

## ABSTRACT

The sugar sub sector is a strategic segment in Kenyan economy, as it is a source of livelihood to over one million people in Kenya. It offers employment and helps in rural infrastructural development. It is also a commodity that has faced a lot of competition from imported sugar under the COMESA protocol or from the residual world market. The cost of production in Kenya has been high when compared to other regional producers and world market prices, which for political and economic reasons are lower than the production costs in most factories in Kenya. In this study stochastic optimization model was applied to establish the optimal production mix for resources allocation to reduce cost of production. The objectives of the study were to: Evaluate the effect of labour on the cost of production, evaluate technology (machinery) cost on efficiency and cost of production, analyse standard operation cost drivers in sugar production, analyse overhead cost on process structure and operation procedure design in sugar production in Kenya. In developing the conceptual frame work, Dantzig and Von Neumann (simplex and duality theory) and Charness and Coopers (goal programming) optimization models informed the study.  $\text{Min } Z = D_{u_1} - D_{o_1} + D_{u_2} - D_{o_2} + \dots + D_{u_n} - D_{o_n}$ . The sample was drawn from five out of eleven sugar factories in western Kenya. Purposive random sampling was used to get 271 from target population of 921. Both secondary and primary data were obtained through historical information or secondary sources of data. Questionnaires, interviews and observation sheets were adopted as tools of data collection. Mathematical analysis was done on data using stochastic optimization model with goal programming. Statistical data was also analysed using SPSS version 20. ANOVA analysis was done to establish the significance of the result. The model application established the level of underachievement based on the operation constraints at USD 86 on sugar production cost achievement level. Which means that with proper production mix current situation still in place the best technology can only produce sugar at USD 386. On statistical analysis, the overall mean of 4.09 was attained on a Likert scale of 1-5, confirming that there is need for proper organization of the resources used in production. Age of technology was also correlated to stoppage hours and  $\rho$  (rho) was got as 0.9, implying that age of machine account for 90% of the idle time hence there was need to modernize technology (machinery). The conclusion was that stochastic optimization model with goal programming can be used to regulate resources to reduce cost of production. The recommendations is that, technology should be modernized, cane variety need to be improved and to the body of knowledge, the study added new knowledge in the the use of stochastic optimization model with goal programming in management systems.