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PRODUCTIVITY AND EFFICIENCY OF RICE PRODUCTION: A STUDY OF ECOWAS COUNTRIES

The growth of the economy depends largely on the performance of the agricultural sector, particularly in the developing nations that are popping up all over the globe. Not only does this sector serve as the primary source of employment in rural areas and the foundation of rural economies, but it also makes a significant contribution to the revenues earned from exports in developed economies. This is in addition to the fact that it ensures the continued availability of food and adequate nutrition. Because agriculture plays such a vital role in industrialized nations, academics have dedicated a significant amount of attention and resources to research aimed at increasing agricultural output. Numerous academics have conducted in-depth investigations on the topic of TFP development in agriculture from a variety of different points of view. According to Le et al. (2019), agriculture is vital for both food security and economic development in many countries. A regional group of fifteen countries in West Africa is called the Economic Community of West African States (ECOWAS) aims to promote economic integration in various sectors, such as industry, agriculture, commerce, and social and cultural matters (African Union). A major source of food for many West African countries is rice, which makes up nearly 40% of their total cereal intake. According to Duvallet et al. (2021), the rice production in the Gulf region, where it has been a customary food for the nations along the western shore (Lançon & Erenstein, 2002), is being impacted by climate change.

The concept of total factor productivity, which was proposed by Solow (1957) and is often referred to as the Solow Residual, describes the rate of economic growth that occurs in addition to labour and capital investment as a result of the development of new technologies (Solow, 1957). To put it another way, total factor productivity refers to the proportion of output in economic growth that cannot be explained by the quantity of inputs. It is recommended that total factor productivity be used as an indication of the development of new technologies (Zuo & Bao, 2008). To determine whether or not there has been a shift in rice productivity, we used the Malmquist Index (MI) methodology and look at total factor productivity (TFP) scores. To measure the rice efficiency in ECOWAS countries, we employed DEA techniques. DEA is an optimization technique that computes the efficiencies for different DMUS by finding the optimal input and output weights (Vincova, 2005). According to Shafali et al. (2010), the input is the entire cost, and the outputs are the units of energy created as well as the total energy sold or consumed. The DEA approach does not call for any initial assumptions to be made either the production functions or the relevant standard errors (Takundwa et al., 2017). DEA was developed by Charnes, Cooper, and Rhodes (1978) (CCR), and it is a non-parametric method that is used in the evaluation of decision-making units (DMUs) that have a large number of inputs and outputs (Despotis & Simirlis, 2002). It's possible that a farm won't ever reach its full potential because of things like the flawed nature of the market or its

limited financial resources, among other things. The VRS DEA model, sometimes referred to as the BCC Model, was presented by Banker, Charnes, and Cooper (1984) as a solution to fill up this gap. The comparison of a DMU's weighted outputs and inputs is how the DEA determines how efficient a DMU is. In order to make comparisons between the various DMUs, linear programming models are used (LP). The distance that each DMU is from the efficient frontier, which encapsulates the most accurate observations, is how the efficiency of each DMU is calculated. DMUs whose efficiency scores are lower than the threshold for their category has lower overall efficiency.

In a nutshell, the ECOWAS member states' rice production is approaching its ideal size of production, but this is happening at widely varied rates throughout the region. The effectiveness of rice production in twelve main ECOWAS nations is the subject of this research, which covers the period of time from 2011 to 2020. We assessed the difference in TFP in the rice output of a few chosen ECOWAS nations using MPI. The DEA approach was used in order to conduct an examination of the technical efficiency as well as the scale efficiency of rice production in these West African nations. The result shows that there is a variation in the productivity change of rice production among the top ECOWAS countries in rice production over the period. The Gambia and Burkina Faso have improved their productivity, while Benin and Guinea have declined their productivity. The other countries have not changed their productivity much as the result shows that most countries have achieved a high level of technical efficiency under the BCC method with all countries having a score of 1 except Burkina Faso and La Cote d'Ivoire.

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