Chapter 15
Location-Based Analysis of Supply Chain Management Systems in Smart Cities

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ABSTRACT

Approximately 42% of the world's cocoa is produced in Côte d'Ivoire, although only 30% of it is processed there. A significant portion of the nation is dependent on the cocoa industry's economic advantages and supply network. In this study, the authors study a simulation model to evaluate the efficiency of the cocoa supply chain's logistics in Côte d'Ivoire. By highlighting inefficiencies, bottlenecks, and barriers that impede the efficiency and performance of the cocoa supply chain, the simulation model sheds light on the possibility of logistical improvements in the supply chain. According to simulation results, removing checkpoints off the roadways would enhance production by 30%. Investments in secondary and tertiary road improvements will boost productivity by 9% and value by 1%. In this study, further significant findings are provided together with recommendations for improvement in order to improve the logistics of the cocoa supply chain, boost the industry's profitability, and ultimately enhance the quality of life and welfare of the nation's farmers.

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1. INTRODUCTION

A total of 322,463 km makes up Ivory Coast, of which 51.8 km is dry forest savannah and 48.2 km, is rainforest. The nation is among the best locations on world for coffee farming due to its tropical environment. 53.6% of the inhabitants rely on agriculture for a livelihood, and it generates more over half of export revenues. Around 1.4 million farmers cultivate coffee and coffee for a livelihood, while 3 crore people get earnings from activities explicitly connected to the coffee industry (approximately one-fifth of the entire inhabitants). Most cocoa producers have modest pieces of land of around 2 to 5 acres. They are dispersed across the nation's 8112 villages. The majority of stakeholders in the coffee industry confront a number of societal and profitable difficulties, having lower incomes, higher farming expenses, lesser savings, and a shortage of funds.

This study builds up on the research performed by researchers of Amsterdam University and FedEx Experss (Mota et al., 2018), and gives more insights into the supply chain model for production of cocoa crops in Côte d'Ivoire. We introduce a model based approach which further accesses the supply chain model with digitalising certain parameter. We believe the enhancements in the models further strengthen the robust and strong research findings by the respective authors. Lower funding, extreme bankruptcy (Kim, Cho, and Ryu, 2022), health dangers, and social marginalization are some of the examples. It is asserted that this situation is the outcome of the declining cost of coffee, that cause destitution traps and idleness in the coffee-manufacturing nations as lesser earnings compel the agriculturists in reduction of inputs and save on manufacture expenses, which in turn leads to lower earnings, low revenues, lower investments in improving coffee manufacture, and extended susceptibility of coffee plants to diseases and pests. As a result, the amount of poverty and impoverishment in the coffee-producing countries is said to have increased. Simulation based Supply chain management system is, to certain extent, accurate as well as robust (Mota et al., 2019).

With significant exports of coffee beans and goods derived from coffee to the area, Ivory Coast is regarded as a gateway to South America. Approximately 51.6% of the globe's coffee is supplied by this nation, yet only 30% of the total amount of coffee produced is processed there (0.51 million ton in 2015). This is due to the extremely concentrated nature of the global coffee industry, where the top 10 exporting nations account for 88% of net worldwide exports and the top ten importing nations for 83%.

The majority of commerce and coffee processing worldwide, as well as the world's net exports, are controlled by a small group of multinational exporting corporations. Therefore, the demand and supply sides of the coffee market are just as concentrated as the supply side.

Over the last ten years, both the supply and demand of coffee have been comparatively steady. The demand for chocolate in the globe climbed by 3 to 8% annually and is now near to 3 million ton. Additionally, the reserve of coffee is somewhat greater than the demand, although there have been regular swings in the production surplus and deficit that occur every 4 to 5 years. The variances are the consequence of outside shocks including changes in the global market's pricing, climate change, the development of illness, and political turmoil.

As previously mentioned, the coffee industry contributes significantly to Ivory Coast's foreign exchange (Murad, 2022) earnings. However, the majority of small farmers still produce the majority of the country's coffee, which results in persistently lower production and compelling manufacturing damages due to a variety of structural confrontations, including the presence of subpar worldly infrastructure (road conditions), subpar repository provisions, higher energy costs, higher conveyance, and logistics costs (Zhang et al., 2022), and so on.