Determining the Efficiency of the Government of Ghana's Network of Grain Storage Facilities

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Abstract

Governments in developing countries design networks of grain storage facilities to help farmers store excess agricultural produce to prepare for climate induced crop failures. The efficiency of such networks has serious economic and food security implications on respective countries. Periodic review of the efficiency of such networks is necessary to identify lapses and opportunities for optimization. Past studies on efficiency of networks of facilities, which usually assume scenarios peculiar to the developed world used data that are usually unavailable or unreliable in developing countries. This work therefore developed an integrated approach that relies solely on readily available and reliable governmental and open source data to compute the short and long-term efficiencies of networks of grain storage facilities. This approach was used to analyze the efficiency of the government of Ghana's network of forty-eight grain storage facilities. A transportation model was used to compute the total transportation cost within the existing network. A P-median model was then used to develop and compute the transportation cost of a theoretically optimal network. Outputs from a forecasting model were used with the transportation and P-median models to study the short and long-term efficiencies of the existing and optimal networks. The average short and long term efficiencies of the existing network were 66% and 26% respectively. The study also investigated the efficiencies of a rank network which is created by siting GSF's in only high grain production districts. The short and long-term efficiencies of this network were 87% and 72% respectively. The study showed that Ghana's GSFs were sub-optimally sited hence farmers would have to travel excessively longer distances than necessary to use it. This offers some explanation for its low patronage. Furthermore, the study shows that a rank network was not as efficient as the optimal network. This study therefore demonstrates the use of this integrated approach coupled with readily available data to analyze networks of grain storage facilities in developing countries.