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Rice (*Oryza sativa L.*) Bioeconomy: A Comprehensive DEA Analysis

M.D. Castro-Alvarez
National Agrarian University La Molina
Perú. Doctoral Program in Natural Resource Economics and Sustainable Development
Natural Resource Management and Related Policies
Email: mcastro294@yahoo.com
https://orcid.org/0000-0002-8066-0687

C.A. Zuniga-Gonzalez
Specific Direction of Agroecology
Research Center in Bioeconomics and Climate Change
National Autonomous University of Nicaragua, Leon. Nicaragua.
Knowledge Area of Agrarian and Veterinary Sciences
Corresponding author Email: czuniga@ct.unanleon.edu.ni
https://orcid.org/0000-0002-2545-8304

W. Mercado
National Agrarian University La Molina, Perú
Email: wmercado@lamolina.edu.pe
https://orcid.org/0000-0001-7167-9581

R. S. Andrade
Centro de Investigación de Agricultura Tropical (CIAT)
Email: r.s.andrade@cgiar.org
https://orcid.org/0000-0002-5764-3854

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Abstract

Purpose: The research focuses on analyzing the technical efficiency of a sample of 612 rice (Oryza sativa L.) producers in Ecuador during the year 2019. The objective is to explore productivity and efficiency gaps to guide decision-making and the development of sustainable policies in the rice sector.

Design/methodology/approach: By employing Data Envelopment Analysis (DEA) models, including BCC and CCR approaches, and incorporating Super Efficiency and Bootstrapping methods, this study identifies efficiency levels and areas for improvement, ensuring robust statistical validation.

Findings: The findings show that more than 60% of the farms operate with an efficiency level below 0.4 according to the CCR model, indicating significant potential for input reduction. The use of bootstrapping reveals that the confidence intervals for efficient farms are narrow, confirming their solid performance, while inefficient farms show wide intervals, reflecting high operational volatility.

Implications: The findings underscore the potential of advanced DEA methodologies in understanding and improving rice production efficiency. This study highlights the need for cooperative initiatives, adoption of efficient technologies, and sustainable farming practices to enhance productivity and sustainability in Ecuador's rice bioeconomy.

Originality: This research pioneers the application of DEA combined with bootstrapping in the Ecuadorian rice sector, offering a novel perspective on optimizing resource use and guiding policy decisions. It also contributes to Decision Sciences by providing a robust methodological framework combining DEA and bootstrapping to support complex decision-making for agricultural policy, resource allocation, and sustainability strategies in the bioeconomy.

Keywords: Rice efficiency, DEA, Bootstrapping, Sustainability, Bioeconomy

JEL Classifications: O30, O38, O47

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