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Mathematical Model for Analysis of Problems Encountered by the Mango Cultivators in Konkan Region

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Abstract

In this research project, we are attempting to identify various problems encountered by the Mango cultivators in Konkan region. Konkan region is situated on West coastal line. Alphanso mangoes is main product in this area. It is seasonal product. The production of mangoes and the profit due to this production is affected by lot of factors. We felt it necessary to study various factors which decide profit from mango cultivation. We studied some factors which affect the profit of Mango cultivators.

Form the collected information we identified the range of number of trees, which is least affected by problems.

INTRODUCTION

To describe situations mathematically which are vague or fuzzy in nature Zadeh [3], introduced the theory of fuzzy sets. Fuzzy relations and fuzzy relational equations have important applications in pattern classification, clustering, fuzzy information retrieval, performance and so on. In system models based on fuzzy sets, one often uses fuzzy matrices to define fuzzy relations.

A fuzzy matrix is a matrix with element having values in the fuzzy interval. In this article, the unit interval [0, 1] and the interval [-1, 1] are called fuzzy intervals[3].

Alphonso Mango cultivation is major cultivation in Konkan. Alphonso Mango is

produced in Konkan region have its unique taste appreciated worldwide. Mango cultivation is major source of income in Konkan region. But the cultivators face many problems in Mango cultivation, a research has been conducted to study the problems encountered by them and inference were drawn using fuzzy matrices.

APPLICATION OF FUZZY MATRICES

In order to analyse the problems encountered by Mango cultivators, an interview schedule was administrated to 50 Mango cultivators by dividing Konkan region into 3 sub-regions : (i) Devgad to Rajapur (ii) Pawas to Jaygad (iii) Palshet to Kelshi.

The list of problems encountered by them are as follows :

P1 - Repeated flowering and fruit drop.

P2 - Quality drop of fruit.

P3 - Lowering of fruit bearing capacity of Mango plant.

P4 - Unseasonal rain, overheat or cold.

P5 - High cost of pesticides and fertilisers.

P6 - Unavailability of skilled labour and increase in wages.

P7 - Destruction of crop by monkeys.

P8 - Inconvenience in transport and distant market.

P9 - Lower rate from market.

P10 - Bi-year flowering tendency of Alphonso.

Based on their number of trees the respondents were grouped into five categories as detailed below :

Number of trees	Number of respondent
1 to 100	10
101 to 200	10
201 to 300	10
301 to 400	10
401 to 500	10

By taking the above five categories as row and number of respondents suffering due to problems as column, a 5x10 initial raw data matrix called Time Dependent Matrix (TD Matrix) [1] was formed.

Number of trees	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
1 to 100	5	2	2	9	4	6	10	4	4	9
101 to 200	4	0	0	10	0	10	10	3	3	10
201 to 300	4	2	2	10	6	3	9	0	1	9
301 to 400	7	4	4	10	8	10	7	1	1	5
401 to 500	9	8	8	10	10	7	10	5	6	5

The initial raw data matrix has been converted into Average Time Dependent Matrix (ATD Matrix)[1] (aij) by dividing each entry with width of the respective class-interval.

ATD MATRIX

Number of trees	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10
1 to 100	0.05	0.02	0.02	0.09	0.04	0.06	0.10	0.04	0.04	0.09
101 to 200	0.04	0.00	0.00	0.10	0.00	0.10	0.10	0.03	0.03	0.10
201 to 300	0.04	0.02	0.02	0.10	0.06	0.03	0.09	0.00	0.01	0.09
301 to 400	0.07	0.04	0.04	0.10	0.08	0.10	0.07	0.01	0.01	0.05
401 to 500	0.09	0.08	0.08	0.10	0.10	0.07	0.010	0.05	0.06	0.05

The average (μj) and standard deviation (σj) of every column were worked out as follows :

Average	0.058	0.032	0.032	0.098	0.056	0.072	0.092	0.026	0.030	0.058
Standard Deviation	0.019	0.027	0.027	0.004	0.034	0.026	0.012	0.019	0.019	0.028

Using the The average (μj), standard deviation (σj) and parameter (α) from the interval [0, 1], a fuzzy matrix called the Refined Time Dependent Data Matrix (RTD Matrix)[1] was formed. The RTD matrix with entries eij, where eij ϵ {-1, 0, 1} was formed using following formula[1].

If $aij \leq (\mu j - \alpha * \sigma j)$ then eij= -1

Else if aij ϵ $(\mu j - \alpha * \sigma j, \mu j + \alpha * \sigma j)$ then eij =0

Else if aij $\geq (\mu j + \alpha * \sigma j)$ then eij = 1, where aij's are entries of Average Time Dependent Matrix.

By varying parameter α ε [0, 1], any number of refined time dependent data matrices can be obtained. Three of such matrices obtain were as follows:

RTD Matrix for α =0.25

-1	0	0	-1	-1	-1	1	1	1	1
-1	0	0	1	-1	1	1	0	0	1
-1	0	0	1	0	-1	0	-1	-1	1
1	0	0	1	1	1	-1	-1	-1	-1
1	0	0	1	1	0	1	1	1	-1

Row sum Matrix

0
2
-2
0
5

RTD Matrix for α =0.50

0	0	0	-1	0	0	1	1	1	1
-1	-1	-1	1	-1	1	1	0	0	1
-1	0	0	1	0	-1	0	-1	-1	1
1	0	0	1	1	1	-1	-1	-1	0
1	1	1	1	1	0	1	1	1	0

Row sum Matrix

3
-1
-2
1
8

RTD Matrix for α =0.75

0	0	0	-1	0	0	0	1	0	1
-1	-1	-1	0	-1	1	0	0	0	1
-1	0	0	0	0	-1	0	-1	-1	1
0	0	0	0	0	1	-1	-1	-1	0
1	1	1	0	1	0	0	1	1	0

Row sum Matrix

1
-2
-3
-2
6

By Combining All These Matrices, The Combined Effect Time Dependent Data Matrix (CETD Matrix) [1], Which Gives The Cumulative Effect All These Entries Was Obtained As Follows:

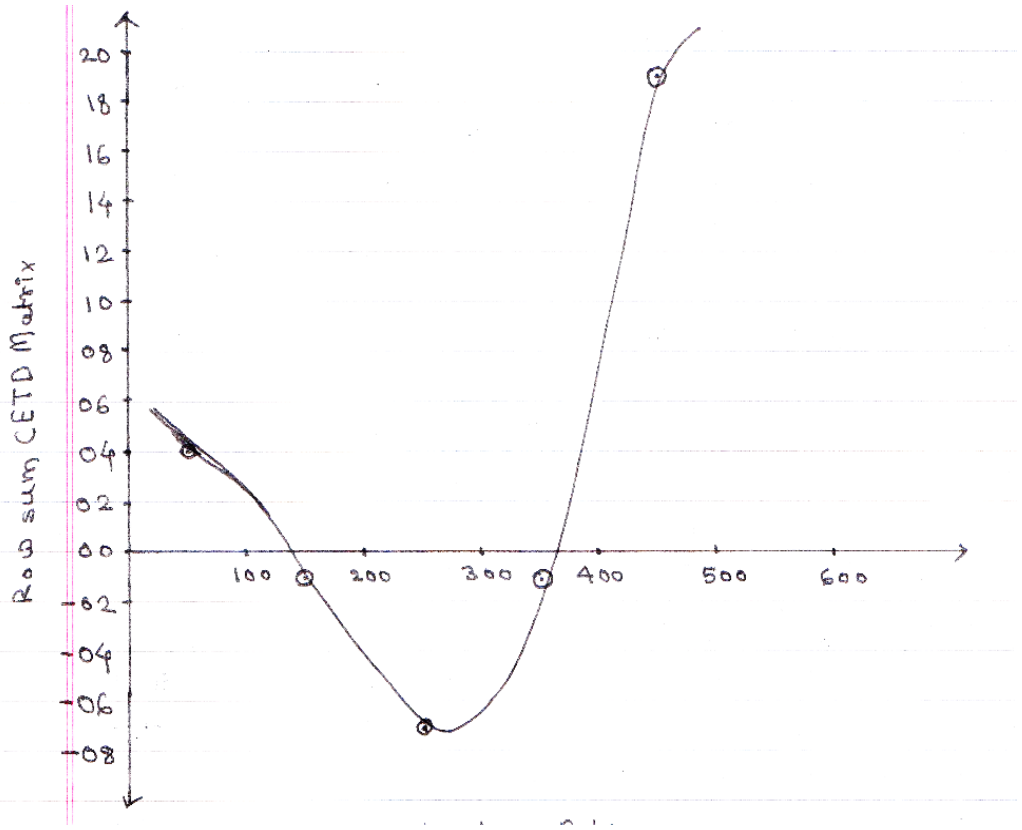
CETD Matrix

$$\begin{bmatrix} 0 & 0 & 0 & -1 & 0 & 0 & 0 & 1 & 0 & 1 \\ -1 & -1 & -1 & 0 & -1 & 1 & 0 & 0 & 0 & 1 \\ -1 & 0 & 0 & 0 & 0 & -1 & 0 & -1 & -1 & 1 \\ 0 & 0 & 0 & 0 & 0 & 1 & -1 & -1 & -1 & 0 \\ 1 & 1 & 1 & 0 & 1 & 0 & 0 & 1 & 1 & 0 \end{bmatrix}$$

Row sum Matrix

$$\begin{bmatrix} 4 \\ -1 \\ -7 \\ -1 \\ 19 \end{bmatrix}$$

The graph as shown below exhibited the group of respondents (based on land holding) worst affected.



For Paclobutrazol factor :

Paclobutrazol users	Problems	Pactrobutrazol non-users	Problems
1	7	1	3
2	6	2	2
3	7	3	4
4	8	4	5
5	7	5	5
6	9	6	4
7	7	7	5
8	7	8	5
9	8	9	4
10	9	10	4

Mean Problems= 8 **Mean Problems= 4**

For Trading Factor :

Indirect Trader	Problems	Direct Trader	Problems
1	8	1	3
2	8	2	2
3	6	3	5
4	7	4	4
5	7	5	5
6	8	6	4
7	8	7	4
8	8	8	5
9	10	9	2
10	8	10	3

Mean Problems= 7 **Mean Problems= 4**

CONCLUSION

i. From the graph it is observed that the cultivators having trees ranging between 200 and 300 are least affected by such problems.
ii. Paclobutrazol users are more affected by such problems than paclobutrazol non-users.
iii. Indirect traders are more affected by such problems than direct traders.

REFERENCE

[1] Vasantha Kandasamy, W.B. Florentin Smarandache and llanthenral, K., "Elementary Fuzzy Matrix Theory and Fuzzy Models for Social Scientists", Automaton Publishers, Los Angeles, 2007.

[2] Vasantha Kandasamy, W.B. Florentin Smarandache and llanthenral, K., "Elementary Fuzzy Matrix Theory and Fuzzy Models for Social Scientists", Info Lean Quest Publishers, Ann Arbor, 2007.

[3] Zadeh, L.A., "Fuzzy Sets", Information and Control, 8 (1965) 338-353.