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An Analysis of Soil Content for Plant Nutrients Using Fuzzy Soft Sets

R.Sophia Porchelvi [1], M.Slochana[2]
[1]*Associate Professor,* [2]*Assistant Professor, Department Of Mathematics, A.D.M College For Women (Autonomous), Nagapattinam-611 001, Tamil Nadu, India.*
Corresponding Author: R.Sophia Porchelvi 1

Abstract: This paper deals with the problem of analyzing the soil content and select the best place for cultivation. Here, the Problem is solved using the concept of Fuzzy soft sets.
Keywords: Fuzzy soft sets, Soil, Cultivation

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I. INTRODUCTION

Soil is the important natural resources of the earth. The factors responsible for influencing the soil formation are Climate, Living organism, Nature of parent material, Topology, and Time.

The term of the 'soil' means floor or ground. The formulation of a simple definition of the soil is made difficult by the great diversity of soils in the world. In general, solid refers to the loose surface of the earth as distinguished from the solid rock. Soil has the three -fold function-physical, chemical and biological. The important physical function of soil is to act as a mechanical support for the growing plant. The soil acts as a reservoir of water and soil.

Chemically, the soil may be looked upon as a store-house of plants and nutrients. It contains a large number of compounds of both organic and inorganic origin. The soil is the habitat of a very large number of organisms. Some of these organisms like worms, insects, etc. are big, while others like bacteria, fungi, etc. are of a microscopic size. In the present investigation surface soil samples were collected from three locations in farmer's fields in the Nagapattinam region of the Cauvery delta zone.

In mathematics, fuzzy sets are sets whose elements have degrees of membership. Fuzzy sets were introduced by Lotfi Zadeh (1965). In classical set theory, the membership of elements in a set is assessed in binary terms, and according to bivalent condition- an element either belongs or does not belong to the set. By contrast, fuzzy set theory permits the gradual assessment of the membership of elements in a set this is described with the aid of the membership function valued in the real unit interval [0, 1]. In fuzzy set theory, classical bivalent sets are usually called crisp sets. Molodtsov (1999) introduced the concept of soft set as a completely new Mathematical tool with adequate parameterization for dealing with uncertainties. Soft Sets are intended to capture and to defuse the conflicts among existing Fuzzy Set Theories and has given basic notation of the theory of soft sets, to present the first results of the theory and to discuss some problems of the future.

II. PRELIMINARIES

2.1 Row Sum

The row-sum is denoted by r_i, and is calculated by using the formula

$$r_i = \sum_{j=1}^{m} C_{ij}$$

2.2 Column Sum

The column-sum is denoted by C_j, and is calculated by using the formula

$$C_j = \sum_{i=1}^{m} C_{ij}$$

2.3 Score

The score is denoted by S_i and given as $S_i = r_i - C_j$.

2.4 DETERMINATION OF SOIL CONTENT FOR PLANT NUTRIENT USING FUZZY SOFT SETS

ANALYSIS A set of all types of soil sample place S={ s_1, s_2, s_3}. For i=1, 2, 3 an alternatives s_i stands for "Venmani", "Naluvethapathi", "Sembodai" which may be characterized by a set of all parameters $N = \{n_1, n_2, n_3\}$. For j=1, 2, 3 the parameters n_j stands for "Nitrogen", "Phosphorous", "Potassium" respectively.

soil sample place	Nitrogen	Phosphorous	Potassium
Venmani	**97**	**84**	**48**
Naluvethapathi	**132**	**56**	**140**
Sembodai	**149**	**89**	**63**

Table 1 Original data of Soil sample

The comparison table of the table 1 is

	s_1	s_2	s_3
s_1	**3**	**1**	**0**
s_2	**2**	**3**	**1**
s_3	**3**	**2**	**3**

Table 2 Comparison Table

Next we compute the row-sum, column-sum of the table 2 and the score for each soil sample place is given below:

Calculation of row sum

$$r_i = \sum_{j=1}^{m} C_{ij}$$

s_1 = 4
s_2 = 6
s_3 = 8

Calculation of column sum

$$C_j = \sum_{i=1}^{m} C_{ij}$$

s_1 = 8
s_2 = 6
s_3 = 4

Calculation of score

$S_i = r_i - C_j$
s_1 = -4
s_2 = 0
s_3 = 4

The row-sum, column-sum of the table 2 and the score for each soil sample place is given below:

	Row-sum	Column-sum	Score
s_1	**4**	**8**	**-4**
s_2	**6**	**6**	**0**
s_3	**8**	**4**	**4**

Table 3 Row sum, column sum and score

The graphical representation of row-sum, column-sum and the score for each soil sample place is given below:

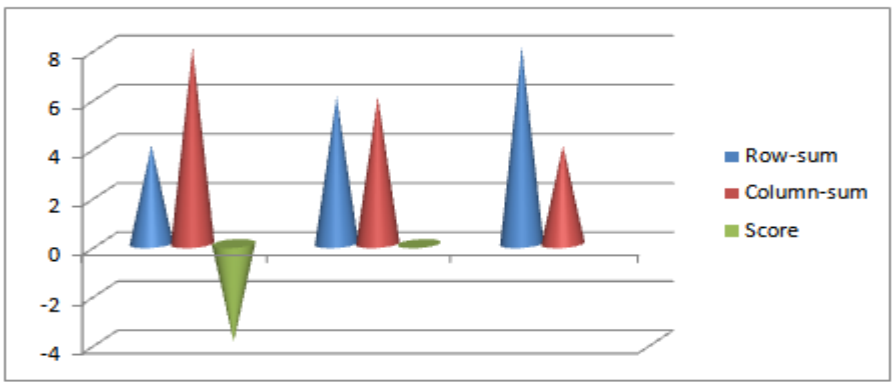

Figure 5.1 Graphical representation of Maximum score

III. CONCLUSION

Clearly, the maximum score is 4, scored by the soil sample place s_3(Sembodai). By using Fuzzy soft sets, from the above analysis, it is concluded that the fertility status of the majority of these soil was grouped under Nitrogen, phosphorous, Potassium in recommending quantities along with FYM/ compost at the rate of 12.5/ha for each group is recommended for all these soils. Since micronutrient is prevalent in the Cauvery delta region, particularly at Sembodai.

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