



Tropentag, September 14-16, 2022, hybrid conference

“Can agroecological farming feed the world?
Farmers’ and academia’s views”

Potential economic benefits of integrating silvopastoral arrangements in Latin American beef cattle fattening systems

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Abstract

The environmental impacts caused by cattle are undeniable, and, in addition to the expansion of land, are related to biodiversity loss, deforestation, and greenhouse gas (GHG) emissions, making the sector a main contributor to climate change. Given the social and economic importance of cattle, it is crucial to implement strategies that can both mitigate environmental impacts and allow productivity increases. Silvopastoral systems (SPS) constitute a valuable strategy in this regard, since they generate environmental benefits, related to the reduction of GHG emissions, increased nitrogen fixation, and nutrient cycling, as well as economic benefits, such as increased production efficiency, reduced production costs, and the generation of additional income. This study evaluates the implementation of a SPS in beef cattle fattening (treatment 1, T1) in Colombia from an economic perspective and contrasts the results with a traditional grazing system under grass monoculture (treatment 2, T2). Information was collected in trials in Palmira, Colombia, during 2021 and 2022. The grass varieties used in both treatments were *Brachiaria brizantha* cv. Toledo and the *Brachiaria* hybrid cv. IATTC BR02/1752. The legume *Leucaena leucocephala* was integrated in the SPS (T1). We applied a discounted cash flow model for the estimation of profitability indicators, and a risk analysis. The results show a positive Net Present Value for both treatments. The probability that this indicator takes negative values is, however, with 21% higher for T2 than for T1 (0%). The internal rate of return is 21% for T2 and 69% for T1. The benefit-cost ratio indicates that for every US\$ spent on the investment, US\$ 1.5 are being obtained in T2 and US\$ 2.7 in T1. The results suggest that the integration of *L. leucocephala* is economically and financially viable for the cattle producer and surpasses the traditional system. It leads to higher efficiency that allows increasing the annual income of the producer. The adoption of this SPS, in addition to its economic benefits, also contributes to conservation, resource-use efficiency, and mitigating GHG emissions. This study is a valuable input for decision-making in adoption processes of SPS in Latin America.

Keywords: Beef, cattle, climate change, mitigation, silvopastoral system, sustainable intensification