Effectiveness of one REDD+ project in the Brazilian Amazon

Simonet (INRA-CIFOR), Subervie (INRA), Ezzine-de-Blas (CIRAD), Cromberg (CIFOR), Duchelle (CIFOR)

CIFOR 2018 Annual Meeting – Bogor, Indonesia
'Impact evaluation and its sisters' session

1

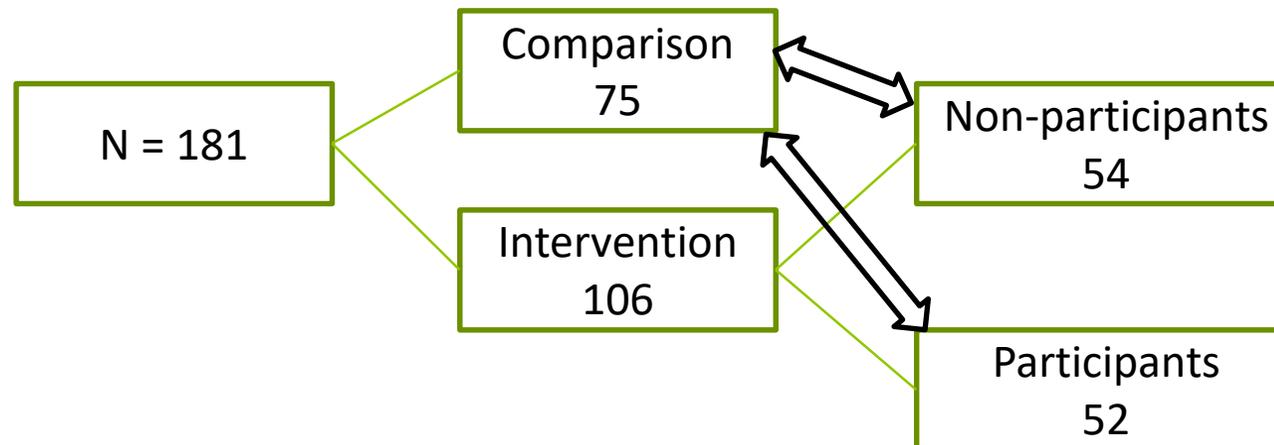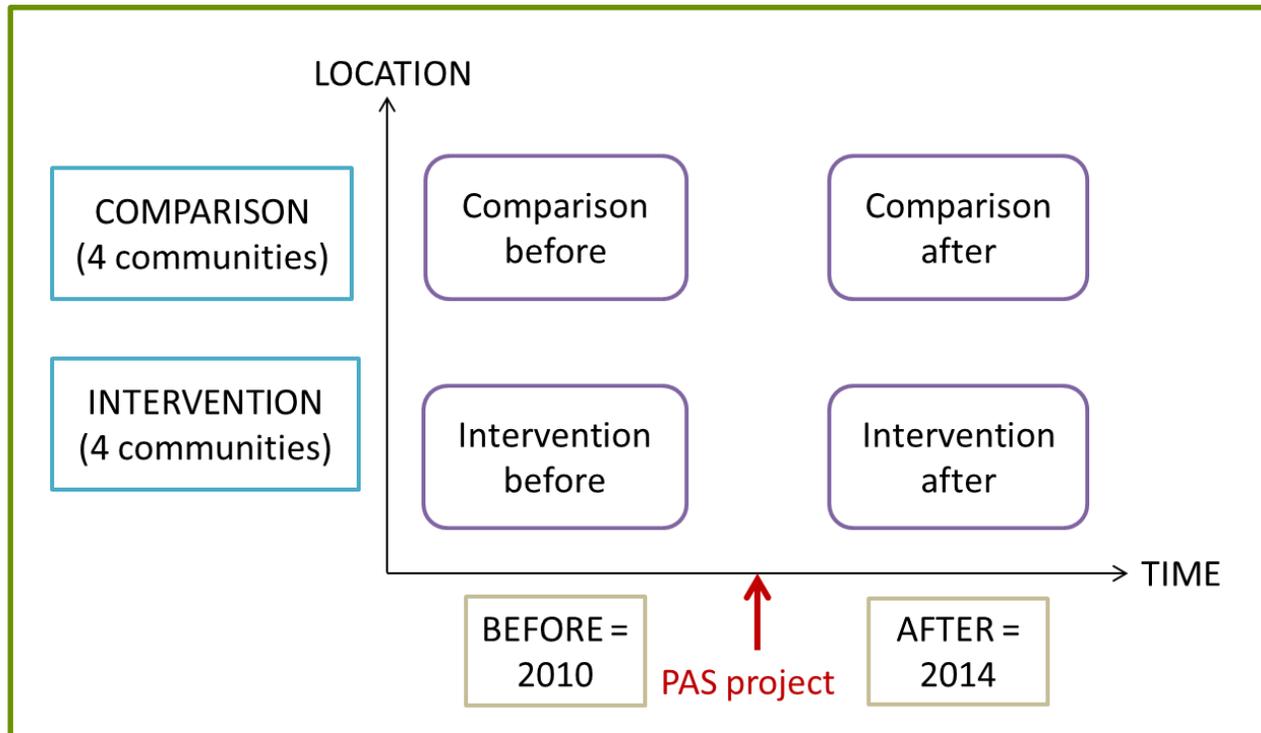# The REDD+ pilot project *Projeto Assentamentos Sustentáveis* (PAS)

- **Brazil,** Pará, Transamazon highway.
- Target = **smallholders** - swidden agriculture and extensive cattle ranching.
- **Refashioning** of old conservation activities (IPAM, Proambiente).
- Amazon Fund 2012-2017.
- Objective: Support ecological intensification of agricultural systems for rural smallholders + comply with Forest Code.

Mix of interventions:

- Enabling measures (administrative support + sensitization and information meetings).
- Conditional incentives (cash payments, conditional on conserving forests and on adopting alternative practices).
- Disincentives (Forest Code, CAR).

BACI sampling

LOCATION

| COMPARISON (4 communities) | | Comparison before | Comparison after |
| INTERVENTION (4 communities) | | Intervention before | Intervention after |

TIME

BEFORE = 2010   PAS project   AFTER = 2014

N = 181

Comparison 75

Intervention 106

Non-participants 54

Participants 52

Identification strategy

- Project's impact on the forest cover answers the following question:

What is the land area covered by forest in participating farms, in 2014, compared to what we would have observed in these farms, had they not been involved in the project?

Average Treatment on the Treated :

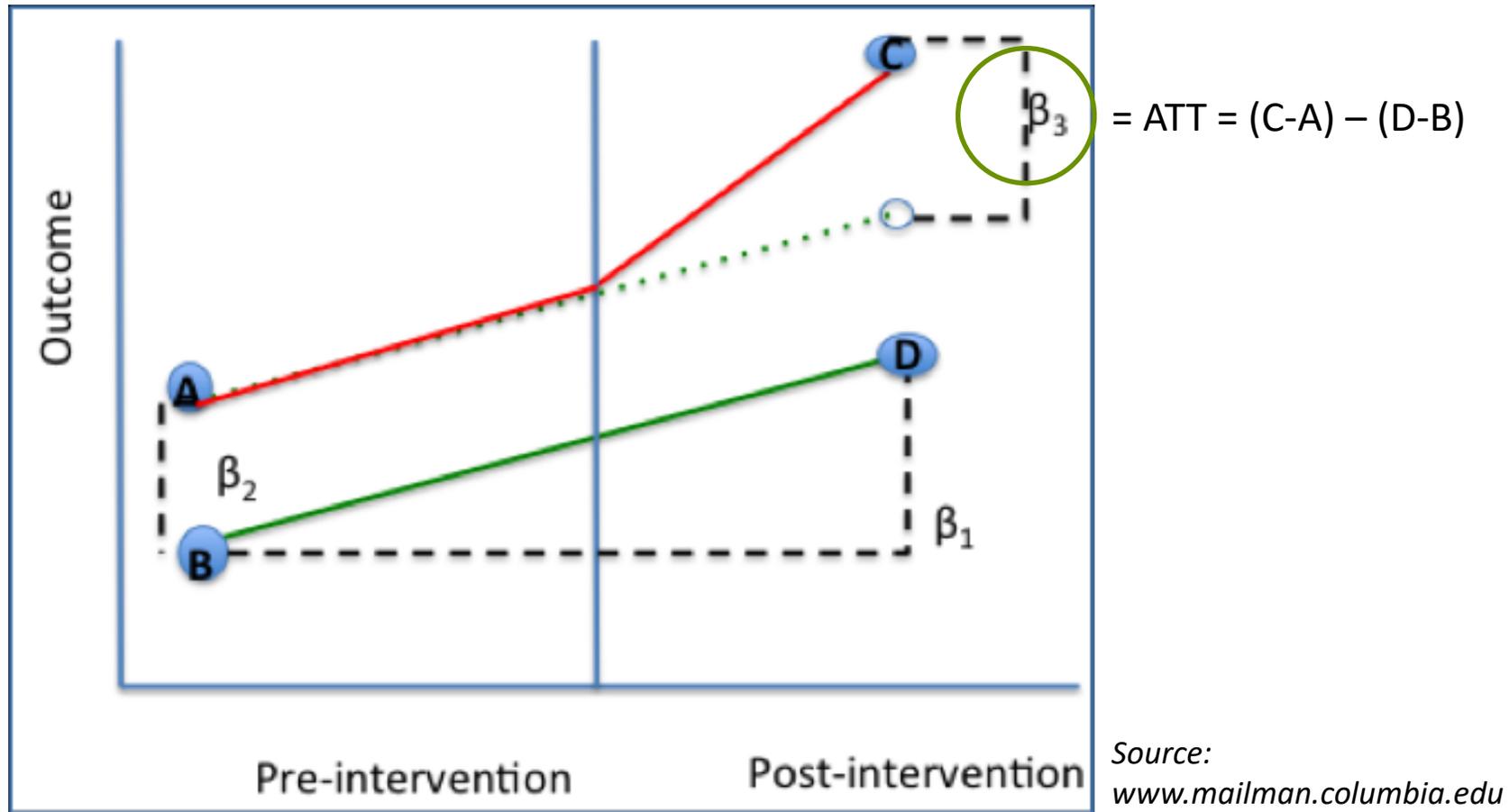ATT = $E(\Delta Y1|D=1)$ – $\boxed{E(\Delta Y0|D=1)}$ ← Counterfactual level = not observable

ΔY = forest cover change between 2010 and 2014.

D = 1 for participants.

D = 0 for comparison households.

Difference-in-difference

$= \text{ATT} = (C-A) - (D-B)$

Source: www.mailman.columbia.edu

Key assumption: Parallel trend in outcome in absence of treatment.

DID-matching

Average Treatment on the Treated :

ATT = $E(\Delta Y1|D=1)$ - $\boxed{E(\Delta Y0|D=1)}$ ← Counterfactual level = not observable

ΔY = forest cover change between 2010 and 2014.

D = 1 for participants.

D = 0 for comparison households.

- DID-matching used to create the counterfactual level: we use comparison households who have the same observable variables X than participants to constitute an appropriate **control group**.

Control group: hh with same characteristics than participants

106 intervention households

| 54 NP | 52 P |

75 comparison households
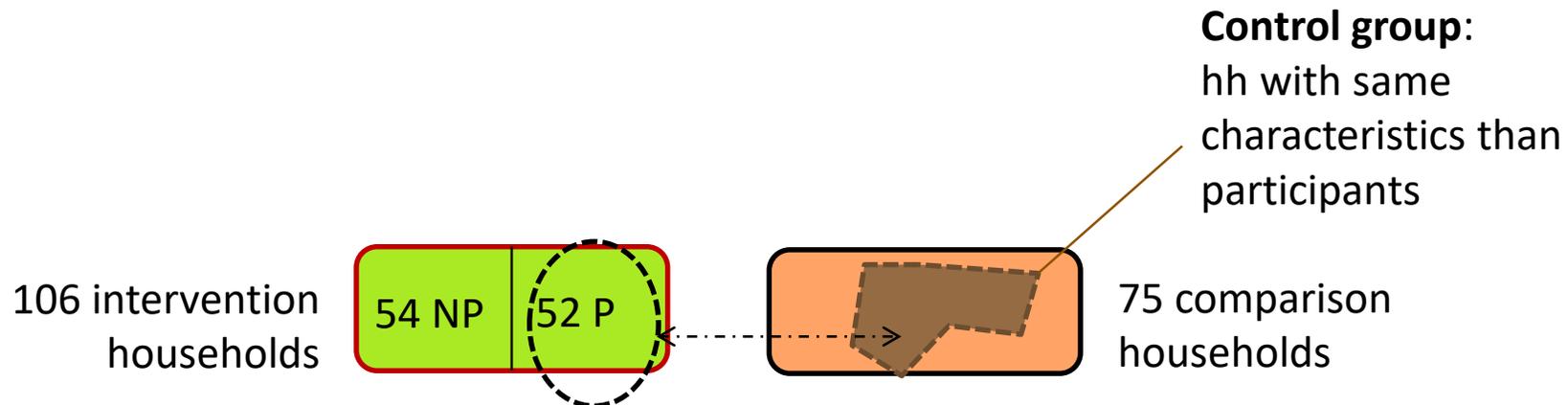
Results: Forest conservation impact on participants

N = 181 → Comparison 75

Intervention 106 → Non-participants 54

Intervention 106 → Participants 52
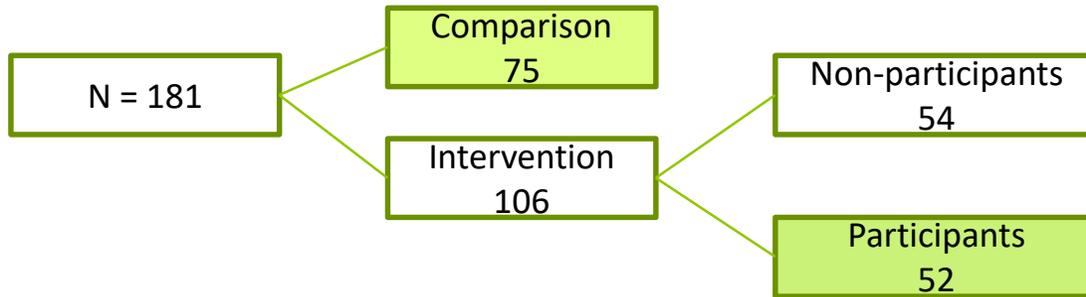
| | Forest cover | | Total land | Crop land | Pastures |
| | Intervention | Participants | Participants | Participants | Participants |
Estimator	(1)	(2)	(3)	(4)	(5)
DID	4.21 *	5.41 **	1.44	0.38	-6.91 **
	2.48	2.71	5.72	1.58	2.74
DID-matching					
NNM(4X)	5.36 *	7.10 **	-4.29	-0.50	-8.11 ***
	2.76	3.21	7.17	2.46	3.07
PSM (kernel)	4.87 *	7.98 *	-2.28	1.39	-11.32 ***
	2.71	4.52	5.66	4.62	3.25
Linear regression					
OLS(X)	4.64 *	6.22 *	-0.73	1.14	-7.82 ***
	2.59	3.23	5.98	1.91	2.97
OLS(PS)	4.38 °	6.06 °	-0.26	0.54	-7.15 **
	2.67	3.91	6.07	2.82	3.35
Mean value y_1	63.16	65.93	79.28	9.34	21.77

Significance:

***: pvalue<1%,

**: pvalue<5%,

*:pvalue<10%,

° : pvalue<15%

→Impact of project on forest cover ranges between 5 and 8 percentage points.

Results

Forest cover as the share of the total area (2008, 2010 and 2014)
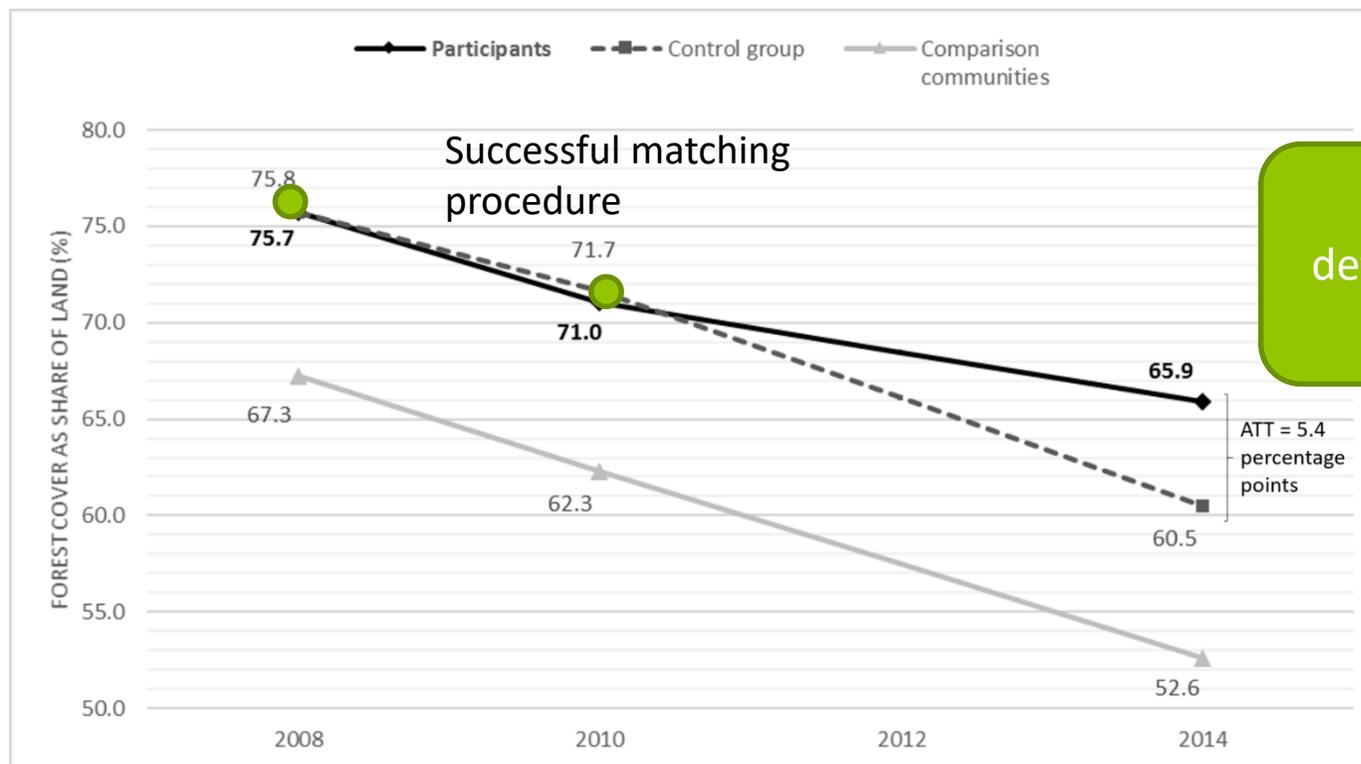
- Impact of project on participants' forest cover : 5 - 8% points (~4ha/farmer).
- Forest area preserved at the expense of pastures.
- Limited risk of leakage on non participants.

Conclusion

- Challenge of drawing causal inferences with observational data:
  DID and DID-matching perform well in our case.

- Encouraging results at preliminary stage on the possibility to stem deforestation among Brazilian smallholders by using positive incentives.
  Forest has been preserved to the detriment of pasture.

- Challenge of using self-declared land use data: cross-checked with remote-sensing data.

- Challenge of measuring heterogeneous treatments: how to disentangle impact of different interventions?

- Short term vs mid-term impact: 5 years enough to achieve a transition toward sustainable agriculture?

Thanks for your attention!