Intra-Household RCT Impact Design, Analytical Approaches and Gendered Impacts.

Based on IFPRI-BMZ Video Based Extension Project:

Presented to Uganda Association of Agricultural Economics Society. Kampala, Uganda. 24 April 2023

Edward Kato
Environment and Production Technology Division

International Food Policy Research Institute

Moderator: Nabumba Rosetti, Uganda Ministry of Finance.

Are you really measuring Project impacts ?

- Impact assessment

- Performance assessment

- Attribution versus Contribution

IFPRI

Have you identified all outcomes to evaluate ?

- Extract outcomes from the project **Theory of Change**.

- Extract outcomes from Project **Results Framework**

- Extract outcomes from Project **Development Objectives (PDOs**)

- **Seek clarity on the outcomes** from project management team , Monitoring and Evaluation staff, donor

IFPRI

Next Slides are Drawn from Experiences and Evidence from an IFPRI-BMZ Project In Uganda 2019-2023.

- Features of the Uganda IFPRI-BMZ Project 2019-2023:

- The project implemented an RCT experiment on video extension approach in central Uganda in six districts in conjunction with Ministry of Agriculture.

- The Intervention showed videos on climate smart practices to both men and women in randomly selected treated villages.

- The project goal was to test if using videos has the potential to significantly reduce the awareness gaps on climate smart practices , adoption gaps, and crop yields gaps between men and women.

IFPRI

Classify the Outcomes to Evaluate?

Do you have the time and budget to examine all identified outcomes

- **Direct outcomes :**   Project directly impacted outcomes: **Example: Extension Videos influencing outcomes: Awareness, Adoption, Knowledge , Crop Yields**

  Indirect outcomes: Project indirectly impacted outcomes: **Example   Women Empowerment, Resilience**

- **First order outcomes : Example** Awareness, Adoption, Crop Yields , Knowledge food security, livestock productivity,, WASH outcomes.

  Second order outcomes : Example: Women Empowerment, Resilience, Poverty, inequality, resilience, environmental outcomes, employment, Prices, wages

- **First generation outcomes   Example :** Awareness, Adoption, Crop Yields, Knowledge

  Second generation outcomes Example: Women empowerment, Resilience.

At What Unit are you Assessing Impacts ?

Micro level:

   Individual level impacts (e.g gender disaggregated impacts for men , women) , Household level impacts**,** Group level impacts

Meso level:

   Village level impacts , county level impacts, district level impacts: Local Economy Wide Impact Evaluation (LEWIE model)

Macro level:

   National level impacts : CGE models, Input-Output models, Multi-Market models :

Extent-Scope of the Impacts

- **Partial Equilibrium Impacts**:

    Evaluating impacts on the beneficiaries (treated group).

    e.g Assessing Impacts on women and men who participated in watching extension Videos on awareness and adoption climate smart practices.

- **General Equilibrium Impacts**:

    Examining impacts beyond the beneficiaries.

Let us Now focus on studies on Micro Level Impacts

(Partial Equilibrium Impacts)

- **Reason:** Most impact evaluations in agriculture are Micro based.

What Impact Evaluation Design Do You Intend to Use?

- Non-Counterfactual Framework

  without a control group

- Counterfactual Framework

  with a control group

  e.g A combination of men and women who watched and those that did not watch videos on climate smart practices in Central Uganda

What Impact Evaluation Design Do You Intend To Use?

▪ Counterfactual Framework:

Quasi-Experimental Design :

Selection bias is an issue

Use Matching methods to minimize selection bias. Propensity Score matching, Covariate matching Coersened Exact matching

Experimental Design :

Gold standard. But not practical all the time.

No selection bias, No matching

example: **You fully randomize allocation of locations and households into those that view the videos and those that do not view the videos on climate smart practices**.

▪ Non-Counterfactual Framework :

Non-Experimental Design

Has selection Biases.

IFPRI

Sources of Bias in Quasi-Experimental Evaluations

- **Selection bias**
  - self-selection of beneficiaries
  - selection bias imposed by Researcher
  - selection bias imposed by Project Design

- **Spillovers** (**Contamination**)
  - Strong spillovers
  - Weak spillovers

- **Confounding factors (Confounders)**
  - Measured confounders
  - Unmeasured confounders

Types of Treatments :

- Non-Factorial treatment
- Factorial treatment

- **Staggered treatment**

    All treated men and women did not watch Climate smart practices videos in the same year. It was an annual rolled out treatment

- **Unstaggered treatment**

    All treated men and women watched climate smart practices videos in the same year. The treatment was not annually rolled out.

IFPRI

What type of Survey Do You Intend to Conduct?

- Intra-Household Survey

  This is what was used in the BMZ Video Extension Project. The treatment was to both a man and woman in the selected treatment household. Gender disaggregated data was collected.

- Inter-Household Survey

IFPRI

What Selection Criteria Will You Use?

- Probability Sampling

- Non-Probability Sampling

IFPRI

Identification Approach (Estimation of Impacts)

(A) Homogenous Impacts:

- **Without Baseline data**

   Then estimate **Single difference**

- **With Baseline data and Endline data:**

   Then estimate **Difference-in-Differences (Double Difference) .**

(B) Heterogeneous Impacts:

Then estimate Difference-in-Difference-In-Differences (Triple Difference)

IFPRI

Reporting Impact Estimates

- Report : **Single Difference estimates (SD)**

    $\text{SD} = Y^{endline}(\text{treatment}) - Y^{endline}(\text{control})$

- Report : **Difference-in-Differences estimates (DID)**

    Staggered   DID

    Unstaggered   DID   (Canonical DID)

    Synthetic   DID

$\text{DID} = (Y^{endline}(\text{treatment}) - Y^{baseline}(\text{treatment})) - (Y^{endline}(\text{control}) - Y^{baseline}(\text{control}))$

DID= Outcome change (Treatment) - Outcome change (Control)

How did you organize Your Baseline data and Endline data?

Data Format used by Researchers determines estimation approach

- **Survey data in Wide Format**

  Non-Regression adjusted Difference-in-Differences

  $$Y^{endline} - Y^{baseline} = \pi0 + \pi1\ Treatment + error$$

  Regression adjusted Difference-in-Differences

  $$Y^{endline} - Y^{baseline} = \pi0 + \pi1\ Treatment + \pi2\ baseline\ controls + error$$

- **Survey data in Long Format**

  Non-Regression adjusted Difference-in-Differences

  $$Y = \pi0 + \pi1 Treatment + \pi2\ Post + \pi3 Treatment * Post + error$$

  Regression adjusted Difference-in-Differences

  $$Y = \pi0 + \pi1 Treatment + \pi2\ Post + \pi3 Treatment * Post + \pi2\ controls + error$$

IFPRI

Difference-in-Differences   Video Impacts on On Climate smart pig management knowledge Uganda :   (RCT Experimental Design Approach)

Single Difference and difference-In-Differences show strong robust impacts on Knowledge

Knowledge Questions % who correctly answered the question:	Impacts on Women				Impacts on Men			
	Single difference estimates (Non-Regression adjusted)	Single difference estimates (Regression Adjusted)	Single-difference estimates (Regression adjusted-ANCOVA)	Difference-in-Difference estimates	Single difference estimates (Non-Regression adjusted)	Single difference estimates (Regression Adjusted-Non ANCOVA)	Single difference estimates (Regression adjusted-ANCOVA)	Difference-in-difference estimates
Should pigs be in a fenced area separated from the homestead and field?	0.7%	-0.6%	-0.7%	-0.7%	1.1%	-0.6%	0.5%	0.5%
Should pig manure be stored openly?	0.6%	-1.6%	-1.5%	-1.5%	-1.2%	-1.2%	-1.6%	-1.6%
Can pig manure replace chemical fertilizers of crops?	1.0%	-0.2%	-0.8%	-0.8%	8.4%*	8.9%	9.1%*	9.1%*
Does pig manure have fewer nutrients than cattle manure?	-0.3%	-0.8%	-0.7%	-0.7%	3.5%	3.6%	3.6%	3.6%
Can pigs provide additional income when crops fail?	-5.1%	-5.9%	-7%	-7%	3.3%	3.5%	2.6%	2.6%
Can poor management of manure contribute to climate change?	16.3%***	15.9%***	15.8%***	15.8%***	19.3%***	18.7%***	18.6%***	18.6%***

Difference-in-Differences and Single Difference estimates show very robust impacts .
Impacts of Videos on Knowledge changes on Climate Smart Poultry Management:
- Climate change knowledge significantly improved by 10% for women and 12% for men
- Videos have potential to increase women knowledge and to reduce gender knowledge gaps

Knowledge Questions: % who correctly answered the question:	Impacts on Women				Impacts on Men			
	Single difference estimates (Non-Regression adjusted)	Single difference estimates (Regression adjusted-Non ANCOVA)	Single difference estimates (Regression adjusted-ANCOVA)	Difference-in-Difference estimates	Single difference estimates (Non-Regression adjusted)	Single difference estimates (Regression adjusted-Non ANCOVA)	Single difference estimates (Regression adjusted-ANCOVA)	Difference-in-Difference estimates
1-Is it okay for poultry to run around the house to look for feed ?	0.7%	5.7%	5.7%	5.7%	3.4%	2.1%	1.9%	1.9%
2-Does poultry manure generate greenhouse gases if not well managed?	5.1%	7.0%	6.5%	6.5%	6.9%	6.2%	6.1%	6.1%
3-Does poultry manure generally have more nutrients than pig manure?	-0.5%	-1.4%	1.4%	1.4%	-1.3%	-1.4%	-1.4%	-1.4%
4-Can poultry generate income to balance potential crop losses due to drought	0.5%	-1.6%	1.9%	1.9%	3.9%	4.3%	4.8%	4.8%
5-Can Poor management of manure contribute to climate change ?	9.5%*	10.4%*	10.3%*	10.3%*	13.5%***	12.6%**	12.4%**	12.4%**
6-Should poultry manure be stored in a pit or covered?	5.8%	3.5%	3.6%	3.6%	-0.4%	-1.1%	-1.2%	-1.2%

IFPRI

Impact of Videos on knowledge changes: IPM

Videos significantly improved women IPM knowledge by 4% but had no significant impact on men .

	Impacts on Women				Impacts on Men			
	Single difference estimates (Non-Regression adjusted)	Single difference estimates (Regression adjusted-Non ANCOVA)	Single-difference estimates (Regression adjusted-ANCOVA)	Difference-in-difference estimates	Single difference estimates (Non-Regression adjusted)	Single difference estimates (Regression adjusted-Non ANCOVA)	Single difference estimates (Regression adjusted-ANCOVA)	Difference-in- difference estimates
% who correctly answered the question:								
Can pests and diseases be managed without using chemicals?	6.5%	7.6%	7.4%	7.4%	2.9%	1.8%	1.9%	1.9%
Does integrated pest management include minimum tillage as apractice?	4.6%	1.6%	1.6%	1.6%	-2.8%	-2.7%	-2.8%	-2.8%
Does integrated pest management include rotating crops as apractice?	5.4%	7.2%	7.1%	7.1%	9.1%*	9.0%*	8.8%*	8.8%*
Does integrated pest management include applying biologicalcontrols, such as natural habitat for natural predators of pests?	6.5%	6.4%	6.5%	6.5%	4.6%	5.1%	4.9%	4.9%
Can integrated pest management increase the cost of purchasingchemical pesticides?	-1.5%	-5.9%	-6.0%	-6.0%	-0.3%	-0.1%	-0.04%	-0.04%
Can chemical pesticides affect human health and the environment	4.2%***	3.8%**	3.9%**	3.9%**	-4.3%	-4.2%	-4.2%	-4.2%

Conclusion

- The presentation has been showcasing Participants in academia, research, NGOs, Government economists, Graduate student on the best practices and principles in Impact evaluation of agricultural interventions.

- The presentation has shared evidence and experiences from a BMZ Project in Uganda that implemented a Video Extension RCT design to boost women uptake of climate smart practices

- Overwhelmingly participants requested for another longer opportunity to practically empower them on executing an analysis similar to the Uganda BMZ project impact analysis