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Agricultural policies to mitigate GHG emissions: a comparative study

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Issue

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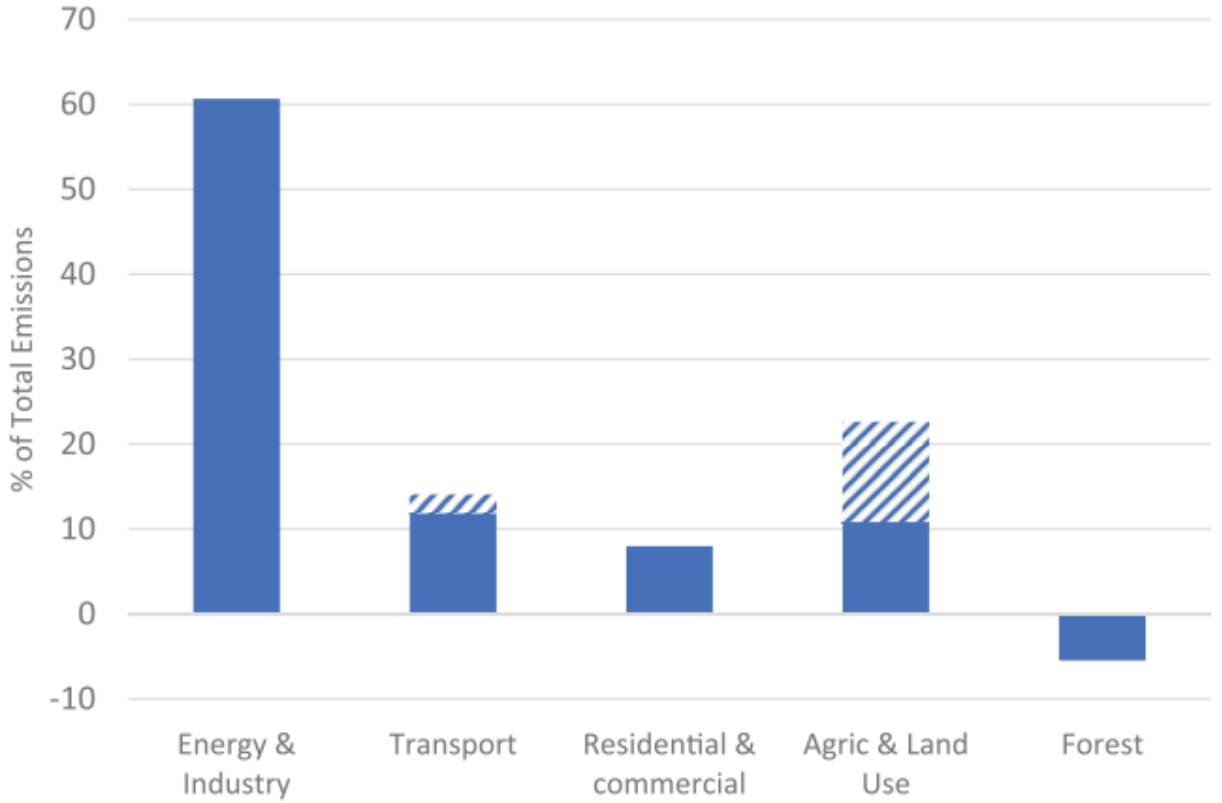
Figure 1. Global GHG (greenhouse gas) emissions by source, 2010 (shares in %).



Source: Mamun, A., Martin, W., & Tokgoz, S. (2021). Reforming agricultural support for improved environmental outcomes. *Applied Economic Perspectives and Policy, 43*(4), 1520-1549.

Note: the striped section of the Transport bar refers to international transport, whereas the striped section of the Agric & Land Use bar refers to land use, excluding carbon sequestration by forests, which is shown in the last bar.

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What is this paper about?

Ex-post analysis of **policies** implemented in the **AFOLU** (Agriculture, Forestry, and Other Land Use) sector.

What do we find?

Non-market-based policies are more **successful** than **market-based** policies in reducing the **impact** of the **AFOLU** sector.

Policies' classification

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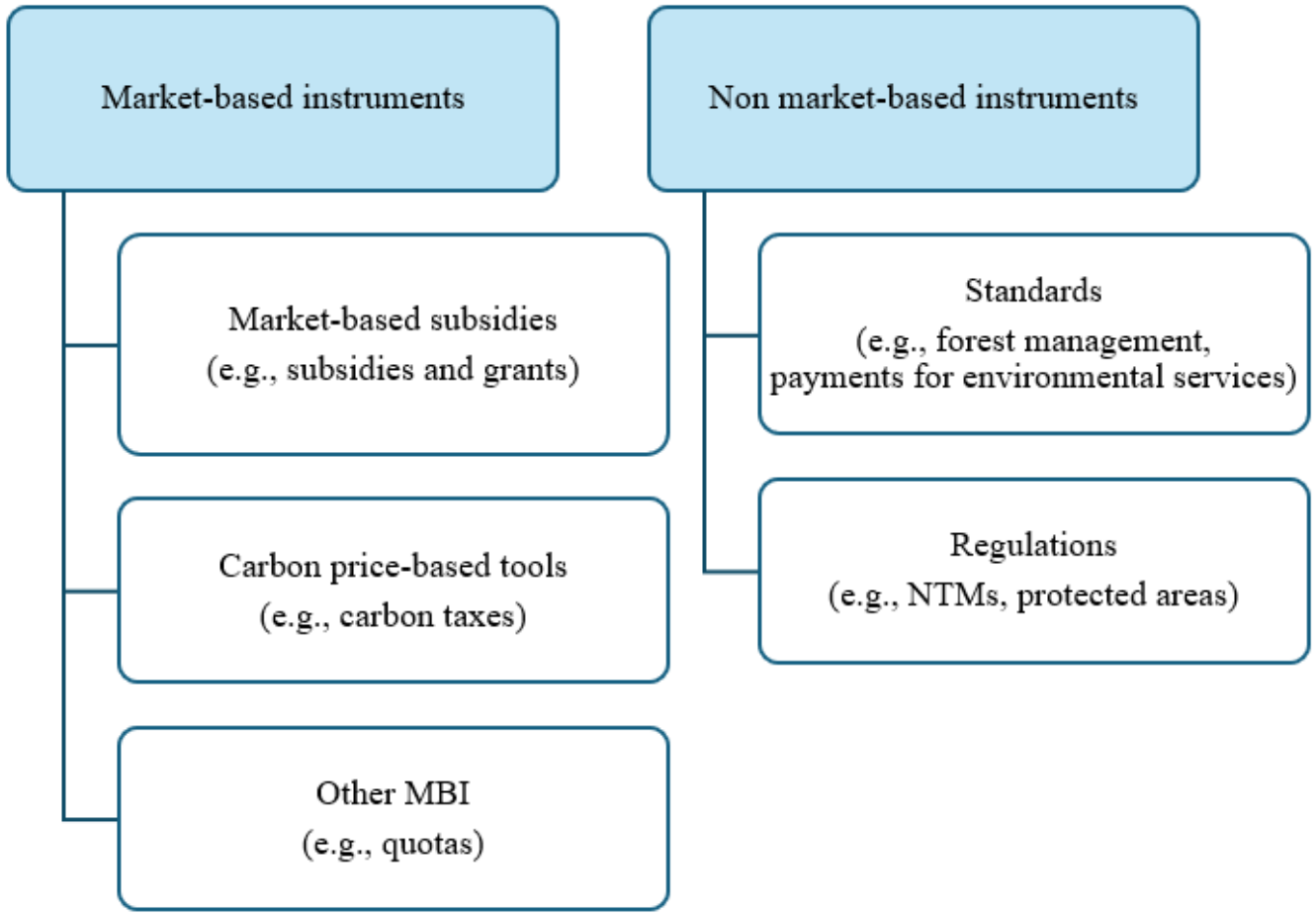
Figure 2. Type of policy to lower emissions.



Subsidies:
- 10% of cost of organic fertilizers.
- 30% of the total cost of livestock waste disposal.
- 30% of fees for using compost centre.
- 30% of the total cost of recycling cultivation waste.
- 10% of the price of energy-saving agricultural machinery.

Carbon tax:
- British Columbia carbon tax.
- $5 Canadian dollar (CAD) per tonne emitted per year in 2008.
- $30 CAD in 2012.
- $35 CAD in 2018.

Protected areas:
- Prohibitions on hunting, harvesting forest products and the amount of land allowed for cultivation to increase forest cover.

Forest management:
- Forest Co-management Program.
- Communities participate in the sustainable management of forests.
- In return, they gain access to forest resources.

How can we measure the impact of the AFOLU sector?

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Emissions indicator *vs* ***Land use change indicator***

Δ CO_2

$$\Delta CO_2 = \frac{CO_{2(t+1)} - CO_{2(t)}}{CO_{2(t)}} * 100$$

[% CO_2eq]

Δ LU

$$\Delta LU = \frac{LU_{(t+1)} - LU_{(t)}}{LU_{(t)}} * 100$$

[% ha]

Evidence

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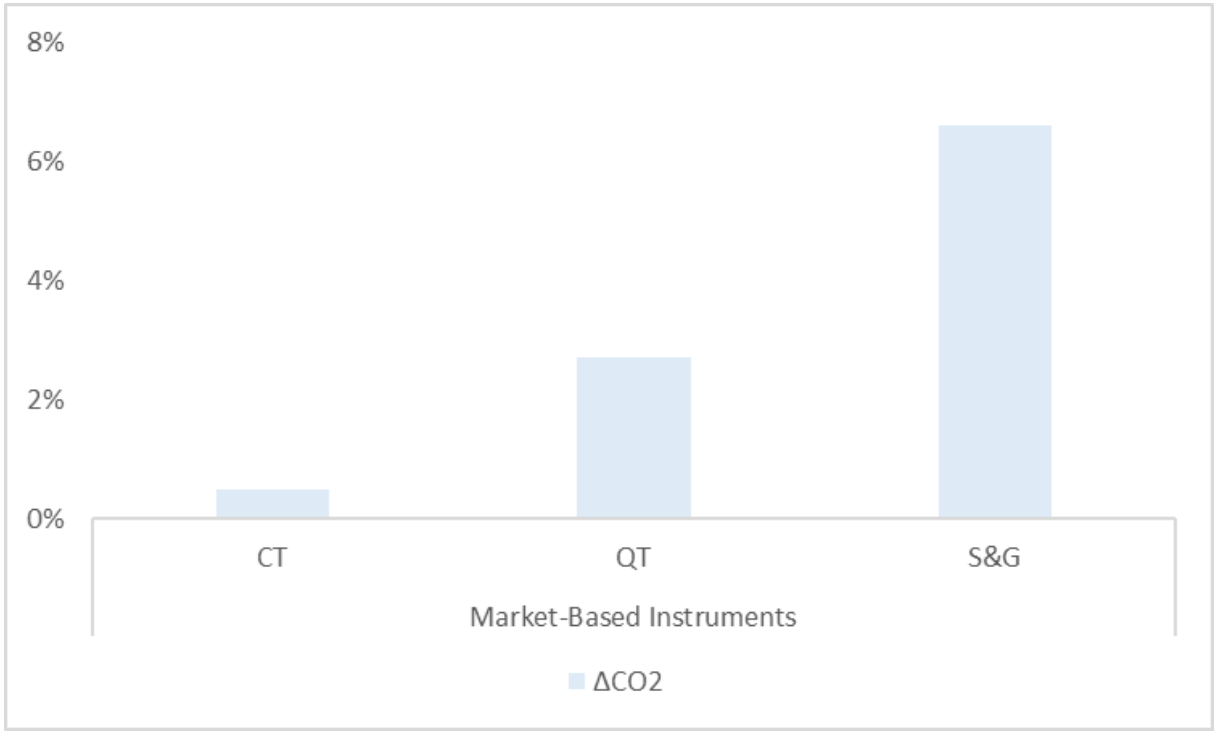
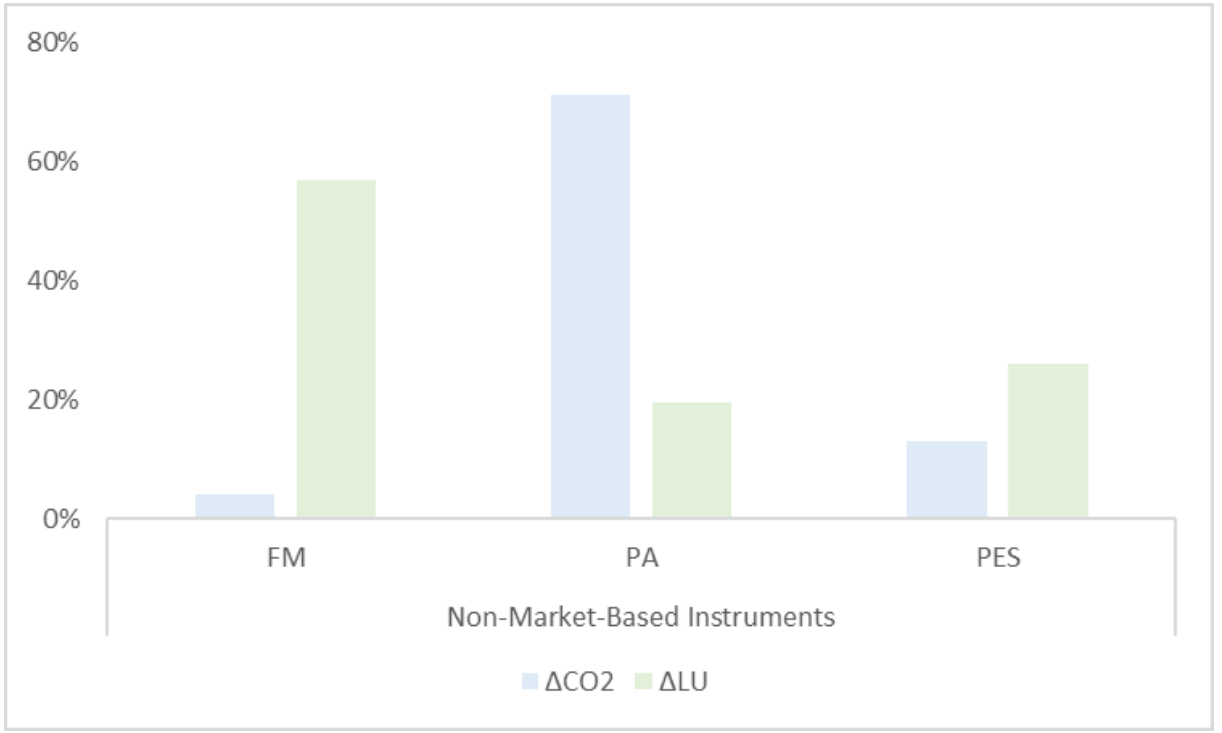
Figure 3. Policies' effects size.





Acronyms are as follow: Carbon Tax (CT), Quota (QT), Subsidies and Grants (S&G), Forest Management (FM), Protected Area (PA), Payments for Environmental Services (PES), Carbon Dioxide (CO_2), Land Use (LU).

Further Research

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- The limited adoption of interventions in the **AFOLU** sector highlights the urgent need for **performance-driven environmental policies**.

- A key challenge in evaluating these interventions is the use of a unique and consistent **performance indicator**, which makes all the different policy instruments comparable (Jayachandran *et al.*, 2017; Liang, Meng, & Ishii, 2022).

- A coordinated, **multilevel strategy** that integrates local, national and global actions is needed (Brandt, Nolte, & Agrawal, 2016; Pretis, 2022).

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Thanks for your time!

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Extra slides

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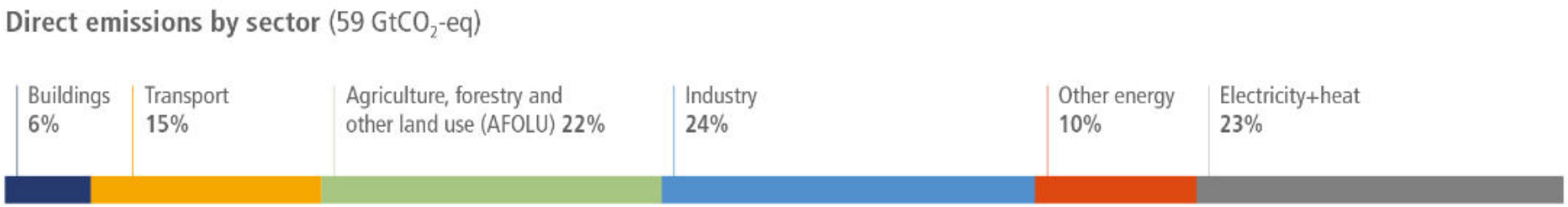
Figure 4. GHG emissions in 2019 by sector.



Source: IPCC, 2022. *Climate Change 2022: Impacts, Adaptation, and Vulnerability.*

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Table 1. Papers included in the analysis.

Authors	Journal[a]	Publication year	Type of policy[b]	Indicators	Country*
Alix-Garcia, Shapiro and Sims	LA	2012	PES	Δ deforested area	MEX
Alix-Garcia, Sims and Yañez-Pagans	AEJEP	2015	PES	Δ deforested area	MEX
Arima, *et al.*	LUP	2014	FM	Δ deforested area	BRA
Assunção, *et al.*	TRES	2023	FM	Δ deforested area	BRA
Brandt, Nolte and Agrawal	LUP	2016	FM	Δ deforested area	COD
Cheng, Sims and Yi	JEEM	2023	PA	Δ forested area	CHN
Chervier and Costedoat	WD	2017	PES	Δ deforested area	KHM
Ferraro, *et al.*	PNAS	2015	PA	Δ CO_2 emissions	BRA, CRI, IDN, THA
Groom, Palmer and Sileci	PNAS	2022	PES	Δ CO_2 emissions	IDN, NOR
Hayes, Murtinho and Wolff	WD	2017	PES	Δ grazing households	ECU
Jayachandran, *et al.*	Science	2017	PES	Δ deforested area	UGA
Läpple, Carter and Buckley	AE	2022	QT	Δ GHG emission intensity	IRL
Liang, Meng and Ishii	DS	2022	S&G	Δ CO_2 emissions	CHN
Mazunda and Shively	EE	2015	FM	Δ deforested area	MWI
Miteva, Murray, and Pattanayak	EE	2015	PA	Δ CO_2 emissions	IDN
Mohebalian and Aguilar	EE	2018	PES	Δ deforested area	ECU
Pretis	ERE	2022	CT	Δ CO_2 emissions	CAN
Sims	JEEM	2010	PA	Δ forested area	THA
Sims and Alix-Garcia	JEEM	2017	PA, PES	Δ deforested area	MEX
Souza-Rodrigues	TRES	2019	FM	Δ CO_2 emissions	BRA

[a]Acronyms are as follows: Land Economics (LA), American Economic Journal: Economic Policy (AEJEP), Land Use Policy (LUP), The Review of Economic Studies (TRES), Journal of Environmental Economics and Management (JEEM), World Development (WD), Proceedings of the National Academy of Sciences (PNAS), Agricultural Economics (AE), Discover Sustainability (DS), Ecological Economics (EE), Environmental and Resource Economics (ERE), Journal of Environmental Economics and Management (JEEM).

[b]Acronyms are as follows: Payments for Environmental Services (PES), Forest Management (FM), Protected Area (PA), Quota (QT), Subsidies and Grants (S&G), Carbon Tax (CT).

* Countries are identified with the ISO 3166-1 code.

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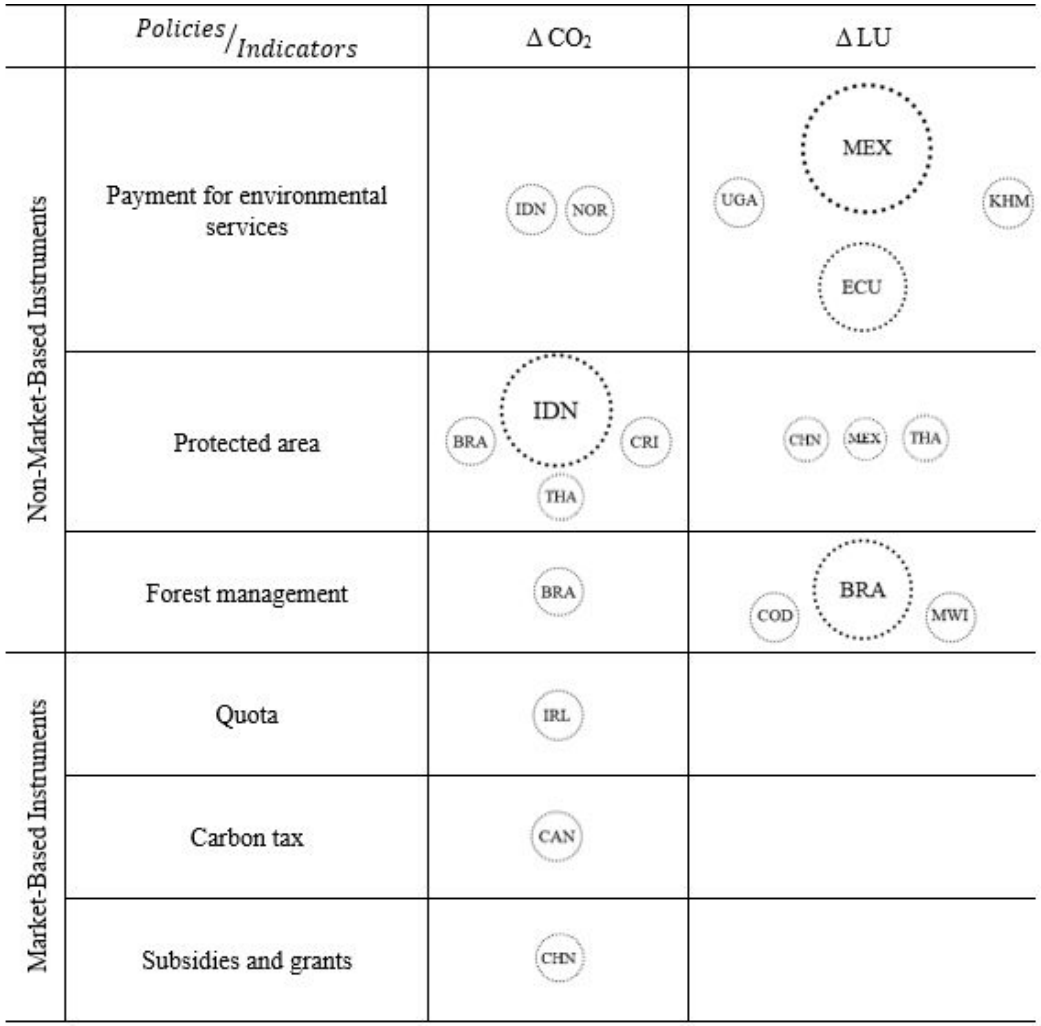
Figure 5. Matrix of e*x-post* features.



Note: Countries are identified with the ISO 3166-1 code, and the size of the circles is directly proportional to their frequency in papers. Acronyms are as follow: Carbon Dioxide (CO_2) and Land Use (LU).