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## Effectiveness of cocoa cropping systems to reduce deforestation in Colombia’s post-conflict areas

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### Abstract

The agriculture, forestry, and other land use sectors are the first source of greenhouse gas (GHG) emissions in Colombia, accounting for more than 50 % of the total. Emission sources include land use change from forest to crop/grassland, enteric fermentation by livestock, manure handling, and rice cultivation. Agricultural expansion is the main driver of deforestation in Colombia, and the government is committed to reduce GHG by 30 % by joining global efforts to achieve deforestation-free production.

Cocoa cultivation is promoted as an economic alternative in post-conflict areas despite a lack of evidence and understanding of the role of such interventions in reducing deforestation. The aim of this work is 1) to establish the spatial distribution of cocoa farming systems in the Caquetá region and 2) to establish if the presence of cocoa farms are associated with deforestation.

From a list of 2353 farmers in the region obtained from with local authorities, growers’ associations and federations, and technical assistance offices, 448 farmers (19 %) were randomly selected for detailed spatial data collection using the Collector tool of the ArcGIS software data. Land cover use and forest and cocoa cropping areas were identified using satellite images. Correlations and spatially explicit analyses were performed to explore to what degree cocoa production is associated with deforestation using official spatial data on forest loss.

Results show that 60 % of the farms have been associated to deforestation during the last 20 years, with most of the forest losses occurring in the 2012–2020 period. When looking specifically at the cocoa production areas within the farms, 20 % of cocoa cropping areas are associated with deforestation. Using data from semi-structured interviews with the same farmers, 32 % of the cocoa farms planted cocoa trees in deforestation areas. As the implementation of new cocoa production areas was supported and implemented in the framework of national and international initiatives, our findings indicate that the promotion of cocoa cultivation needs to be done taking into account the risk of promoting deforestation. Therefore, such initiatives must be addressed and co-designed with different actors in each specific context to avoid deforesting new areas to plant cocoa.

**Keywords:** Agroforestry, climate change mitigation, sustainable supply chain, zero deforestation