

Developing a Spatial Transport Model to Determine Optimal Routes When Delivering Unprocessed Milk

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Abstract : In Malawi, smallholder dairy farmers transport unprocessed milk to sell at Milk Bulking Groups (MBGs). MBGs store and chill the milk while awaiting collection by processors. The farmers deliver milk using various modes of transportation such as foot, bicycle, and motorcycle. As a perishable food, milk requires timely transportation to avoid deterioration. In other instances, some farmers bypass the nearest MBGs for facilities located further away. Untimely delivery worsens quality and results in rejection at MBG. Subsequently, these rejections lead to revenue losses for dairy farmers. Therefore, the objective of this study was to optimize routes when transporting milk by selecting the shortest route using time as a cost attribute in Geographic Information Systems (GIS). A spatially organized transport system impedes milk deterioration while promoting profitability for dairy farmers. A transportation system was modeled using Route Analysis and Closest Facility network extensions. The final output was to find the quickest routes and identify the nearest milk facilities from incidents. Face-to-face interviews targeted leaders from all 48 MBGs in the study area and 50 farmers from Namahoya MBG. During field interviews, coordinates were captured in order to create maps. Subsequently, maps supported the selection of optimal routes based on the least travel times. The questionnaire targeted 200 respondents. Out of the total, 182 respondents were available. Findings showed that out of the 50 sampled farmers that supplied milk to Namahoya, only 8% were nearest to the facility, while 92% were closest to 9 different MBGs. Delivering milk to the nearest MBGs would minimize travel time and distance by 14.67 hours and 73.37 km, respectively.

Keywords : closest facility, milk, route analysis, spatial transport

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