

MINIMIZING EMISSIONS AND OPTIMIZING TRANSPORT ROUTES: A SPECIAL CASE RELATED TO GREEN LOGISTICS IN HYBRID MAIZE VALUE CHAIN

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ABSTRACT – This study presents a qualitative analysis focused on minimizing emissions and optimizing transport routes as objectives within the context of green logistics in the hybrid maize value chain. The aim of this research is to provide a comprehensive assessment of the environmental benefits that can be achieved through efficient logistics strategies in the hybrid maize value chain. The study is mainly focused on Badulla district. Source of the data is in-depth interviews and questionnaires taken from 100 maize growers in the area of Meegahakiula and Kandaketiya. Microsoft office package was used in analyzing the data and interpreting the results. This analysis aims to provide potential reductions in emissions and evaluate the optimization of transport routes in order to support sustainable practices. The findings suggested that promoting the use of more fuel-efficient vehicles for transporting maize from farms to processing plants and distribution centers can significantly contribute to reducing carbon emissions and replacing older and less efficient vehicles with newer models is required. Suggestions came out from the study are adopting advanced logistics planning and routing algorithms and it is possible to minimize the distance traveled and also improve the timeliness and reliability of maize deliveries.

Keywords: Emissions reduction; Green logistics; Hybrid maize; Route optimization; Value chain

1. INTRODUCTION

Maize (*Zea mays* L.) is the second important cereal crop, which can be grown successfully in many parts of Sri Lanka under rain fed and irrigated conditions. It is mainly used in the poultry industry as poultry feed ingredient, while a small percentage is being used for human consumption as boiled green cobs or as “Triposha or Samaposha,” or corn flour as a supplementary diet. Maize is mainly cultivated during the maha season as a rain fed crop in the uplands. During the minor season yala season, maize cultivation is limited to paddy fields under supplementary irrigation [1]. The extent cultivated with hybrids has increased over the last few years. Department of Agriculture released the first local hybrid maize variety (Sampath) in 2004. Further, there is a growing export market for meat products in Sri Lanka. Therefore, the demand for maize is projected to surpass 500,000 tons in 2018 [2]. However, limitations in, expansion of local maize farming; poor technological expertise, marketing facilities and fair prices had led to import large portion of national requirement for the production of animal feed [3]. Green logistics is an important concept in optimizing the transport sector, reducing traffic congestion, and minimizing emissions from vehicles [4]. The problem has some features of the integrated production and distribution scheduling problem in that we seek to determine the fleet size and the trucks’ routes subject to a planning horizon constraint [5]. In the hybrid maize value chain, optimizing growth and welfare outcomes with hybrid maize is crucial, even if other crops are promoted [6]. Improvements and maintenance of highways and routes, a road infrastructure in good condition is essential to reduce the disparity in competitive opportunities between maize producers and between companies located in places far from the centers of demand and those located at a shorter distance. Improvement of rural roads is required since there are roads without maintenance, severe erosion, cuts that are more and more prolonged, Lorries without completing their load so as not to fit in, high transportation costs. In the context of green logistics, a green and low-carbon logistics distribution route optimization with minimum cost has been crucial [7].

2. MATERIALS AND METHODS

Primary data were collected from 100 respondents of two main maize growing DS divisions (Kandeketiya and Meegahakiula) of Badulla district. Structured questionnaire, focus group discussions with key informants of the value chain and field visits were main data collection tools and secondary data was used. Random sampling method was used in the study. Representative from maize growing farmers from selected DS divisions was selected as the feasibility of the study. The data were collected within a week from March 2023. Descriptive statistics were used to explore the characteristics of the data. Objective is to evaluate the potential of strategies to promote green logistics of hybrid maize. Frequencies and percentages were also calculated for categorical variables. Microsoft Excel package was used in analyzing the data.

3. RESULTS AND DISCUSSION

3.1. Value Chain Roadmap

The value chain roadmap of hybrid maize in Sri Lanka involves several actors, including maize farmers, seed distributors, and clients. However, the overall productivity of maize requires logistics like, storing, warehousing, transportation like steps in the chain of its value addition.

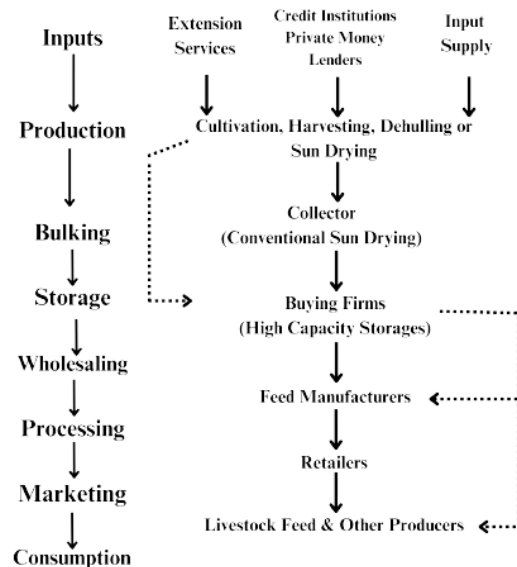


Figure 1. Value Chain Roadmap of Hybrid Maize

3.2. Minimizing Emissions

This study explored the implementation of green logistics concepts in the transportation of the hybrid maize value chain in Sri Lanka. The findings suggest that several measures can be taken to promote sustainability in this sector. Firstly, promoting the use of more fuel-efficient vehicles for transporting maize from farms to processing plants and distribution centers can significantly contribute to reducing carbon emissions. By replacing older and less efficient vehicles with newer models that incorporate fuel-saving technologies, transportation-related greenhouse gas emissions can be substantially decreased. In addition to vehicle efficiency improvements, optimizing transportation routes and schedules can have a significant impact on

reducing the carbon footprint associated with transportation in the hybrid maize value chain. By adopting advanced logistics planning and routing algorithms, it is possible to minimize the distance traveled, avoid congestion, and enhance overall operational efficiency. Such optimization strategies not only reduce emissions but also improve the timeliness and reliability of maize deliveries. Such initiatives can serve as a blueprint for other logistics facilities in Sri Lanka and beyond, inspiring the adoption of sustainable practices in the transportation of agricultural commodities. Overall, stakeholders can work collaboratively towards achieving a greener and more environmentally friendly maize transportation system.

4. CONCLUSION

With the optimization approaches presented here, in the “Green Logistics” demonstrate the practicability and potential of environment friendly logistics services. The final outcomes of the study is, encouraging the adoption of fuel-efficient vehicles in the transportation of maize from farms to processing plants and distribution centers can make a substantial impact in carbon emission reduction. The replacement of outdated and less efficient vehicles with newer models is essential. The action recommendations and guidelines derived from this study suggested by implementing sophisticated logistics planning and routing algorithms.

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