

Impacts of an irrigation investment in the Philippines: Effect modifiers and social impacts



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Investing in rural people

Motivation: Irrigation – Ag. growth Literature

- Increases cropping intensity & yields
- Increases demand for labor
- Decreases seasonality
 - in agricultural production
 - hence food availability

(Knox et al., 2011; Pinstруп-Andersen and Shimokawa, 2008; IOB 2011)
- Catalyst for Ag R&D: uptake and impact of improved seeds, other inputs and practices increase with irrigation (Evenson and Gollin 2003, Hazell 2009).



Investing in rural people

→ Lack of understanding of “Effect modifiers”

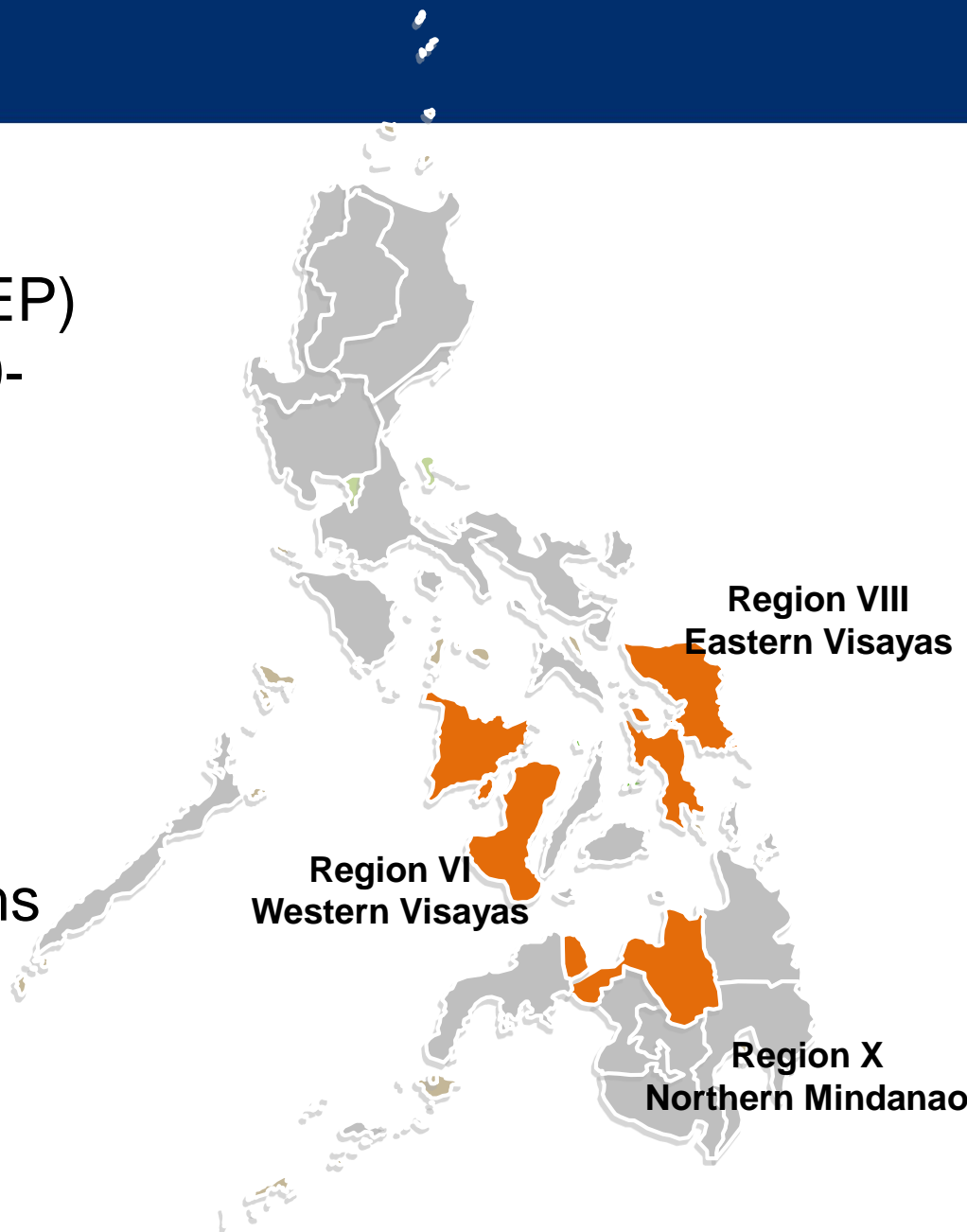
Motivation: Cash Transfer/Ag program Lit.

- From protection to production → Cash transfers improve productive outcomes
 - Davis et al (2016)
- Production for Protection? → Productive investments improve social outcomes?
 - Salazar et al (2016)
 - Gitter et al (2017)

→ Lack of rigorous evidence on social/food security impacts of ag programs

Philippines: IRPEP

- Irrigated Rice Production Enhancement Project (IRPEP) implemented between 2010-2015 with budget of \$22 million
- Implemented in Regions VI, VIII, and X
- ~13,000 farm families in community irrigation systems covering ~9,000 hectares
- Typhoon Haiyan in 2013 (region VIII)



INPUTS AND ACTIVITIES

OUTPUTS

OUTCOMES

IMPACTS

Rehabilitation of CIS

Investment in canal infrastructure – improved water delivery and expansion of area



Strengthening of Irrigation Association

- Strengthening of IA rules
- Training of IA leadership
- Inclusion of women



Farmer capacity building

- Training on water and crop management
- Improvement of post-harvest management



- CIS area expanded and timely water delivery to farmers improved
- Irrigation associations are established and functioning with greater membership including women
- Farmers trained on water management and in new rice production technologies and techniques
- Farmers provided with information and skills on post harvest management
- Solar dryers, storage warehouses and other post-harvest facilities are established



Household Level

- Increased input use
- Two season planting and harvesting
- Increased rice productivity
- Increased rice market participation
- Increased rice profitability



IA Level

- Increased membership and participation
- Sustained management structure
- Collection and adequate management of water user fees
- Increased involvement of women in IAs



Household Level

- Increased income
- Increased food security/nutrition
- Increased resilience
- Empowerment of women
- Increased schooling



IA Level

- Ability to mobilise IA owned implements
- Ability to mobilise additional resources
- Ability to expand activities

Hypotheses to be tested

- IRPEP increases water access
- IRPEP increases rice production
- IRPEP increases income and assets
- IRPEP increases nutrition and schooling
- **Sub-hypotheses:** How do impacts vary across regions, household location along the canal and extreme weather exposure?

Identification strategy

- Ex post impact evaluation: Data and methods
- Statistical matching and key informant interviews to select treatment and control communities
- Project selection criteria:
 - Baseline annual paddy productivity below 3.78MT/ha
 - Average landholding size of below 0.76ha
 - Supply of water through CIS is low and/or inadequate
 - High poverty incidence
 - Irrigation potential of CIS
 - Feasibility of implementing agency to provide support
 - Willingness and capacity of LGU to provide timely counterpart funding

Data collection

- Household survey – sample 2,104 households
 - Agricultural household questionnaire with social indicators
- Irrigators' Association (IA) survey – 113 IAs
- Focus Group Discussions – 12 w. IA officers, 3 w. project staff
- Key Informant Interviews – 6 w. regional and provincial project staff
- Regional coverage of household and IA surveys:

		Region VI	Region VIII	Region X
Household survey	Treatment	360	361	301
	Control	361	359	362
IA survey	Treatment	21	20	17
	Control	18	20	15

Household characteristics

Socio-Economic characteristics	Whole sample	Treatment only	Control only
Ave. age in household	39.52	39.42	39.67
Ave. years of education in household	7.93	7.87	7.99
Age of head	57.02	57.16	56.81
Nr years of education of head	8.05	7.93	8.23
Female hh head (%)	12.84	12.24	13.73
Household size	4.28	4.34	4.20
Nr adults	3.00	3.06	2.91
Nr economically active hh mem. in 2010	1.49	1.54	1.43

Assets	Whole sample	Treatment only	Control only
Asset index score in 2010	2.99	2.98	3.01
Nr rooms in house in 2010	2.16	2.12	2.21
Tropical Livestock Units score in 2010	1.78	2.01	1.55

Methods

- Inverse Probability Weighted Regression Adjustment

$$IPW_i = T_i + \frac{P_i (1 - T_i)}{1 - P_i}$$

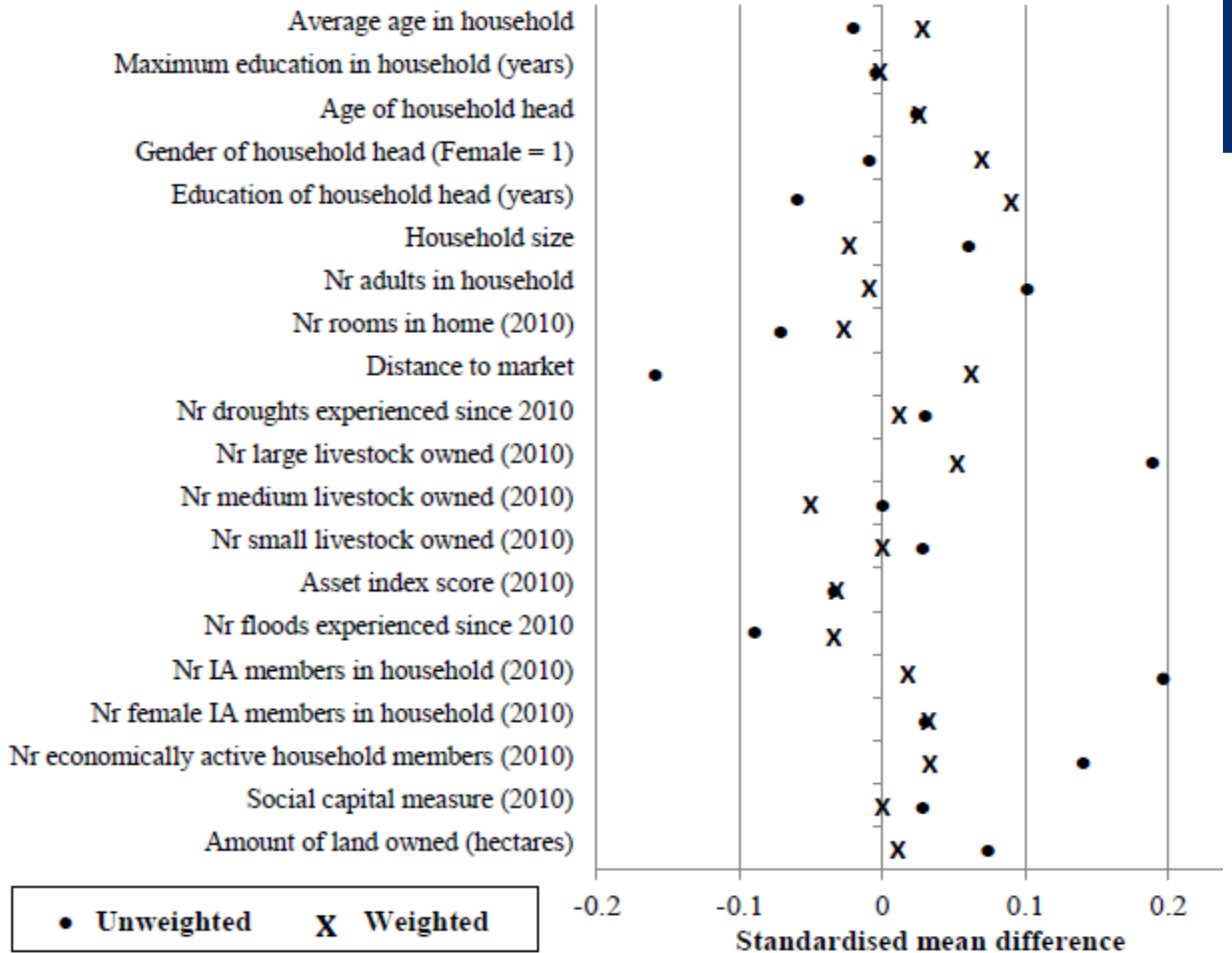
$$Y_i = \beta_0 + \beta_1 T_i + \Sigma X_{ij} \beta_{2j} + e_i; \text{ weight} = IPW_i$$

$Y_i = \text{indicator}$

$T_i = \text{treatment status}$

$P_i = \text{propensity score}$

$X_{ij} = \text{vector of controls}$



Results- Hypothesis 1: Irrigation water

Irrigation water supply	All	Reg. VI	Reg. VIII	Reg. X
Nr times irrigated per parcel	5.67***	5.82***	4.17***	6.75
Parcels with sufficient irrigation in both wet and dry season (%)	19.79***	27.50***	12.37	22.20***
Nr. Hectares covered by irrigation	0.49***	0.17**	0.47***	0.90***
Exp't on irrigation pha (%)	204***	315***	297***	-33***

Results - Hypothesis 2: Production

Rice productivity	All	Reg. VI	Reg. VIII	Reg. X
Harvest pha (%)	4.49	13.31***	-7.88***	8.08***
Gross margin pha (%)	5.33***	-4.05	0.30	13.13***
Revenue from crop sale pha(%)	36.11	-5.90	-37.20	127.5***

Results - Hypothesis 3: Income and assets

Income and assets	All	Reg. VI	Reg. VIII	Reg. X
Total income per capita (%)	10.77*	18.23***	-9.06	0.72***
Asset index score (0-10)	-0.02	-0.14***	-0.25	0.10
Tropical Livestock Units (TLU)	0.22	1.14***	0.15**	0.30***

Results: Effect modifiers

IRPEP impact by parcel location

	Nr seasons with sufficient irrigation supply	Harvest/ha.	Rice sale revenue/ha.
Up/midstream	0.19***	2.45%***	92.01%***
Downstream	0.45**	10.26%***	18.56%

IRPEP impact by extreme weather exposure

At least one event	0.46**	-1.03%	13.36%
No events	0.59***	17.37%***	123.18%***

Results - Hypothesis 4: Nutrition and education

Wealth and Wellbeing	All	Reg. VI	Reg. VIII	Reg. X
Dietary Diversity Score	0.38**	0.28**	-0.07	0.04
Consumed egg in past 24 hours (dummy)	8.25***	6.80***	9.48***	4.05
Consumed meat in past 24 hours (dummy)	8.13***	0.12	7.33	-0.05***
Education expenditure per child	-2.04%	74.35%	22.69%	4.80%

Discussion

- IRPEP achieved increased water access
- Mixed results on rice production increases - at least partly due to typhoon
- Qualitative work showed issues with market access for production limiting sales and thus revenue
- Downstream parcels & those that have not been hit by extreme weather events benefited more
- Some impacts on income and livestock assets
- Social outcomes have some impacts
- Need to reassess results and analysis to understand inconsistencies and how much is linked to approach