

Effect of Climate Variability on Coconut Farming: A Bayesian-Ricardian Approach using Panel Data from the Western and North Western Provinces of Sri Lanka

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Coconut is a vital agricultural commodity in Sri Lanka and tropical economies, sustaining global agricultural stability and the livelihoods of millions. However, it is highly susceptible to climate change since its reproductive development is more sensitive to changes in temperature, precipitation distribution and adverse weather conditions including droughts and floods. This leads to the reduction in both nut weight and yield, subsequently reducing coconut farmers' income. Therefore, this study aims at quantifying the impact of climate change on coconut profitability. The study addresses the lack of a robust framework for quantifying the uncertainty associated with climate change impacts on coconut profitability by employing a Bayesian-Ricardian approach, which uniquely integrates uncertainty into economic projections. The analysis utilized previously collected monthly profit data from 67 coconut estates, spanning from 2002 to 2018 and climate data from the Worldclim web site extracted through QGIS. A Ricardian model was employed for the analysis and as panel data was available, a pooled regression model was estimated using Bayesian methods to simulate marginal effects of temperature and precipitation under different climate scenarios. The impact of long-term average temperature and long-term average precipitation on profitability exhibits a probability exceeding 70% and 99% of being negative across different scenarios respectively. Additionally, extreme droughts before twelve months lead to an average monthly profit reduction of 31.81% per hectare, with losses ranging between 42.3% and 21.4% at a 95% credible interval. Therefore, the findings reveal that climate change has a significant negative impact on coconut estate-level profitability. Since the temperature, variability of precipitation patterns and frequency of drought events are expected to increase, estate holders will suffer large losses in the future. To mitigate these effects, it is essential to develop climate resilient coconut cultivars, adopt precision agricultural technologies and improve water management practices.

Keywords: Bayesian Analysis, Climate Change, Coconut, Profitability, Ricardian Analysis