



Plithogenic CRITIC-MAIRCA Ranking of Feasible Livestock Feeding Stuffs

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Abstract

The objective of any decision-making method in a plithogenic environment is to make an optimal ranking of the alternatives subjected to core essential criteria. The preference for plithogenic decision-making methods is gaining momentum in recent times as plithogenic representations are more comprehensive and efficient in handling uncertain and imprecise decision-making data. In this paper, a plithogenic CRITIC-MAIRCA decision-making model is developed and applied to decision-making on livestock feeding stuff. A total of 20 alternatives under three major feed categories of green fodder, subsidiary fodder and concentrate feed are ranked using MAIRCA (The Multi Attributive Ideal-Real Comparative Analysis) method and the criterion weights are determined using the method of CRITIC (CRITERIA Importance Through Inter-criteria Correlation). The final results of the plithogenic ranking are compared with fuzzy and crisp ranking methods and it is observed that the plithogenic CRITIC-MAIRCA method is highly efficient in making a feasible ranking.

Keywords: CRITIC-MAIRCA; plithogenic decision making; livestock; feeding stuff

1. Introduction

Multi-criteria decision-making (MCDM) is a conflict -resolving process characterized by alternatives, criteria and suitable methods of processing data represented in the form of a decision matrix. It is the choice of the experts and their opinions that play a key role in determining the nature of decision making. Deterministic decision making occurs when the input decision matrix is quantitative with precise data, but in many instances only a qualitative decision matrix with uncertain and imprecise data is available. To handle such circumstances, fuzzy decision-making methods are introduced and later they are extended to intuitionistic and neutrosophic decision-making systems.

The fuzzy and its extended decision-making methods are differentiated by various forms of data representations. Zadeh [1] introduced the theory of fuzzy sets. In fuzzy MCDM, the values of the decision matrix are either fuzzy values or linguistic variables represented using fuzzy numbers. Intuitionistic fuzzy sets developed by Atanassov [2] are characterized by membership and non-membership values. The intuitionistic fuzzy MCDM decision matrix consists of intuitionistic representations of data. The concept of hesitancy also forms a part of intuitionistic fuzzy sets. Smarandache [3] coined neutrosophic sets as an extended version of intuitionistic fuzzy sets. The neutrosophic sets consist of truth, falsity and intermediate membership values. In neutrosophic MCDM, the representations of data with intermediate membership values facilitate optimal ranking. In addition to these major types of data representations in MCDM, the other forms of representing data as interval-value sets, Pythagorean sets, are also used based on the decision needs.