



Research article

Application of fuzzy goal programming model to assess optimal multi crop cultivation planning

Navodi Mekhala Hakmanage*, Nishani Vasana Chandrasekara†, Mangalika Jayasundara†

Department of Statistics & Computer Science, Faculty of Science, University of Kelaniya, Dalugama, Kelaniya 11300, Sri Lanka

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Abstract

Importance of the work: Planning for the optimal use of resources in agricultural systems considering uncertainty, with the objective of maximizing profit and production, will improve the social and economic conditions of farmers.

Objectives: A rural farming area in Sri Lanka was used as a study site to apply the fuzzy goal programming (FGP) approach to identify the optimal cultivation plan and land resource allocation under uncertainty to optimize profit, production, labor, water use, fertilizer costs and land allocation.

Materials & Methods: A tolerance-based FGP technique was used to quantify the fuzziness of different goals for the model. This study was carried out using 24 crops on a total land area under cultivation of 47.4 ha. These crops were categorized into three varieties: vegetable, fruit and other. Furthermore, the crops were classified into seven groups according to the required period of cultivation.

Results: The proposed model suggested statistically significant increments of 11% and 10.6% for the net return and harvest amount, respectively, for the 24 crops compared to existing cultivation techniques.

Main finding: The FGP multi-crop cultivation planning approach is a new application for the Sri Lankan rural farming community and it should be useful for agricultural planners, by allowing them to make more informed recommendations to the farming community. Crops that provide higher levels of production and profit than those currently being cultivated should be developed to extend cultivation under the supervision of agricultural experts or officers to obtain sustainable development of cultivation.

† Equal contribution.

* Corresponding author.

E-mail address: navodi93mekala@gmail.com (N.M. Hakmanage)

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