Abstract

This study investigated the stochastic price dynamics of green grams in Kitui County, Kenya, aiming to analyze and predict price movements using a Markov chain model. Employing monthly price data from January 2012 to December 2024, sourced from the Ministry of Agriculture and Livestock Development and the Kenya National Bureau of Statistics, the research addressed the limitations of traditional time series models in capturing agricultural price volatility and mean recurrent times. A three-state Markov process (price increase, decrease, or no change) was constructed. The study estimated the transition probability matrix, determined the long-run price distribution, and calculated mean recurrent times, revealing rapid price state transitions and a dynamic market equilibrium. Notably, mean recurrent times ranged from 1.35 to 2.5 months between price increase and decrease states. Data analysis, conducted using R software, included descriptive statistics, price variability analysis, and Markov chain model fitting. The findings provide crucial insights into green gram price dynamics, offering a robust forecasting approach for farmers, traders, and consumers. This research highlights the significance of Markov chain models as a practical and effective tool for predicting and managing price volatility in emerging agricultural markets, such as Kitui County, thereby enhancing profitability and market stability.