CRITERIA FOR SUSTAINABLE SUPPLIER SELECTION IN AGRO-INDUSTRIAL COMPLEX

Miroslav Nedeljković[1]

Abstract

The main goal of paper is to rank the criteria that are important for the selection of the most favourable supplier of the agricultural company by applying a multi-criteria decision-making model. Subject of the paper is the procurement of mineral fertilizer for sowing certain field crops. As a method of work, the author uses DEMATEL (The Decision making Trial and Evaluation Laboratory) method of multicriteria decision making. In order to bring the research as close as possible to human thinking, the fuzzy logic of multicriteria decision-making was applied in the paper. Method is an expert assessment and ranking by experts in the field. In addition to the group of economic and technical criteria, the paper also uses criteria related to sustainable development such as environmental management system, green product, pollution and waste control, recycling and eco-product design. Results of the research show that the criteria that are from the economic group are still assessed as the most important for the decision maker. Importance of the research would be in pointing out the increase in the importance of criteria, especially those from the sustainability group according to their importance in the coming period, and the possibility of applying modern decision-making methods.

Key words: sustainable development, agro-industrial complex, DEMATEL method, fuzzy logic.

JEL[2]**:** Q01, Q10, C44

Introduction

The choice of suppliers is a complex business in the agro-industrial complex. The complexity of the process increases the impact of the many criteria that emerge in the decision process. The sustainability factors are of the main importance. Some authors confirm that the decision-making process is an important segment of business in their previous research. (Aguezzoul, 2012; Jafarnejad, Salimi, 2013).

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1 Miroslav Nedeljković, Ph.D., Assistant Professor, Faculty of Agriculture, Bijeljina University, Pavlovića put bb, 76300 Bijeljina, Republic of Srpska, BiH, Phone: +387 66 893 935, E-mail: miroslavvnedeljkovic2015@gmail.com,

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The selection of available suppliers is affected by several factors (Puška, 2015). The supply chain includes not only the buyer and the supplier, but also the transport, storage, retailers and consumers themselves (Singh et al., 2012).

Identification of the most important criteria that affect the selection itself is of the great importance. Some authors even state the number of necessary criteria. (Liao, Kao 2011; Aguezzoul, 2012). For the needs of the paper, 10 criteria were selected, which are classified in the group of economic-technical and criteria related to sustainable development. Their significance is confirmed in previous research by a certain group of the authors (Bai, Sarkis, 2009; Liu, 2010; Mwikali, Kavale, 2012; Wen et al., 2013; Jain et al., 2013).

In the process of selecting suppliers, the sustainability factor plays a vital role in the long-term success of the supply chain, which also makes the decision more complicated. Some studies using multi-criteria decision-making examine the impact of these criteria on the success of the decision (Bai, Sarkis, 2009; Awasthi et al., 2010; Hashemi et al., 2015).

Apart from the use of classical methods of multi-criteria decision making, the *fuzzy* logic of these methods is also increasingly used. The reason is that some of the selected criteria are qualitative. The importance of using this variant of multi-criteria decision-making is found in previous research conducted by some of the authors (Govindan et al., 2015; Stević et al., 2019; Nedeljković et al., 2021a; Nedeljković et al., 2021b, Nedeljković, 2022). Aim of this paper is to select adequate criteria by modern decision-making methods that would lead to a rational choice of suppliers, and for that occasion the procurement of mineral fertilizers as a case study was used, as one of the most important inputs in the production of agro-industrial complex located in Bijeljina.

Methodology

As a source of data, the literature from the subject area was used, as well as the expert assessment of the selected five experts in the field of the subject. The method of multicriteria decision making DEMATEL (Decision Making Trial and Evaluation Laboratory) was used for the method of work. DEMATEL method was initiated and established by the Battelle Memorial Institute of Geneva Research during 1972. The importance of using this method is confirmed by previous research by a group of authors (Gharakhani, 2012; Govindan, Chaudhuri, 2016; Shaik, Abdul-Kader, 2018; Hsu, Yeh, 2017; Jarosz, 2019; Yildirim, Koca, 2021). According to Chang et al. (2011), this method of multicriteria decision-making allows separation into causal groups and identification of the most important criteria from the group of all criteria that are marked as key in the decision-making process. The reason for using fuzzy logic in this method is that it tries to bring the final decision as close to human thinking as possible. Concrete steps in the use of this method will be presented in the chapter research results, where they will be used to adequately select the set criteria in the paper.

Research results

Generate the fuzzy direct-relation matrix

A matrix of type n x n serves to identify the relationship between the criteria.
The influence of the elements within the matrix is represented by fuzzy numbers.
All experts fill in the matrix and the arithmetic mean of their opinions is used to generate the matrix of the direct relation z.

$$z = \begin{bmatrix} 0 & \cdots & \tilde{z}_{n1} \\ \vdots & \ddots & \vdots \\ \tilde{z}_{1n} & \cdots & 0 \end{bmatrix}$$

The table below (Table 1.) indicates the direct relation matrix, which is the same as pairwise comparison matrix of the experts.

Table 1. The direct relation matrix

Element	Delivery costs	Delivery speed	Technology & management.	Payment flexibility	Service	Environmental management system	Green product	Pollution control	Recycling	Eco design
Delivery costs	(0.000, 0.000,0.000)	(5.000, 7.000,8.600)	(6.200, 8.200,9.000)	(4.600, 6.600,8.200)	(6.600, 8.600,9.000)	(5.400, 7.400,9.000)	(4.200, 6.200,8.200)	(4.600, 6.600,8.200)	(4.600, 6.600,8.600)	(4.200, 6.200,8.200)
Delivery speed	(5.400, 7.400,8.600)	(0.000, 0.000,0.000)	(5.400, 7.400,8.200)	(4.600, 6.600,8.200)	(5.800, 7.800,8.600)	(4.200, 6.200,7.800)	(4.200, 6.200,7.800)	(3.800, 5.800,7.800)	(4.200, 6.200,7.800)	(3.800, 5.800,7.400)
Technology & management	(1.800, 3.400,5.400)	(1.000, 2.200,4.200)	(0.000, 0.000,0.000)	(1.000, 1.400,3.400)	(3.800, 5.800,7.800)	(1.400, 2.600,4.600)	(1.800, 3.800,5.800)	(1.800, 3.400,5.400)	(2.200, 4.200,6.200)	(1.800, 3.000,5.000)
Payment flexibility	(5.800, 7.800,9.000)	(6.200, 8.200,9.000)	(7.000, 9.000,9.000)	(0.000, 0.000,0.000)	(6.200, 8.200,9.000)	(3.400, 5.400,7.400)	(4.600, 6.600,8.200)	(3.000, 5.000,7.000)	(5.000, 7.000,8.600)	(4.200, 6.200,8.200)
Service	(1.800, 3.400,5.400)	(1.000, 3.000,5.000)	(3.800, 5.800,7.800)	(1.000, 2.600,4.600)	(0.000, 0.000,0.000)	(1.800, 3.800,5.800)	(2.200, 3.800,5.800)	(1.800, 3.800,5.800)	(2.200, 4.200,6.200)	(2.600, 4.600,6.600)
Environmental management system	(5.000, 7.000,9.000)	(4.600, 6.600,8.600)	(7.000, 9.000,9.000)	(4.600, 6.600,8.600)	(6.600, 8.600,9.000)	(0.000, 0.000,0.000)	(5.000, 7.000,9.000)	(3.800, 5.800,7.800)	(5.800, 7.800,9.000)	(5.000, 7.000,8.600)
Green product	(2.200, 4.200,6.200)	(2.600, 4.600,6.600)	(4.200, 6.200,7.800)	(2.600, 4.600,6.600)	(5.000, 7.000,8.600)	(2.600, 4.600,6.600)	(0.000, 0.000,0.000)	(2.200, 4.200,6.200)	(3.000, 5.000,7.000)	(3.000, 5.000,7.000)
Pollution control	(5.000, 7.000,9.000)	(4.200, 6.200,8.200)	(6.600, 8.600,9.000)	(3.000, 5.000,7.000)	(6.600, 8.600,9.000)	(3.400, 5.400,7.400)	(5.400, 7.400,9.000)	(0.000, 0.000,0.000)	(5.000, 7.000,8.600)	(4.600, 6.600,8.600)
Recycling	(3.000, 5.000,7.000)	(3.000, 5.000,7.000)	(5.800, 7.800,8.600)	(3.400, 5.400,7.400)	(5.800, 7.800,9.000)	(2.200, 4.200,6.200)	(5.000, 7.000,9.000)	(2.600, 4.600,6.600)	(0.000, 0.000,0.000)	(4.200, 6.200,7.800)
Eco design	(2.200, 4.200,6.200)	(1.400, 3.400,5.400)	(5.800, 7.800,8.600)	(1.800, 3.800,5.800)	(6.200, 8.200,9.000)	(2.200, 4.200,6.200)	(4.200, 6.200,7.800)	(2.600, 4.600,6.600)	(4.200, 6.200,8.200)	(0.000, 0.000,0.000)

Source: Authors' calculation

In next table (Table 2.) is given the fuzzy scale applied in the model.

Table 2. Fuzzy Scale

Code	Linguistic terms	L	M	U
1	Very Low	1	1	3
2	Low	1	3	5
3	Medium	3	5	7
4	High	5	7	9
5	Very high	7	9	9

Source: According to Kiani Mavi et al., 2016; Mijajlović et al., 2020.

Normalize the fuzzy direct-relation matrix

By next step is generated the normalized fuzzy direct-relation matrix (Table 3.):

$$\tilde{x}_{ij} = \frac{\tilde{z}_{ij}}{r} = \left(\frac{l_{ij}}{r}, \frac{m_{ij}}{r}, \frac{u_{ij}}{r}\right)$$

Where,

$$r = \max_{i,j}\left\{\max_{i}\sum_{j=1}^{n} u_{ij}, \max_{j}\sum_{i=1}^{n} u_{ij}\right\} \qquad i, j \in \{1,2,3, \ldots, n\}$$

Table 3. The normalized fuzzy direct-relation matrix

Element	Delivery costs	Delivery speed	Technology and management	Payment flexibility	Service	Environmental management system	Green product	Pollution control	Recycling	Eco design
Delivery costs	(0.000, 0.000,0.000)	(0.063, 0.089,0.109)	(0.078, 0.104,0.114)	(0.058, 0.084,0.104)	(0.084, 0.109,0.114)	(0.068, 0.094,0.114)	(0.053, 0.078,0.104)	(0.058, 0.084,0.104)	(0.058, 0.084,0.109)	(0.053, 0.078,0.104)
Delivery speed	(0.068, 0.094,0.109)	(0.000, 0.000,0.000)	(0.068, 0.094,0.104)	(0.058, 0.084,0.104)	(0.073, 0.099,0.109)	(0.053, 0.078,0.099)	(0.053, 0.078,0.099)	(0.048, 0.073,0.099)	(0.053, 0.078,0.099)	(0.048, 0.073,0.094)
Technology and management	(0.023, 0.043,0.068)	(0.013, 0.028,0.053)	(0.000, 0.000,0.000)	(0.013, 0.018,0.043)	(0.048, 0.073,0.099)	(0.018, 0.033,0.058)	(0.023, 0.048,0.073)	(0.023, 0.043,0.068)	(0.028, 0.053,0.078)	(0.023, 0.038,0.063)
Payment flexibility	(0.073, 0.099,0.114)	(0.078, 0.104,0.114)	(0.089, 0.114,0.114)	(0.000, 0.000,0.000)	(0.078, 0.104,0.114)	(0.043, 0.068,0.094)	(0.058, 0.084,0.104)	(0.038, 0.063,0.089)	(0.063, 0.089,0.109)	(0.053, 0.078,0.104)
Service	(0.023, 0.043,0.068)	(0.013, 0.038,0.063)	(0.048, 0.073,0.099)	(0.013, 0.033,0.058)	(0.000, 0.000,0.000)	(0.023, 0.048,0.073)	(0.028, 0.048,0.073)	(0.023, 0.048,0.073)	(0.028, 0.053,0.078)	(0.033, 0.058,0.084)
Environmental management system	(0.063, 0.089,0.114)	(0.058, 0.084,0.109)	(0.089, 0.114,0.114)	(0.058, 0.084,0.109)	(0.084, 0.109,0.114)	(0.000, 0.000,0.000)	(0.063, 0.089,0.114)	(0.048, 0.073,0.099)	(0.073, 0.099,0.114)	(0.063, 0.089,0.109)
Green product	(0.028, 0.053,0.078)	(0.033, 0.058,0.084)	(0.053, 0.078,0.099)	(0.033, 0.058,0.084)	(0.063, 0.089,0.109)	(0.033, 0.058,0.084)	(0.000, 0.000,0.000)	(0.028, 0.053,0.078)	(0.038, 0.063,0.089)	(0.038, 0.063,0.089)
Pollution control	(0.063, 0.089,0.114)	(0.053, 0.078,0.104)	(0.084, 0.109,0.114)	(0.038, 0.063,0.089)	(0.084, 0.109,0.114)	(0.043, 0.068,0.094)	(0.068, 0.094,0.114)	(0.000, 0.000,0.000)	(0.063, 0.089,0.109)	(0.058, 0.084,0.109)
Recycling	(0.038, 0.063,0.089)	(0.038, 0.063,0.089)	(0.073, 0.099,0.109)	(0.043, 0.068,0.094)	(0.073, 0.099,0.114)	(0.028, 0.053,0.078)	(0.063, 0.089,0.114)	(0.033, 0.058,0.084)	(0.000, 0.000,0.000)	(0.053, 0.078,0.099)
Eco design	(0.028, 0.053,0.078)	(0.018, 0.043,0.068)	(0.073, 0.099,0.109)	(0.023, 0.048,0.073)	(0.078, 0.104,0.114)	(0.028, 0.053,0.078)	(0.053, 0.078,0.099)	(0.033, 0.058,0.084)	(0.053, 0.078,0.104)	(0.000, 0.000,0.000)

Source: Authors' calculation

Calculation of the fuzzy total-relation matrix

In next step, it could be obtained the *fuzzy* total-relation matrix:

$$\tilde{T} = \lim_{k \to +\infty} (\tilde{x}^1 \oplus \tilde{x}^2 \oplus \ldots \oplus \tilde{x}^k)$$

In next formula are defined all elements linked to matrix:

$\tilde{t}_{ij} = (l''_{ij}, m''_{ij}, u''_{ij})$ it can be calculated as follows:

$$[l''_{ij}] = x_l \times (I - x_l)^{-1}$$

$$[m''_{ij}] = x_m \times (I - x_m)^{-1}$$

$$[u''_{ij}] = x_u \times (I - x_u)^{-1}$$

Accordingly, by calculating the inverse matrix and subtracting it from the matrix, we obtain a normalized matrix that is multiplied by the resulting matrix. The following table (Table 4.) shows the *fuzzy* direct-relation matrix.

Table 4. The fuzzy total-relation matrix

Element	Delivery costs	Delivery speed	Technology and management.	Payment flexibility	Service	Environmental management system	Green product	Pollution control	Recycling	Eco design
Delivery costs	(0.040, 0.140,0.518)	(0.095, 0.212,0.593)	(0.138, 0.291,0.707)	(0.088, 0.198,0.569)	(0.144, 0.297,0.722)	(0.098, 0.212,0.588)	(0.096, 0.226,0.650)	(0.089, 0.204,0.584)	(0.101, 0.231,0.651)	(0.093, 0.217,0.627)
Delivery speed	(0.101, 0.218,0.588)	(0.033, 0.123,0.467)	(0.124, 0.271,0.665)	(0.086, 0.191,0.542)	(0.130, 0.278,0.683)	(0.082, 0.192,0.549)	(0.093, 0.218,0.614)	(0.077, 0.188,0.552)	(0.092, 0.218,0.612)	(0.085, 0.205,0.589)
Technology and management	(0.036, 0.107,0.393)	(0.025, 0.089,0.365)	(0.024, 0.094,0.385)	(0.024, 0.076,0.343)	(0.070, 0.163,0.484)	(0.030, 0.092,0.364)	(0.039, 0.119,0.421)	(0.034, 0.102,0.375)	(0.043, 0.123,0.424)	(0.038, 0.106,0.398)
Payment flexibility	(0.108, 0.229,0.609)	(0.109, 0.224,0.586)	(0.146, 0.298,0.694)	(0.033, 0.120,0.464)	(0.138, 0.292,0.708)	(0.075, 0.189,0.561)	(0.100, 0.229,0.637)	(0.070, 0.185,0.560)	(0.104, 0.234,0.639)	(0.092, 0.216,0.615)
Service	(0.037, 0.119,0.427)	(0.026, 0.109,0.406)	(0.072, 0.179,0.514)	(0.026, 0.100,0.388)	(0.026, 0.112,0.435)	(0.035, 0.116,0.409)	(0.045, 0.132,0.458)	(0.035, 0.117,0.412)	(0.045, 0.137,0.460)	(0.048, 0.136,0.450)
Environmental management system	(0.100, 0.223,0.630)	(0.091, 0.209,0.602)	(0.149, 0.303,0.718)	(0.089, 0.200,0.581)	(0.146, 0.301,0.733)	(0.035, 0.128,0.495)	(0.107, 0.238,0.668)	(0.080, 0.197,0.588)	(0.115, 0.247,0.665)	(0.103, 0.229,0.640)
Green product	(0.051, 0.151,0.497)	(0.052, 0.148,0.482)	(0.089, 0.214,0.586)	(0.051, 0.141,0.466)	(0.099, 0.225,0.606)	(0.052, 0.145,0.475)	(0.027, 0.110,0.455)	(0.047, 0.142,0.474)	(0.063, 0.170,0.534)	(0.062, 0.163,0.518)
Pollution control	(0.096, 0.215,0.611)	(0.083, 0.197,0.579)	(0.139, 0.287,0.696)	(0.067, 0.175,0.547)	(0.140, 0.290,0.711)	(0.073, 0.185,0.562)	(0.107, 0.233,0.648)	(0.031, 0.122,0.480)	(0.102, 0.229,0.641)	(0.095, 0.216,0.621)
Recycling	(0.065, 0.174,0.542)	(0.062, 0.166,0.521)	(0.117, 0.252,0.636)	(0.065, 0.162,0.507)	(0.118, 0.254,0.654)	(0.052, 0.154,0.505)	(0.093, 0.208,0.596)	(0.056, 0.159,0.512)	(0.033, 0.126,0.491)	(0.081, 0.191,0.563)
Eco design	(0.051, 0.154,0.501)	(0.039, 0.138,0.473)	(0.110, 0.237,0.600)	(0.042, 0.135,0.461)	(0.115, 0.244,0.616)	(0.048, 0.144,0.475)	(0.079, 0.188,0.550)	(0.052, 0.149,0.482)	(0.078, 0.187,0.552)	(0.026, 0.108,0.441)

Source: Authors' calculation

Defuzzify into crisp values

Appliance of the suggested CFCS method is linked to generation of crisp value of total-relation matrix (Table 5.). CFCS method involves next steps:

$$l_{ij}^{n} = \frac{\left(l_{ij}^{t} - \min l_{ij}^{t}\right)}{\Delta_{min}^{max}}$$

$$m_{ij}^{n} = \frac{\left(m_{ij}^{t} - min\ l_{ij}^{t}\right)}{\Delta_{min}^{max}}$$

$$u_{ij}^{n} = \frac{\left(u_{ij}^{t} - min\ l_{ij}^{t}\right)}{\Delta_{min}^{max}}$$

So that,

$$\Delta_{min}^{max} = \max u_{ij}^{t} - \min l_{ij}^{t}$$

Upper and lower bounds of normalized values could be calculated as follows:

$$l_{ij}^{s} = {m_{ij}^{n}}/{\left(1 + m_{ij}^{n} - l_{ij}^{n}\right)}$$

$$u_{ij}^{s} = {u_{ij}^{n}}/{\left(1 + u_{ij}^{n} - l_{ij}^{n}\right)}$$

CFCS algorithm generates the crisp values, while calculation of the total normalized crisp values could be presented by next formula:

$$x_{ij} = \frac{\left[l_{ij}^{s}\left(1 - l_{ij}^{s}\right) + u_{ij}^{s} \times u_{ij}^{s}\right]}{\left[1 - l_{ij}^{s} + u_{ij}^{s}\right]}$$

Table 5. The crisp total-relation matrix

Element	Delivery costs	Delivery speed	Technology and management..	Payment flexibility	Service	Environmental management system	Green product	Pollution control	Recycling	Eco design
Delivery costs	0.201	0.264	0.341	0.25	0.349	0.263	0.285	0.256	0.289	0.274
Delivery speed	0.27	0.179	0.321	0.241	0.33	0.243	0.274	0.24	0.274	0.259
Technology and management..	0.155	0.135	0.142	0.121	0.215	0.138	0.169	0.147	0.173	0.155
Payment flexibility	0.28	0.272	0.345	0.176	0.343	0.242	0.285	0.239	0.289	0.271
Service	0.17	0.158	0.231	0.147	0.166	0.164	0.186	0.165	0.19	0.187
Environmental management system	0.279	0.263	0.352	0.253	0.354	0.187	0.296	0.252	0.303	0.284
Green product	0.206	0.201	0.269	0.193	0.281	0.197	0.168	0.194	0.227	0.219
Pollution control	0.27	0.251	0.338	0.229	0.343	0.239	0.291	0.18	0.286	0.273
Recycling	0.23	0.22	0.304	0.215	0.309	0.208	0.265	0.213	0.187	0.247
Eco design	0.208	0.191	0.288	0.187	0.296	0.196	0.243	0.201	0.243	0.164

Source: Authors' calculation

Set the threshold value

We get the matrix of internal relations with the help of the limit value. So, incomplete relations are rejected, while the network relationship map (NRM) is created. There are links that has values within the matrix T much higher than the threshold value. Research shows that the value of threshold is 0.2380 and all values that are lower are set to zero, and its causal relationship is not taken into account. In following table (Table 6.) is shown the significance relationship model.

Table 6. The crisp total - relationships matrix by considering the threshold value

Element	Delivery costs	Delivery speed	Technology and management..	Payment flexibility	Service	Environmental management system	Green product	Pollution control	Recycling	Eco design
Delivery costs	0	0.264	0.341	0.25	0.349	0.263	0.285	0.256	0.289	0.274
Delivery speed	0.27	0	0.321	0.241	0.33	0.243	0.274	0.24	0.274	0.259
Technology and management	0	0	0	0	0	0	0	0	0	0
Payment flexibility	0.28	0.272	0.345	0	0.343	0.242	0.285	0.239	0.289	0.271
Service	0	0	0	0	0	0	0	0	0	0
Environmental management system	0.279	0.263	0.352	0.253	0.354	0	0.296	0.252	0.303	0.284
Green product	0	0	0.269	0	0.281	0	0	0	0	0
Pollution control	0.27	0.251	0.338	0	0.343	0.239	0.291	0	0.286	0.273
Recycling	0	0	0.304	0	0.309	0	0.265	0	0	0.247
Eco design	0	0	0.288	0	0.296	0	0.243	0	0.243	0

Source: Authors' calculation

Final output and create a causal relation diagram

With the help of the following expressions we get the sum of rows (D) and the sum of columns (R):

$$D = \sum_{j=1}^{n} T_{ij}$$

$$R = \sum_{i=1}^{n} T_{ij}$$

With the help of D + R values, we get the degree of importance of the factor in the whole system, and with D-R values, we get the net effects to which the factor contributes to the system.

Previously mentioned results are shown in following table (Table 7.).

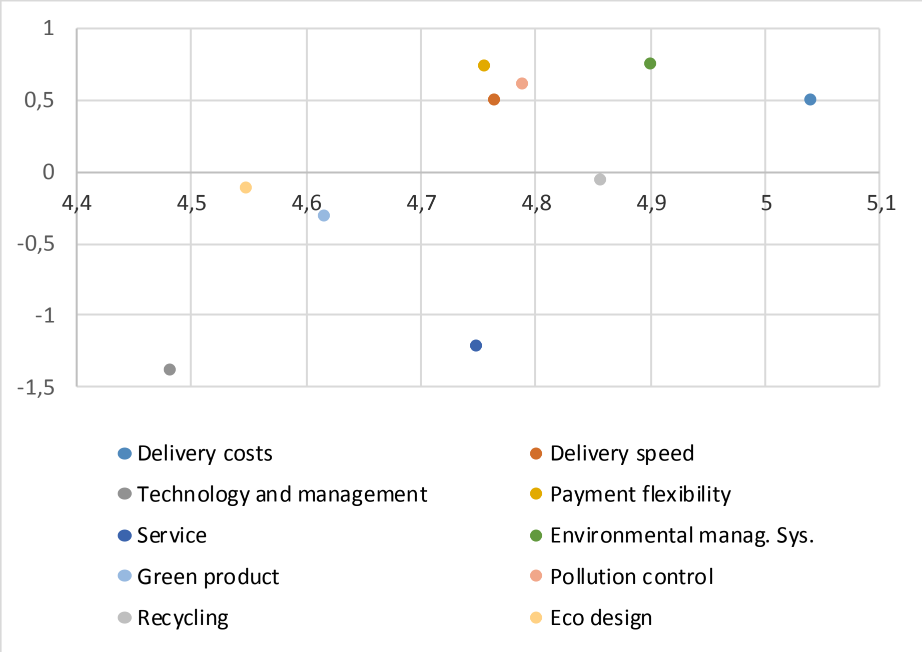
Table 7. The final output

Element	R	D	D+R	D-R
Delivery costs	2.269	2.772	5.041	0.503
Delivery speed	2.134	2.631	4.765	0.498
Technology and management	2.931	1.551	4.482	-1.38
Payment flexibility	2.013	2.743	4.756	0.731
Service	2.985	1.764	4.749	-1.221
Environmental management system	2.077	2.823	4.9	0.746
Green product	2.462	2.153	4.616	-0.309
Pollution control	2.089	2.7	4.789	0.611
Recycling	2.46	2.397	4.857	-0.063
Eco design	2.333	2.217	4.549	-0.116

Source: Authors' calculation

The following figure (Figure 1.) shows a diagram of the significance relationship, where the position and interaction of each factor is located in the coordinate system.

Figure 1. Cause-effect diagram



Source: Author

Interpret the results

In the previous diagram we notice that it is Delivery costs is ranked in first place and Environmental management system, Recycling, Pollution control, Delivery speed, Payment flexibility, Service, Green product, Eco design and Technology and management, are ranked in the next places. In this study, Delivery costs, Delivery speed, Payment flexibility, Environmental management system, Pollution control are considered to be as a causal variable, Technology and management, Service, Green product, Recycling, Eco design are regarded as an effect.

Considering that the positive value of D-R is causally variable, and the negative value of D-R effect then in terms of importance Delivery costs is ranked in first place and Environmental management system, Recycling, Pollution control, Delivery speed, Payment flexibility, Service, Green product, Eco design and Technology and management, are ranked in the next places. In this study, Delivery costs, Delivery speed, Payment flexibility, Environmental management system, Pollution control are considered to be as a causal variable, Technology and management, Service, Green product, Recycling, Eco design are regarded as an effect.

Conclusion

From the above, we can conclude that the choice of supplier is a complex task for the decision maker. Rationality in decision-making depends on a good selection of criteria to be set as well as on the applied decision-making method. Precisely the application of the modern method of multicriteria, decision-making, its fuzzy logic is imposed as a solution when it comes to rational choice, the selection of adequate criteria. In addition, the inclusion of sustainable criteria in the decision-making process brings with it a good basis for improving the characteristics of each criterion individually, which is of particular importance when it comes to today's agro-industrial complex. In future research it is necessary to analyse as many sustainability criteria as possible and thus improve the offer and create greater competition among suppliers.

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