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Determinants of cacao agroforestry practices adoption in Colombia and implications for technical assistance programs

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Abstract

Understanding the factors associated with the adoption of agroforestry practices is key to adequately designing programmes that promote such practices among smallholder farmers, to increase the likelihood of success of such programs. This study examines the determinants of adoption of agroforestry management practices in Cesar and Caquetá—two of Colombia’s most rapidly expanding cacao-producing departments. We use data of 3,091 farmers collected in late 2024 and estimate multivariate probit models for five practices of interest: organic fertilisation, chemical fertilisation, cover crop use, cacao pruning, and cacao sanitary control. This multivariate approach explicitly accounts for the interdependence of adoption decisions, a methodological strength that allows for the detection of complementarities and substitution effects across practices. Results reveal that adoption decisions are jointly determined by household socioeconomic characteristics, resource endowments, institutional access, and farm-level biophysical conditions. Statistically significant cross-equation correlations confirm that chemical fertilisation, pruning, and sanitary control tend to be adopted as a cluster of input-intensive practices, driven primarily by access to credit, liquidity, and agricultural extension services. Conversely, organic fertilisation and cover crop use exhibit a substitution dynamic with chemical inputs, being more prevalent among resource-constrained farmers with limited financial access—suggesting these practices serve partially as low-cost alternatives rather than purely agronomic choices. Farm-level characteristics further affect adoption probabilities, as the presence of clonal cacao materials is positively associated with adoption across nearly all practices, likely reflecting the higher management requirements and yield potential of improved genetic materials. Additionally, the type of shade tree integration significantly increases the likelihood of doing some of the practices, highlighting the role of agroforestry system composition in shaping management decisions. These findings carry direct implications for extension design and practitioners. First, interventions that promote individual practices in isolation risk achieving low levels of adoption if they fail to account for labour and liquidity constraints, practice complementarities, and the heterogeneity of farming systems. Second, addressing some of the limiting factors may require coordination with other programs, for example, financial assistance to ease liquidity constraints. The results highlight the need for differentiated, systems-oriented extension approaches to achieve higher adoption rates.

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