	Improved vegetables	Group fishponds	Individual fishponds
Individual nutrient intake, men	Increase: vit A, iron	Decrease: protein	Increase: protein, vit A, iron
Individual nutrient intake, women	Increase: vit A Decrease: calorie	n.s.	Increase: calorie, protein, vit A
Percentage below RDA, hh members	Decrease: % < RDA vit A, iron	Increase: % < RDA calorie, protein	Decrease: % < RDA calorie, protein
Percentage below RDA, women	Decrease: % < RDA vit A		Decrease: % < RDA calorie, protein

Long-term impacts on individual nutritional

	Improved vegetables	Group fishponds	Individual fishponds
HAZ score (children age 10-18)	n.s.	Increase	Increase
Stunting (children age 10-18)	Decrease (girls)	Decrease	
ZBMI (children age 10-18)	Decrease	Decrease	Decrease
%ZBMI<-2	Decrease (boys)	Increase	
BMI (men)	n.s.	n.s.	n.s.
BMI (women)	Increase	n.s.	Decrease
Hemoglobin (women)	Increase	n.s.	n.s.