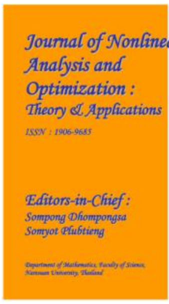
Journal of **N**onlinear **A**nalysis and **O**ptimization
Vol. 15, Issue. 2, No.3 : 2024
ISSN : **1906-9685**



MULTI OBJECTIVE - EMERGENCY TRANSPORTATION PROBLEM IN NEUTROSOPHIC FUZZY ENVIRONMENT

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Abstract

Objectives: The primary objective of this work is to offer a constructive solution for a transportation problem with several goal functions under emergency, disaster, or catastrophic scenarios. This study concentrates on Vogel's Approximation Method (VAM), which is applicable in solving real-life-oriented MOETP (Multi-Objective Emergency Transportation Problem) using Neutrosophic Fuzzy
Methods: The purpose of this paper is to evaluate the VAM's appropriateness for solving critical transportation problems. And to ascertain whether this approach is the best one, it is compared with other approaches (Rusell's Approximation Method (RAM), Heuristic Method (HM-1 & 2), etc., that are currently in use.
Findings: After an enormous flood, data was gathered from the area affected by the flood to determine the optimal route for transportation. Based on this survey data, this emergency transportation problem was created. VAM provides the best choice in an emergency, according to our analysis of the data. The usefulness and validity of the suggested approach are demonstrated with a numerical example.
Novelty: The intention of the problem is to choose the best transportation path with the minimum expenditure rate, the most possible quicker way, and paramount manpower to the people of the flood-affected area with the help of Neutrosophic fuzzy.

Keywords: Entropy value, MOETP, Neutrosophic fuzzy set, VAM, Weightage

1. Introduction

An unanticipated series of bad events like deadly diseases, hurricane, tornado that affect society is called a natural disaster. Numerous natural disasters harm both the environment and the creatures that inhabit it. Tsunami, earthquake, flood, cyclone, landslip, volcanic eruption, are a few of them. Almost 90% of the civilians undergo one catastrophic tragedy at a point of life. People who are impacted by damage may have financial strain due to property loss, living space, business places etc.,

Numerous successful technical methodologies, including industrial placement, manpower planning, investments, tourism, and so on, have been handled by the MOTP technique. The unique hospitality and mathematical qualities are the noticeable features behind the success of this approach. The transfer of commodities between several origins and destinations is underlining demand of transportation problem, which is a linear programming problem of the distribution type. The concept's initial goal is to achieve maximum profit, while outsourcing least expensive and time. In 1941, Hitchcock introduced transportation problems (TP) after analyzing them. He had provided an explanation of TP, which refers to the distribution of goods from different supply points to different destination points. These transportation-related issues are related to a single goal. However, in the world of realistic scenarios, transportation criteria typically involve a number of contradictory and imprecise parameters. A method that addresses this type of problem is known as Multi- Objective Transportation Problem (MOTP).

Due to the conflict and imprecise nature, it has became very challenging to solve. In order to get around this problem, Zadeh introduced Fuzzy Set Theory (FST) in 1965. Since 1965, numerous researchers have examined and analyzed fuzzy transportation problems (FTP) and have also developed numerous novel ideas in this area. While FST is a useful tool, there are some uncertain situations that it cannot handle, making it difficult to prove the membership degree. In order to get around this restriction, Atanassov introduced the Intuitionistic fuzzy set (IFS) in 1986 as an expansion of FST. In order to tacklethe TP problem, several researchers looked at the IFS.

Emergency situations are characterized by multiple- uncertainty cases and insufficient information. Smarandache (1998) introduced needless ambiguities and put forth the notion of a Neutrosophic set (NS), accounting for three factors: the degree of Truth (T), the degree of Indeterminacy (I), and the degree of Falsity (F). To deal with such imprecise and ambiguous information, this was done. Employing fuzzy programming techniques,

In 2019, a discussion regarding specific fuzzy neutrosophic matrices and operators was held by Sophia Porchelvi and Jayapriya[1]. Using the cost mean and a complete contingency cost table, Sikkannan et. al [2] solved the Neutrosophic transportation problem. An algorithm was given by Kumar A. et al.[3] to address the transshipment problem in an uncertain setting. Transportation problems were tackled by Saini et al.[4] using single-valued trapezoidal Neutrosophic numbers. Studies on multi-objective non-linear four-valued refined neutrosophic optimisation have been done by Freen et. al [5] in 2020. Lin Lu et. al [6] in 2020 used a single-value neutrosophic set with these three membership functions to address the emergency transportation problem. Using a fuzzy soft set, Snekaa and Sophia Porchelvi [7] used the Hungarian method in2020 to determine each player's position. In 2021, Hepzibah et al [8] worked on solving Neutrosophic Unconstrained Optimization Problems. The multi objective fractional transportation problem was presented by Veeramani C. et al.[9] using the neutrosophic goal programming technique in 2021. Aakanksha Singh et al.[10] (2021) devised a solution for the bilevel transportation problem using neutrosophic numbers. Recently (2022), Joshi VD, [11] were working in a neutrosophic environment to solve a multi-objective linear fractional transportation problem. Multi-objective fixed-charge transportation problem had solved by Giri and Roy [12]using Neutrosophic fuzzy in 2022.
Mardanya and Roy[13] have devised a novel method to address the fuzzy multi-objective multi-item solid transportation problem. Maheswari [14]et al., [2024] created a novel approach to address transportation issues in a Neutrosophic environment. Gupta et al. [15][2024] gave an application for multi-objective fixed-charge transportation problem using Neutrosophic goal programming approach

Here, the primary goal of this new method is to offer the most appropriate possible solution, under any emergency circumstances, to a transportation problem with multiple objective functions. The article is categorized as follows:

- Afterthe introduction, section 2 discusses some basic concepts.
- Section 3 talks about MOETP in a Neutrosophic environment and the problem procedure.
- The application of MOETP for problem solving is presented in Section 4.
- Section 5 deals with the comparison of the proposed method.
- Section 6 discusses the interpretation of the results.
- The conclusion of the paper can be found in the final section.

2. PRELIMINARIES

Definition 2.1[1]

Let X be an universe of discourse. A Neutrosophic fuzzy set N^A of X can be defined as $N^A = \{(x, T_{N^A}(x), I_{N^A}(x), F_{N^A}(x))/x \in X\}$ Where $T_{N^A}(x)$ is truth – membership, $I_{N^A}(x)$ is indeterminacy membership $F_{N^A}(x)$ is falsity- membership function such that $T_{N^A}(x), I_{N^A}(x), F_{N^A}(x)$: X→$\left]^{-}0,3^{+}\right[$ for all $x \in X$ and $^{-}0 \leq T_{N^A}(x) + I_{N^A}(x) + F_{N^A}(x) \leq 3^{+}$.

Definition 2.2

Some basic values of Neutrosophic fuzzy set are given by

a) Normalize value $r_{ij} = \frac{x_{ij}}{\sum_{i=1}^{m} x_{ij}}$

b) Entropy value, $e_j = -h\sum_{i=1}^{m} r_{ij}\, In\, r_{ij},\ j = 1,,2,,..,n$

$h = \frac{1}{In(m)}$ where m is the number of constraints

c) Weight vector $w_j = \frac{1-e_j}{\sum_{j=1}^{n}(1-e_j)}$, $j = 1,,2,,..,n$

3. Methodology

3.1 Vogel's Approximation Method (VAM)

The following describes the steps involved in Vogel's Approximation Method (VAM).

1. Identify the problem and organize the data into a matrix form.
2. Determine which two minimum values exist in each row and column. After that, subtract those two lowest values.
3. Decide which row and column has the biggest difference in value.
4. Choosing the cell in a row or column that has the smallest difference value. Allocate the cell after that.
5. Steps 2 through 4 should be repeated until the cell is allocated as much as possible.

3.2 Multi-Objective Transportation Problem underNeutrosophic Environment

Defining the problem in the form of Neutrosophic fuzzy set as

$$D_N = \left(\bigcap_{i=1}^{m} O_i\right)\left(\bigcap_{j=1}^{n} C_j\right)(x, H_D(x), I_D(x), K_D(x))$$

Where $O_i \rightarrow neutrosophic\ objectives$;

$C_i \rightarrow neutrosophic\ constrains$;

$H_D \rightarrow truth\ membership\ grade$;

$I_D \rightarrow indeterminacy\ membership\ grade$;

$K_D \rightarrow falsity\ membership\ grade.$

$$H_D(x) = min\begin{Bmatrix} H_{o1}(x), H_{o2}(x), \dots H_{om}(x); \\ H_{c1}(x), H_{c2}(x), \dots H_{cn}(x) \end{Bmatrix} \forall x \in X$$

$$I_D(x) = min\begin{Bmatrix} I_{o1}(x), I_{o2}(x), \dots I_{om}(x); \\ I_{c1}(x), I_{c2}(x), \dots I_{cn}(x) \end{Bmatrix} \forall x \in X$$

$$K_D(x) = min\begin{Bmatrix} K_{o1}(x), K_{o2}(x), \dots K_{om}(x); \\ K_{c1}(x), K_{c2}(x), \dots K_{cn}(x) \end{Bmatrix} \forall x \in X$$

To find U_K and L_K for each objective functions, for formulating the membership values, Where $U_K -$ upper bound and $L_K -$ lower bound are defined as follows

$U_K = max\{H_K(x)\}_{K=1}^{K}$ and $L_K = min\{H_K(x)\}_{K=1}^{K}$

Then, with the help of bounded values, the membership values are determined as follows

$$H_K(Z_K(x)) = \begin{cases} 1 & if\ Z_K(x) \le L_K^H \\ 1 - \dfrac{Z_K(X) - L_K^H}{U_K^H - L_K^H} & if\ L_K^H \le Z_K(x) \le U_K^H \\ 0 & if Z_K(x) \ge U_K^H \end{cases}$$

$$I_K(Z_K(x)) = \begin{cases} 1 & if\ Z_K(x) \le L_K^I \\ 1 - \dfrac{Z_K(X) - L_K^I}{U_K^I - L_K^I} & if\ L_K^I \le Z_K(x) \le U_K^I \\ 0 & if Z_K(x) \ge U_K^I \end{cases}$$

$$K_K(Z_K(x)) = \begin{cases} 1 & if\ Z_K(x) \ge L_K^K \\ 1 - \dfrac{L_K^K - Z_K(X)}{U_K^K - L_K^K} & if\ L_K^K \le Z_K(x) \le U_K^K \\ 0 & if Z_K(x) \le U_K^K \end{cases}$$

3.3 Problem Procedure For New Approach

To convert the real-life situation problem into optimization model, there exist computational procedures for the formation of mathematical model. For solving MOTP, the proposed method is summarized in the following steps.

- Formulate the real life MOTP incorporating with Neutrosophic fuzzy parameters.
- Construct the membership values (H_D), non-membership values (K_D), and indeterminacy values (I_D)of the problem.
- Compute the lower and upper bounds by taking $U_K = max\{H_K(x)\}_{K=1}^{K}$ and $L_K = min\{H_K(x)\}_{K=1}^{K}$
- Define the membership values under Neutrosophic environment.
- Taking minimum values for truth membership and indeterminacy membership and taking maximum values for falsity membership.

Solve the MOTP using any basic TP method to obtain the best compromise solutions

4. Application of Multi-objective Emergency Transportation Problem (MOETP in Neutrosophic fuzzy)

After a heavy **flood**, A community welfare team has shipped their units of

i) Food and water items

ii) Health supplies like medicine and sanitation etc.,

iii) Man power

From their Welfare Community Team WC_1, WC_2, WC_3 to most affected rural areas RA_1, RA_2, RA_3, RA_4 respectively with the following characteristics; the transportation cost, time, and loss of deterioration are considered as Neutrosophic penalties.

Supplies: 8,19,17 Demand: 11,3,14,16

Penalties:

Category 1:

$$C_1 = \begin{bmatrix} (0.5,0.3,0.6) & (0.3,0.1,0.2) & (0.6,0.7,0.3) & (0.5,0.4,0.6) \\ (0.5,0.4,0.6) & (0.4,0.4,0.5) & (0.5,0.3,0.7) & (0.5,0.5,0.4) \\ (0.6,0.5,0.3) & (0.6,0.7,0.4) & (0.4,0.4,0.5) & (0.6,0.4,0.3) \end{bmatrix}$$

Category 2:

$$C_2 = \begin{bmatrix} (0.4,0.4,0.5) & (0.4,0.3,0.7) & (0.5,0.6,0.3) & (0.6,0.5,0.2) \\ (0.6,0.5,0.2) & (0.7,0.6,0.4) & (0.3,0.7,0.3) & (0.5,0.3,0.7) \\ (0.4,0.3,0.6) & (0.6,0.5,0.7) & (0.5,0.2,0.6) & (0.6,0.4,0.3) \end{bmatrix}$$

Then, separating the membership function in matrix format as shown below

$$H_1 = \begin{bmatrix} 0.5 & 0.3 & 0.6 & 0.5 \\ 0.5 & 0.4 & 0.5 & 0.5 \\ 0.6 & 0.6 & 0.4 & 0.6 \end{bmatrix} \& H_2 = \begin{bmatrix} 0.4 & 0.4 & 0.5 & 0.6 \\ 0.6 & 0.7 & 0.3 & 0.5 \\ 0.4 & 0.6 & 0.5 & 0.6 \end{bmatrix}$$

$$I_1 = \begin{bmatrix} 0.3 & 0.1 & 0.7 & 0.4 \\ 0.4 & 0.4 & 0.3 & 0.5 \\ 0.5 & 0.7 & 0.4 & 0.4 \end{bmatrix} \& I_2 = \begin{bmatrix} 0.4 & 0.3 & 0.6 & 0.5 \\ 0.5 & 0.6 & 0.7 & 0.3 \\ 0.3 & 0.5 & 0.2 & 0.4 \end{bmatrix}$$

$$K_1 = \begin{bmatrix} 0.6 & 0.2 & 0.3 & 0.6 \\ 0.6 & 0.5 & 0.7 & 0.4 \\ 0.3 & 0.4 & 0.5 & 0.3 \end{bmatrix} \& K_2 = \begin{bmatrix} 0.5 & 0.7 & 0.3 & 0.2 \\ 0.2 & 0.4 & 0.3 & 0.7 \\ 0.6 & 0.7 & 0.6 & 0.3 \end{bmatrix}$$

Now, evaluating the membership values and we get

$$H_1 = \begin{bmatrix} 0.5 & 0.3 & 0.6 & 0.5 \\ 0.5 & 0.4 & 0.5 & 0.5 \\ 0.6 & 0.6 & 0.4 & 0.6 \end{bmatrix}; U_1^H = 0.6 \& L_1^H = 0.3$$

$$H_2 = \begin{bmatrix} 0.4 & 0.4 & 0.5 & 0.6 \\ 0.6 & 0.7 & 0.3 & 0.5 \\ 0.4 & 0.6 & 0.5 & 0.6 \end{bmatrix}; U_2^H = 0.7 \& L_2^H = 0.3$$

We get the truth membership values as given below

$$H_1(U(u)) = \begin{bmatrix} 0.33 & 1 & 0 & 0.33 \\ 0.33 & 0.67 & 0.33 & 0.33 \\ 0 & 0 & 0.67 & 0 \end{bmatrix} \&$$

$$H_2(V(v)) = \begin{bmatrix} 0.75 & 0.75 & 0.50 & 0.25 \\ 0.25 & 0 & 1 & 0.50 \\ 0.75 & 0.25 & 0.50 & 0.25 \end{bmatrix}$$

From above two matrices, we get a truth membership matrix as

$$\begin{array}{c|cccc|c} & RA1 & RA2 & RA3 & RA4 & Supply \\ WC1 & 0.33 & 0.75 & 0 & 0.25 & 8 \\ WC2 & 0.25 & 0 & 0.33 & 0.33 & 19 \\ WC3 & 0 & 0 & 0.5 & 0 & 17 \\ Demand & 11 & 3 & 14 & 16 & \end{array}$$

Applying VAM, then the Initial feasible solution is

$$\begin{array}{c|cccc|c} & RA1 & RA2 & RA3 & RA4 & Supply \\ WC1 & 0.33 & 0.75 & 0(\mathbf{8}) & 0.25 & 8 \\ WC2 & 0.25(\mathbf{10}) & 0(\mathbf{3}) & 0.33(\mathbf{6}) & 0.33 & 19 \\ WC3 & 0(\mathbf{1}) & 0 & 0.5 & 0(\mathbf{16}) & 17 \\ Demand & 11 & 3 & 14 & 16 & \end{array}$$

The minimum time for transporting food items =0×8+0.25×10+0×3+0.33×6+0×1+0×16 = 4.48
Here, the allocated cell's number = 6 (is equal to m + n - 1 = 3 + 4 - 1 = 6)
∴ This is not a degenerate solution.
Now taking the indeterminacy values

$$I_1 = \begin{bmatrix} 0.3 & 0.1 & 0.7 & 0.4 \\ 0.4 & 0.4 & 0.3 & 0.5 \\ 0.5 & 0.7 & 0.4 & 0.4 \end{bmatrix}; U_1^H = 0.7 \;\&\; L_1^H = 0.1$$

$$I_2 = \begin{bmatrix} 0.4 & 0.3 & 0.6 & 0.5 \\ 0.5 & 0.6 & 0.7 & 0.3 \\ 0.3 & 0.5 & 0.2 & 0.4 \end{bmatrix}; U_1^H = 0.7 \;\&\; L_1^H = 0.2$$

We get the indeterminacy membership values as given below

$$I_1(U(u)) = \begin{bmatrix} 0.67 & 1 & 0 & 0.5 \\ 0.5 & 0.5 & 0.67 & 0.3 \\ 0.3 & 0 & 0.5 & 0.5 \end{bmatrix} \& I_2(V(v)) = \begin{bmatrix} 0.6 & 0.8 & 0.2 & 0.4 \\ 0.4 & 0.2 & 0 & 0.8 \\ 0.8 & 0.4 & 1 & 0.6 \end{bmatrix}$$

From above two matrices, we get a indeterminacy membership matrix as

$$\begin{array}{c|cccc|c} & RA1 & RA2 & RA3 & RA4 & Supply \\ WC1 & 0.60 & 0.8 & 0 & 0.4 & 8 \\ WC2 & 0.4 & 0.20 & 0 & 0.30 & 19 \\ WC3 & 0.3 & 0 & 0.5 & 0.5 & 17 \\ Demand & 11 & 3 & 14 & 16 & \end{array}$$

Initial feasible solutions for the problems are given by

	$RA1$	$RA2$	$RA3$	$RA4$	$Supply$
$WC1$	0.60	0.8	$0(\mathbf{8})$	0.4	8
$WC2$	0.4	0.20	$0(\mathbf{6})$	$0.30(\mathbf{13})$	19
$WC3$	$0.3(\mathbf{11})$	$0(\mathbf{3})$	0.5	$0.5(\mathbf{3})$	17
$Demand$	11	3	14	16	

The minimum time for transporting health supplies =0×8+0×6+0.3×13+0.3×11+0×3+0.5×3=8.7
Here, the allocated cell's number = 6 (is equal to m + n - 1 = 3 + 4 - 1 = 6)
∴ This is not a degenerate solution.

Now taking the falsity values

$$K_1 = \begin{bmatrix} 0.6 & 0.2 & 0.3 & 0.6 \\ 0.6 & 0.5 & 0.7 & 0.4 \\ 0.3 & 0.4 & 0.5 & 0.3 \end{bmatrix}; U_1^H = 0.7 \ \& L_1^H = 0.2$$

$$K_2 = \begin{bmatrix} 0.5 & 0.7 & 0.3 & 0.2 \\ 0.2 & 0.4 & 0.3 & 0.7 \\ 0.6 & 0.7 & 0.6 & 0.3 \end{bmatrix}; U_1^H = 0.7 \ \& L_1^H = 0.2$$

We get the falsity membership values as given below

$$K_1(U(u)) = \begin{bmatrix} 0.8 & 0 & 0.20 & 0.8 \\ 0.8 & 0.6 & 1 & 0.4 \\ 0.2 & 0.4 & 0.6 & 0.2 \end{bmatrix} \& K_2(V(v)) = \begin{bmatrix} 0.6 & 1 & 0.2 & 0 \\ 0 & 0.4 & 0.2 & 1 \\ 0.8 & 1 & 0.8 & 0.2 \end{bmatrix}$$

From above two matrices, we get a falsity membership matrix as

	$RA1$	$RA2$	$RA3$	$RA4$	$Supply$
$WC1$	0.8	1	0.2	0.8	8
$WC2$	0.8	0.60	1	1	19
$WC3$	0.8	1	0.8	0.2	17
$Demand$	11	3	14	16	

Similar methods are used to get an optimal solution for the transportation problem. Initial feasible solutions for the problems are

	$RA1$	$RA2$	$RA3$	$RA4$	$Supply$
$WC1$	$0.8(\mathbf{5})$	$1(\mathbf{3})$	0.2	0.8	8
$WC2$	0.8	0.60	$1(\mathbf{3})$	$1(\mathbf{16})$	19
$WC3$	$0.8(\mathbf{6})$	1	$0.8(\mathbf{11})$	0.2	17
$Demand$	11	3	14	16	

The maximum man power =0.8×5+1×3+1×3+1×16+0.8×6+0.8×11=39.6
Here, the allocated cell's number = 6 (is equal to m + n - 1 = 3 + 4 - 1 = 6)
∴ This is not a degenerate solution.

5. Result and Discussion

We can use various approaches to solve the same problem in order to demonstrate the efficacy of our suggested method. And then the results of VAM compared with other existing methods like RAM, Heuristic Method -1 and Heuristic Method -2 by evaluating weightage of results using entropy method.

Matrix of Obtained Optimal Solution

$$\begin{array}{c} \\ \boldsymbol{H} \\ \boldsymbol{I} \\ \boldsymbol{K} \end{array}\begin{array}{c} \boldsymbol{VAM} \quad \boldsymbol{RAM} \quad \boldsymbol{HM-1} \quad \boldsymbol{HM-2} \\ \begin{bmatrix} 4.48 & 4.48 & 4.9 & 4.48 \\ 8.7 & 8.7 & 10.7 & 8.7 \\ 39.6 & 39 & 39 & 39.6 \end{bmatrix} \end{array}$$

The above results show that the minimum of time (H and I) for transportation to supply food, water and health supplies like medicine and so on. And maximum man power (K) to help the flood affected area peoples.

Normalized decision matrix

Using Normalize values for the matrix of optimal solution, to get normalized decision matrix as follows

$$\begin{array}{c} \\ \boldsymbol{H} \\ \boldsymbol{I} \\ \boldsymbol{K} \end{array}\begin{array}{c} \boldsymbol{VAM} \quad \boldsymbol{RAM} \quad \boldsymbol{HM-1} \quad \boldsymbol{HM-2} \\ \begin{bmatrix} 0.0849 & 0.0859 & 0.0897 & 0,0849 \\ 0.1648 & 0.1667 & 0.1959 & 0.1648 \\ 0.7503 & 0.7474 & 0.7143 & 0.7503 \end{bmatrix} \end{array}$$

Entropy values

$$\begin{array}{ccccc} & \boldsymbol{VAM} & \boldsymbol{RAM} & \boldsymbol{HM-1} & \boldsymbol{HM-2} \\ \boldsymbol{e_j} & (0.6572 & 0.6618 & 0.7062 & 0.6572) \end{array}$$

Weightage of constraints

$$\begin{array}{ccccc} & \boldsymbol{VAM} & \boldsymbol{RAM} & \boldsymbol{HM-1} & \boldsymbol{HM-2} \\ \boldsymbol{w_j} & (0.2602 & 0.2567 & 0.2229 & 0.2602) \end{array}$$

Rank of Four Methods

$$\begin{array}{ccccc} & \boldsymbol{VAM} & \boldsymbol{RAM} & \boldsymbol{HM-1} & \boldsymbol{HM-2} \\ \boldsymbol{\rho_j} & (1 & 2 & 3 & 1) \end{array}$$

Using the weightage and rank, **Figure 1** presents a comparison study of the suggested approach with some current methods.

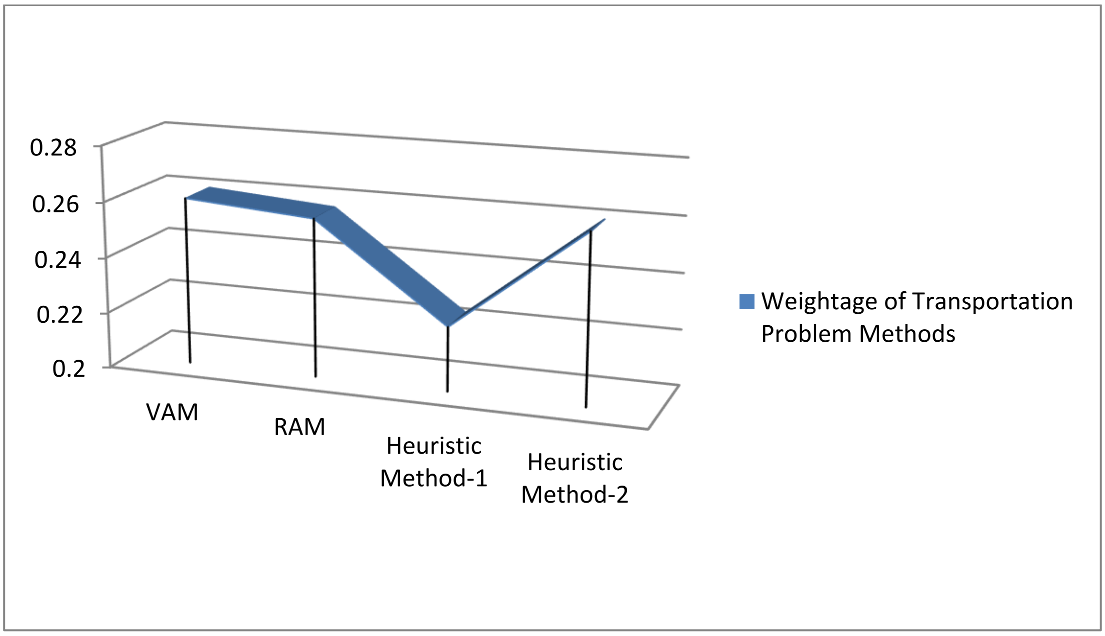

Figure 1. Weightage Analysis

Following the examination of four different transportation strategies, our suggested planned approach provides the most optimal result. We endorsing VAM in light of this offered strategy. VAM is more conveniently applied than the other methods.

6. Comparative Study

Neutrosophic fuzzy are often difficult to rank for human satisfaction, even using a variety of ranking techniques. In this particular case, we identified the difficulties and provided a straightforward ranking system in order to address the problems. The efficiency of the suggested method is compared to other methods in the following table

Table 1 – Comparative table

Methods	Minimum time for transporting food and beverages (in hours)	Minimum time for transporting health supplies(in hours)	Maximum man power (in Hundreds)
Vogel's Approximation Method	4.48	8.7	40
Rusell's Approximation Method	4.48	8.7	39
Heuristic Method-1	4.9	10.7	39
Heuristic Method-2	4.48	8.7	40
Least cost Method	4.65	9.21	38
North west corner method	5.03	11.14	36
Proposed method	4.48	8.7	40
Optimal Value	4.48	8.7	40

. In order to support the method we suggest a comparative analysis between the proposed strategy and a few current techniques is shown in Figure 2.

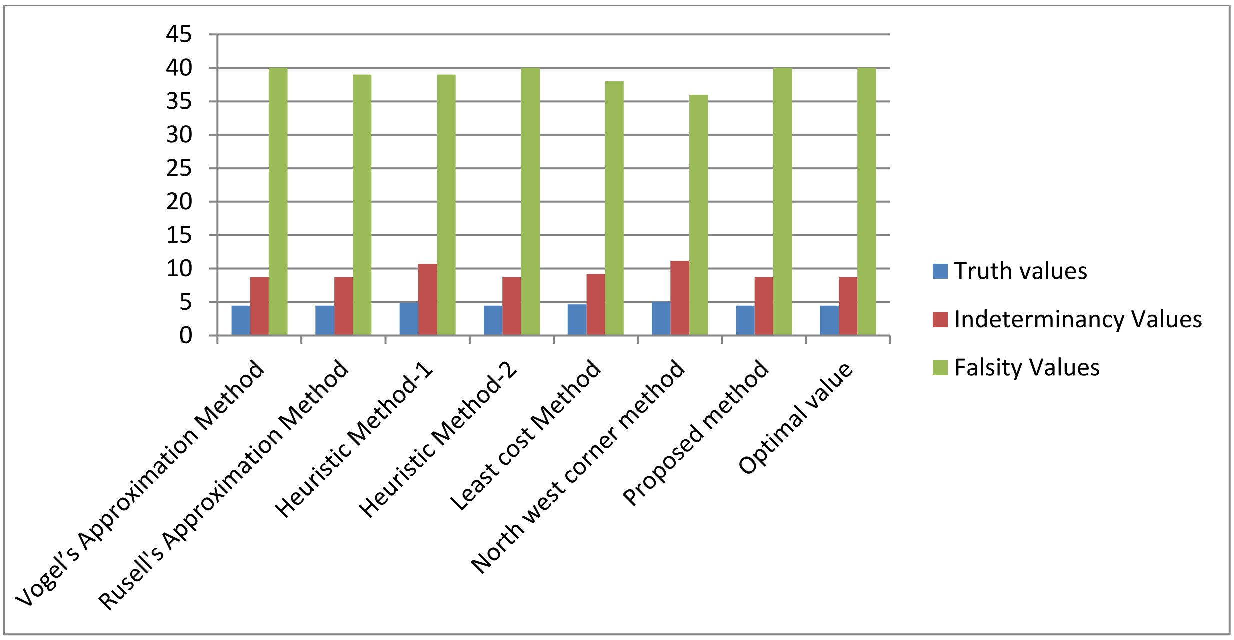

Figure 2: Chart of comparison

7. Conclusion

This paper finds the most optimal solution for one of the most affecting problems of peninsular regions in recent days. Additionally, when compared to other current methods, our proposed method achieves our goal and demonstrates the efficiency of solving a Neutrosophic Emergency Transportation Problem by transforming the given problem into a crisp equivalent. This approach saves time and is simple to comprehend. That is why decision-makers who are dealing with this kind of transportation issue would find it useful in any emergency situation.

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