

Stochastic Optimal Control and Simulations with Application to the Cashew Nut Sector in Senegal

Amadou S. Diallo¹, Steeven B. Affognon², Babacar M. Ndiaye³, P. Ngare²

¹ Laboratory of mathematics and applications.
University of Assane SECK, Ziguinchor, BP 523, Senegal.
saikoudiallo1@gmail.com

² School of Mathematics, University of Nairobi.
P.O. Box 30197-00100, Nairobi, Kenya.
belvinos@gmail.com, philipngare@gmail.com

³ Laboratory of Mathematics of Decision and Numerical Analysis.
University of Cheikh Anta Diop. BP 45087 Dakar-Fann, Senegal.
babacarm.ndiaye@ucad.edu.sn

Abstract : *In this article, we propose a new methodology based on stochastic optimal control problems, to solve the revenue and exploitation issues of the cashew nut sector in Senegal (West Africa). First, we reviewed some underlying tools from stochastic calculus such as stochastic processes, Brownian motion, martingales, and stochastic differential equations. The stochastic optimal sales plan and agricultural exploitation plan are determined using the Hamiltonian-Bellman-Jacobi equations that correspond to the proposed maximization problems in this paper. Finally, numerical simulations and real data from Casamance (Southern Senegal) were used to analyze the performance of this novel approach to the cashew nut sector.*

Keywords : *stochastic, Hamiltonian-Jacobi-Bellman, optimal control, cashew nut, stock, investment*

References

- [1] A.S. Diallo, S.B. Affognon, B.M. Ndiaye, P. Ngare, Stochastic optimal control and simulations with application to the cashew nut sector in Senegal, Results in Applied Mathematics, Volume 14, 2022, 100272, ISSN 2590-0374.
- [2] Takayama A, Mathematical Economics, Cambridge University Press, 2nd Edition, p. 448-459.
- [3] L.C. Evans, An introduction to the Mathematical Optimal Control Theory. Available on <http://math.berkeley.edu/eevans>.
- [4] MATLAB and Statistics Toolbox Release 2018b, The MathWorks, Inc., Natick, Massachusetts, United States.
- [5] Fabbri, Giorgio and Gozzi, Fausto and Swiech, Andrzej, Stochastic optimal control in infinite dimension, Probability and Stochastic Modelling. Springer, 2017.