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To little, too late?

Rice production to mitigate climate change in Colombia

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CGIAR Mitigate+: Research for Low-Emission Food Systems

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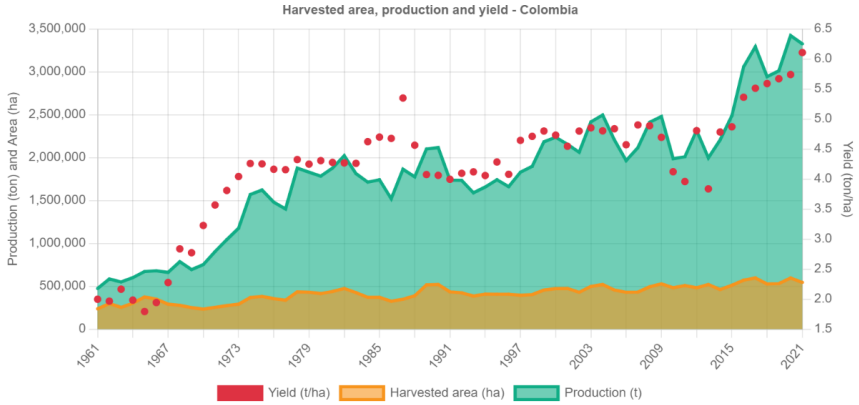
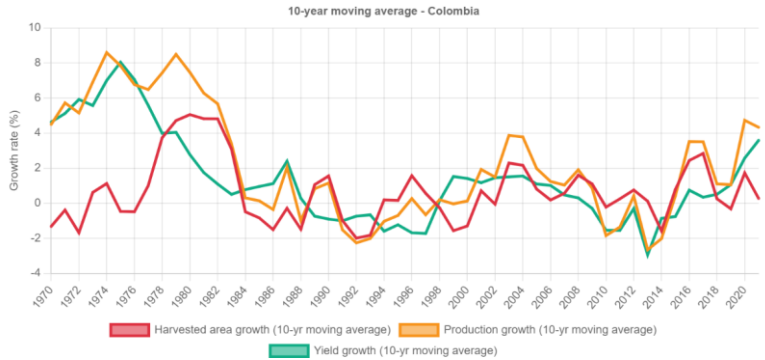
Context and relevance of the issue.

- Climate change affects rice yield and rice quality (FAO, 2015)
- Rice plays a pivotal role for food security in Colombia, being consumed daily by more than 90% of the population and contributing to 11,3% of daily dietary needs (Minsalud, 2015)
- On the other hand, rice production is responsible for the emissions of greenhouse gasses such as Methane (CH4) and Nitrous Oxide (N20) (IDEAM et al. 2021; Castro-Llanos, et al. 2019)





Methodology

- Use of quasi-experimental econometrics model with data on rice production in Colombia-2021

- Outcomes : yield (tons/hectares) and emissions (kg / tons)

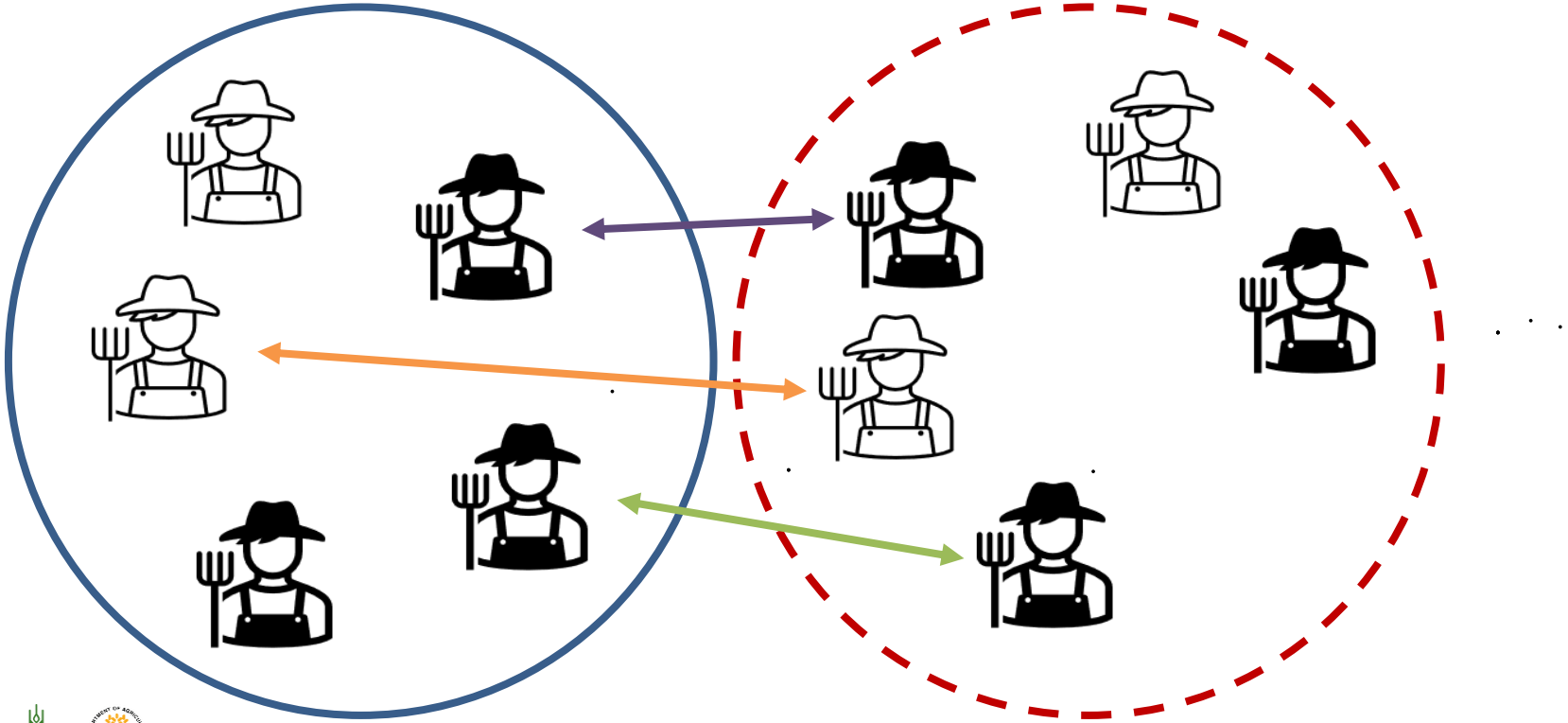
  - OLS : Simple Linear regression (SLR) and Multiple Linear regression(MLR)

$$Y = \beta_0 + \beta_1 X_i + \varepsilon_i \qquad i = 1,2,\ldots,n.$$

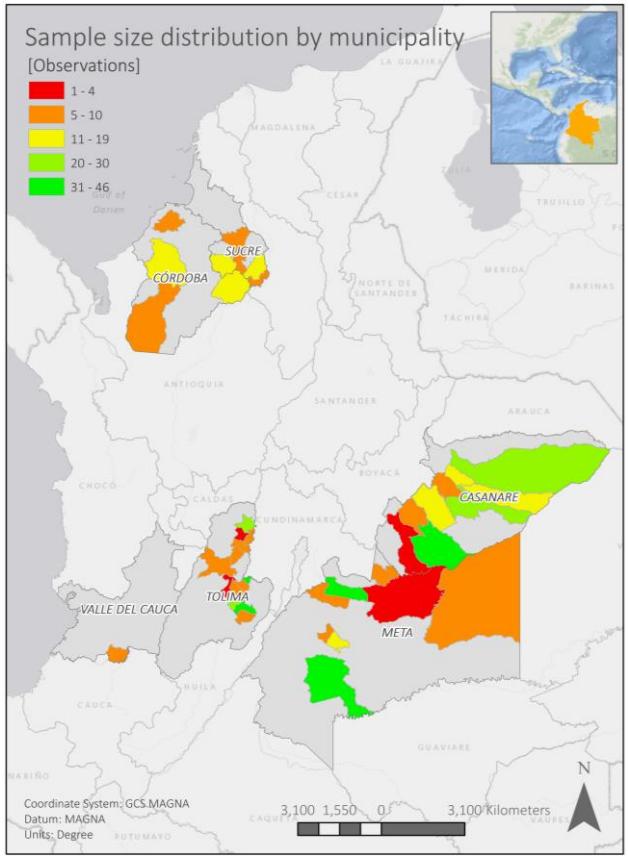
  - PSM: Propensity Score Matching, following Rosenbaum and Rubin (1983)

$$e(x) = \Pr(Z = 1 | X = x)$$

Methodology – PSM



Data



- Cross-sectional sample of rice farmers collected in 2021, 616 households in 6 departments

Sample distribution:

Tolima (208)

Casanare (150)

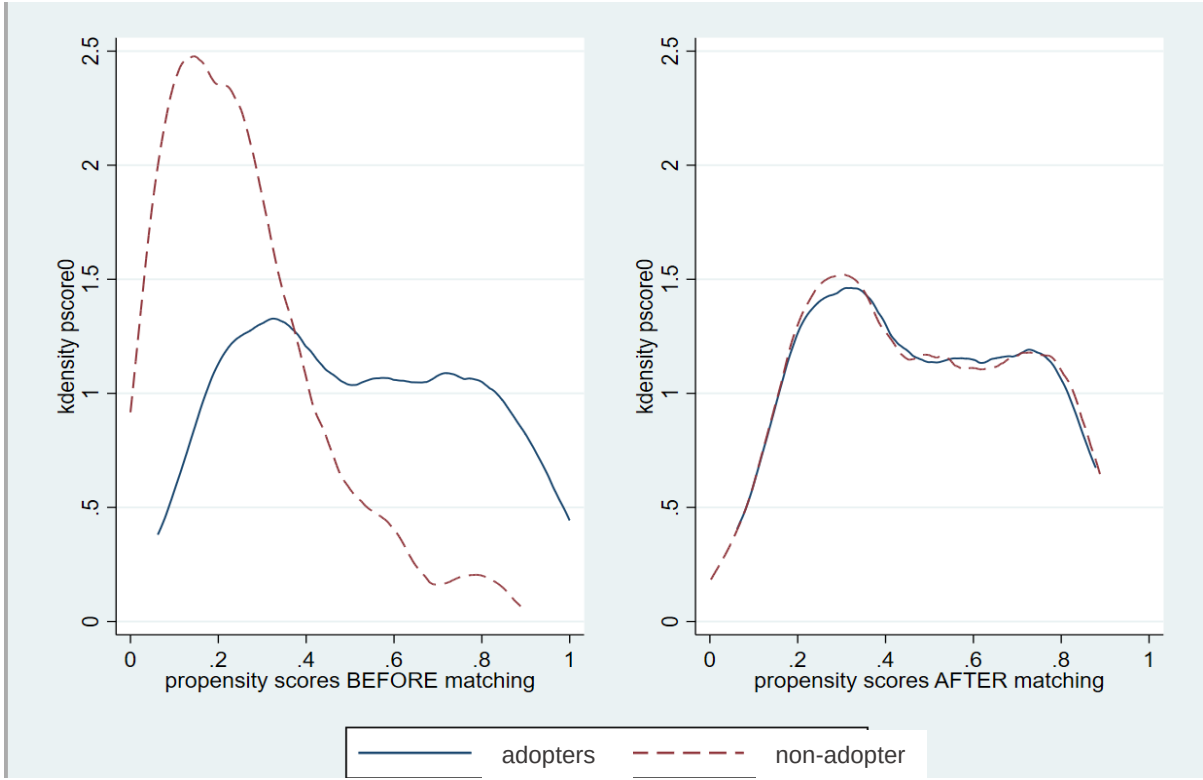
Sucre (102)

Meta (80)

Córdoba (36)

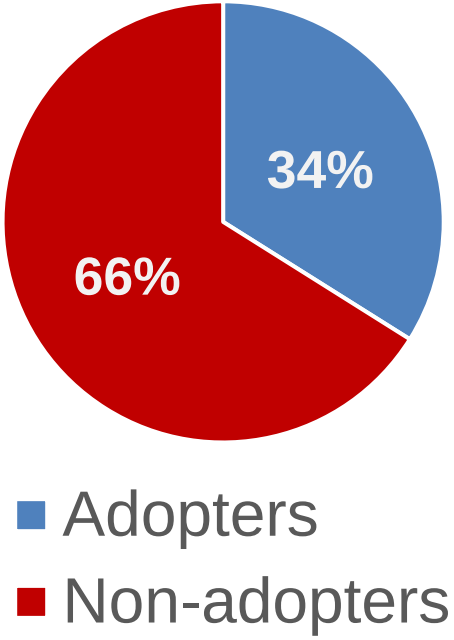
Valle del Cauca (5)

Results - distribution of the propensity score before and after matching



- Before matching adopters and non-adopters had a probability of adopting that did not overlap.
- Thanks to the matching the two groups become much more comparable.

Results – Adopters and non-adopters.



- The division between adopters and nonadopters is based on “information and extension services” (AMTEC by Fedearroz).

- We consider adopters those produces which self-report to have implemented any of the technologies and practices recommended

Results – Descriptive statistics.

	Obs	Mean	S.D	Min	Max
Yield (ton/ha)*					
Adopters	206	**5.703**	1.871	0.15	14.375
Non-adopters	398	**5.012**	2.084	0.28	10.9
GHG Emissions (kg/ton)**					
Adopters	186	**479.44**	378.26	28.73	2784.122
Non-adopters	351	**554.22**	355.04	92.76	2796.159

* For the yield we considered outliers and dropped the observations with yield higher than 15 ton.
** For Emissions we considered outliers and dropped the observations with emissions higher than 6,000 kg.

Results 1\2 – Yield

Yield.	Single Linear Regression	Multiple Linear Regression	Propensity score Matching
Adoption	0.858*** (0.000)	0.432*** (0.005)	0.580*** (0.003)
Control Variables	No	Yes	Yes
Number of observations	606	594	544

Significant control variables: household size, type of seeds, cropping system, use of fertilizers and harvest loss.

Results 2\2 – Emissions

Emissions	Single Linear Regression	Multiple Linear Regression	Propensity score Matching.
Adoption	-109.60** (0.021)	-59.532* (0.065)	-67.212* (0.065)
Control Variables	No	Yes	Yes
Number of observations	539	513	498

Significant control variables: cropping system and harvest loss.

Discussion

- Yield increase for adopters : Adaptation
- Adopters emit less greenhouse gasses : Mitigation
- The adoption of better technological practices make rice production more resilient
- These results demonstrate the pivotal role of agroclimatic forecasting and extension services to mitigate the effects of climate change on rice production
- Better measurements of GHG emissions and computation of site-specific emissions are crucial to clearly identify the effects of adaptation and mitigation initiatives

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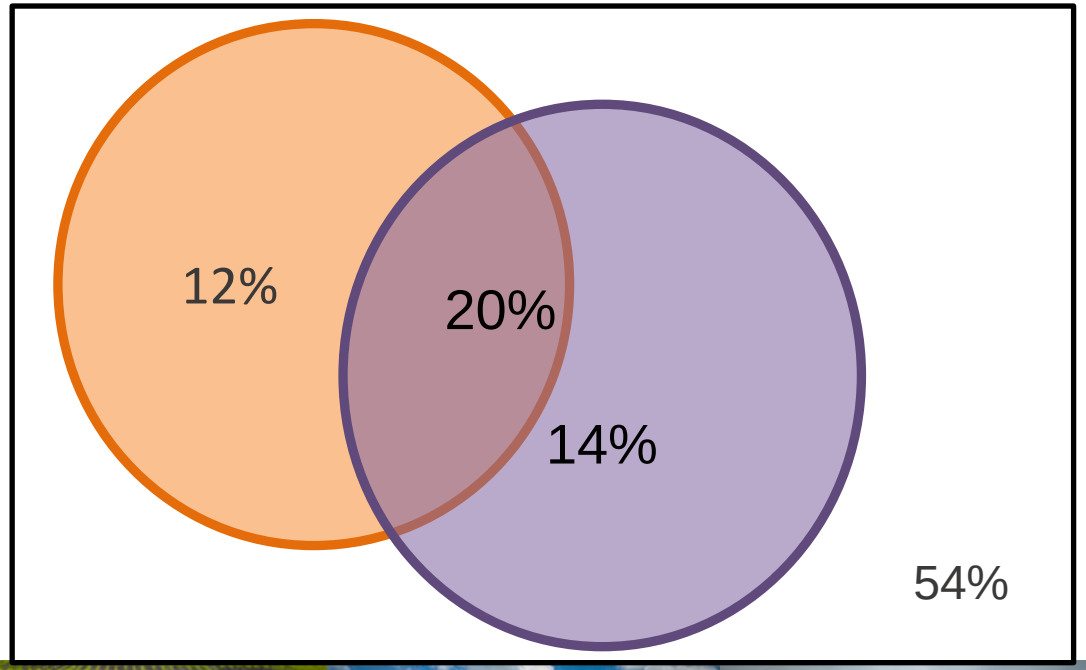
Further work



- 12% had access to forecasting but did not implement the info
- 14% used other AMTEC advise but not climate forecasting
- 20% did both.
- 54% non- adopters

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Thank you!

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