

The uses of fuzzy logic method for finding agriculture and livestock value of potential village

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Abstract

This paper presents the potential owned by the Bulurejo village in the field of Agriculture and Livestock field. The authors conducted a study to determine the outcomes of potential Bulurejo village based on criteria such as potential in the field of agriculture, field of large cattle and small livestock and poultry using fuzzy logic method. So from the results of these studies there are results of the value of 74.29 which is included in the potential of a good village. The application of fuzzy logic method in determining the potential value of the village in accordance with the criteria has been successfully established, so that the fuzzy logic method is suitable for the calculation of the search results from the potential of Bulurejo village.

Keywords: *fuzzy logic; agriculture; livestock; potential village.*

1. Introduction

1.1 Background

Information and Communication Technology is a requirement that has been considered the principal for now. Especially in the field of governance to improve the quality of work processes and provide efficient and effective services in order to attract investment to the community to promote the potential of the village thus placing a village in the position of the village advanced in developing the potential empowerment of the village. E-government in government is expected to improve the quality of work and service to the community.

In the process of designing this system apply fuzzy logic method in case study of village potency information. It is based on the lack of information to this dive community, where many people are asking about the potential of Bulurejo village and they can only know from information that is not necessarily true, even if they will verify the truth of the information they must go directly to the office of Bulurejo village. It will take a long time and is not practical. Thus, in the wake of a potential information system in which the village is also applied fuzzy logic method.

The system to be built is fuzzy database system, because in the process of taking information the village potency using fuzzy logic and using database in storing and retrieving the potential information of village data. The model used in this fuzzy database is the Mamdani model, which still uses a standard database relation, with more emphasis on fuzzy usage on some fields in the existing tables of the database and easier in computation. This research is inspired by researchers [1-26].

1.2 Problem Formulation

Based on the background that has been described above, then obtained two problem formulas are:

1. How to make a search application data and information quickly and accurately to the potential of Bulurejo village?
2. How to apply fuzzy logic approach in searching the potential information of Bulurejo village?

1.3 Limitation Problems

The limitations of the problem in this study are as follows:

1. The research used is fuzzy logic approach to draw conclusion.
2. Criteria determination is the potential in the field of Large Livestock, Small Livestock, Poultry, Agriculture.

1.4 Objectives and Benefits of Research

The purpose of this research is as follows:

1. Realizing the government data processing system and the potential of better Bulurejo village.
2. To produce a computerized system to process data quickly and accurately.

2. Literature Review

2.1 Fuzzy Logic

Fuzzy logic is the development of fuzzy set theory which is initiated by Prof. Lotfi Zadeh from the University of California USA, in 1965. Fuzzy logic differs from ordinary digital logic, where the usual digital logic recognizes only two states: Yes_No or ON_OFF or Hight_Low or "1" _ "0" while fuzzy logic mimics the way of human thinking by using the concept of the pseudonym of

a value dari 0 continuously until the value of one. Fuzzy logic is a good way to map an Input space into an Output space.

Fuzzy logic has several characteristics: fuzzy set and membership characteristics. In boolean logic, an individual is ensured as a member of a single set, whereas in a fuzzy set an individual can enter on two different sets. How big its existence in the set can be seen from the value of its membership.

2.2 Fuzzy Mamdani

The Mamdani method is often known as the Max-min method. This method was introduced by Ebrahim Mamdani in 1975.

1. Max Method (Maximum)

The fuzzy set solution is obtained by taking the maximum value, then using it to change the fuzzy area, and applying it to the output using the OR (union) operator. In general can be written:

$$\mu_{sf} [x_i] = \max (\mu_{usf} [X_i], \mu_{kf} [X_i])$$

By: $\mu_{sf} [X_i]$ = membership value fuzzy solution until rule to I $\mu_{kf} [X_i]$ = fuzzy membership value fuzzy rules to i

2. Additive Method (Sum)

The fuzzy set solution is obtained by binding the bounded sum to all fuzzy region outputs generally written:

$$\mu_{sf} (x_i) = \min (1, \mu_{sf} (x_i) + \mu_{kf} (x_i))$$

with:

$\mu_{sf} [X_i]$ = the value of the membership of the solution fuzzy until the rule to i

$\mu_{kf} [X_i]$ = consecutive membership value fuzzy rules to i

3. OR Probabilistic Method (probor)

The fuzzy set solution is obtained by doing the product of all fuzzy area outputs.

Generally written:

$$\mu_{sf} (x_i) = (\mu_{sf} (x_i) + \mu_{kf} (x_i)) - (\mu_{sf} (x_i) * \mu_{kf} (x_i))$$

with:

$\mu_{sf} [X_i]$ = membership value fuzzy solution until rule i

$\mu_{kf} [X_i]$ = fuzzy membership value rule to i

2.3 E-Government

E-government is all actions in the public sector (both central and local) that involve information technology and communication with the aim of optimizing the efficient, transparent and effective public service process, has become an important part of the effort to establish good governance in Indonesia. The importance of E-government is at least caused by three factors.

1. Electronic communication between the public and the public sectors offers both new forms of participation and interaction.
2. Cyber space in public services facilitates the removal of bureaucratic structures and the classical process of convoluted service.
3. E-government can also offer localized information.

2.4 Website

Website can also be interpreted as a collection of pages displaying text data, still or moving image data, sound animation data, video or a combination of all, both static and dynamic that form a series of buildings interconnected where each is connected to the network pages.

2.5 Potential

Potentials owned by the village Bulurejo include:

1. Agriculture

In the agricultural sector Bulurejo village is said to be very much, with a land area of 30 ha, which usually planting rice during the rainy season and after the harvesting community usually Bulurejo reprocess their land.

2. Large Livestock and Small Livestock

Bulurejo village has the potential of livestock that includes large livestock and small livestock which is mostly done by the community.

3. Livestock Poultry

In addition to small cattle and large Bulurejo village also has poultry farms that are managed by some communities.

3. Analysis and Design

3.1 System Analysis

The purpose of this system analysis is to know what things will be analyzed by the system. The first step that will be done is the data collection of any potential that is owned by the Bulurejo village by going directly to the office of Bulurejo village to get detailed information.

3.2 Determination Analysis of Bulurejo Village Potential Value

This analysis is conducted to obtain information in accordance with the potential owned by the Bulurejo village also in accordance with what is managed or developed by many of its own community, so that people can know the truth of the information. So in this case study the potential potency of the village to be set is potential in the field of small cattle, large livestock, poultry, and agriculture.

For the variable value Potential Villages have the Weight and criteria of the fuzzy numbers divided into 4 parts as shown in Table 1.

Table 1: Weight and criteria of the fuzzy numbers

Criteria Value	Fuzzy Sets	Weight Value
Value 0 - 90	Medium weighing	0 - 20
	Many Fuzzy	10 - 40
	Very Many	30 - 60
	Very Much	50 - 90

The Little Fuzzy set has a weight value (0 - 20) with an equivalent degree less at 10, if the seminal value of the variable is high and exceeds 10 the closer, the Fuzzy set is less represented by the left shoulder, as follows:

$$\mu_{\text{Medium Weighing}} [X_1] = \begin{cases} 1; X_1 \leq 10 \\ \frac{10 - X_1}{5}; 10 \leq X_1 \leq 20 \\ 0; X_1 \geq 20 \end{cases}$$

For the Fuzzy set Medium weighing the value (10 - 40) with the highest medium degree of value is at 25, if the value of the variable is higher and exceeds the value of 25 then the more closely approximates. The fuzzy set is often implemented with the membership function as follows:

$$\mu_{\text{Many Fuzzy}} [X_1] = \begin{cases} 0; X_1 \leq 10 \text{ or } X_1 \geq 40 \\ \frac{X_1 - 10}{15}; 10 \leq X_1 \leq 25 \\ \frac{40 - X_1}{15}; 25 \leq X_1 \leq 40 \end{cases}$$

Many Fuzzy sets have a weighting value (30 - 60) with membership degrees Many of the highest values are at 45, if the value of the variable is higher and exceeds the value of 45, the closer is very much.

The Fuzzy Set of Many as follows;

$$\mu_{\text{Very Many}}[X_1] = \begin{cases} 0; X_1 \leq 30 \text{ or } X_1 \geq 60 \\ \frac{X_1 - 30}{15}; 30 \leq X_1 \leq 45 \\ \frac{60 - X_1}{15}; 45 \leq X_1 \leq 60 \end{cases}$$

$$\mu_{\text{Very Many}} [65] = \begin{cases} 0; 65 \leq 40 \text{ or } X_3 \geq 60 \\ \frac{65 - 40}{15}; 40 \leq X_3 \leq 45 \\ \frac{60 - 65}{15}; 45 \leq X_3 \leq 60 \end{cases}$$

Meanwhile, for the Very Much Fuzzy set has the weight of the value (60 - 90), the degree of membership is very much the highest value is found at 70, if the value is less than 70 then approaching Many.

The fuzzy set is very much presented with the right shoulder as follows;

$$\mu_{\text{Very Much}} [X_1] = \begin{cases} 0; X_1 \leq 50 \\ \frac{X_1 - 50}{20}; 50 \leq X_1 \leq 70 \\ 1; X_1 \geq 70 \end{cases}$$

$$\mu_{\text{Very Much}} [65] = \begin{cases} 0; X_3 \leq 40 \\ \frac{X_3 - 40}{20}; 40 \leq X_3 \leq 55 \\ 1; X_3 \geq 55 \end{cases}$$

3.3 Example of application of fuzzyfication in the program

The potential output of Bulurejo village as a whole is potential in agriculture or food crops 60, Large Livestock 65, Small Livestock 75, and Poultry 80.

1. Agriculture = 60

$$\mu_{\text{Medium Weighing}} [60] = \frac{10 - X_1}{5} \begin{cases} 1; X_1 \leq 10 \\ 10 \leq X_1 \leq 20 \\ 0; X_1 \geq 20 \end{cases}$$

$$\mu_{\text{SMany Fuzzy}} [60] = \begin{cases} 0; X_1 \leq 10 \\ \frac{60 - 10}{15}; 10 \leq 25 \text{ or } 50 \geq 60 \\ \frac{60 - 40}{15}; 25 \leq 65 \\ = 1,33 \end{cases}$$

$$\mu_{\text{Very Many}} [60] = \begin{cases} 0; X_1 \leq 30 \text{ or } X_1 \geq 60 \\ \frac{60 - 30}{15}; 30 \leq X_1 \leq 65 \\ \frac{60 - 60}{15}; 65 \leq X_1 \leq 60 \\ = 0 \end{cases}$$

$$\mu_{\text{Very Much}} [60] = \frac{X_1 - 50}{20} \begin{cases} 0; X_1 \leq 50 \\ 60 \leq X_1 \leq 60 \\ ; X_1 \geq 90 \end{cases}$$

2. Large Livestock = 65

$$\mu_{\text{Medium Weighing}} [65] = \begin{cases} 1; 65 \leq 30 \\ \frac{30 - 65}{5}; 30 \leq X_3 \leq 10 \\ 0; X_3 \geq 0 \end{cases}$$

$$\mu_{\text{Many Fuzzy}} [65] = \begin{cases} 0; X_3 \leq 30 \text{ or } X_3 \geq 30 \\ \frac{X_3 - 30}{15}; 30 \leq X_3 \leq 45 \\ \frac{65 - 65}{15}; 45 \leq X_3 \leq 30 \\ = 0 \end{cases}$$

3. Small Cattle = 75

$$\mu_{\text{Medium Weighing}} [75] = \begin{cases} 1; 75 \leq 20 \\ \frac{20 - 75}{5}; 10 \leq X_3 \leq 10 \\ 0; X_3 \geq 0 \end{cases}$$

$$\mu_{\text{Many Fuzzy}} [75] = \begin{cases} 0; X_3 \leq 20 \text{ or } X_3 \geq 30 \\ \frac{X_3 - 20}{15}; 20 \leq X_3 \leq 15 \\ \frac{60 - 75}{15}; 15 \leq X_3 \leq 30 \end{cases}$$

$$\mu_{\text{Very Many}} [75] = \begin{cases} 0; 75 \leq 20 \text{ or } X_3 \geq 60 \\ \frac{75 - 20}{15}; 20 \leq X_3 \leq 40 \\ \frac{60 - 75}{15}; 40 \leq X_3 \leq 60 \end{cases}$$

$$\mu_{\text{Very Much}} [75] = \begin{cases} 0; X_3 \leq 40 \\ \frac{X_3 - 40}{15}; 40 \leq X_3 \leq 55 \\ 1; X_3 \geq 55 \end{cases}$$

4. Poultry 80

$$\mu_{\text{Many Fuzzy}} [80] = \frac{10 - x_1}{5} \begin{cases} 1; X_1 \leq 10 \\ 10 \leq X_1 \leq 20 \\ 0; X_1 \geq 0 \end{cases}$$

$$\mu_{\text{Very Many}} [80] = \begin{cases} 0; X_1 \leq 30 \text{ or } X_1 \geq 60 \\ \frac{80 - 30}{15}; 30 \leq X_1 \leq 45 \\ \frac{60 - 80}{15}; 45 \leq X_1 \leq 60 \\ = 3,33 \end{cases}$$

$$\mu_{\text{Very Much}} [80] = \frac{X_1 - 50}{20} \begin{cases} 0; X_1 \leq 60 \\ 80 \leq X_1 \leq 60 \\ 1; X_1 \geq 60 \end{cases}$$

3.4 Reasoning (Inference)

At this stage a rule-rule determination of the fuzzy logic system, rules (implementations) can be established to represent relations between input and output. The operator used to combine the input rule is the operator and that describes the input output is IF - THEN.

If (Agriculture is Medium) and (Cattle is a lot)

α - potential village results = $\mu_{\text{PAPmedium}} \cap \mu_{\text{TUmany}}$

= $\mu_{\text{PAPmedium}} (60) \cap \mu_{\text{TUmany}} (80)$

= $\min (1.33; 3.33)$

= 1.33

3.5 Defuzzification

This stage is also called the input and process confirmation stage. This assertion is a vague set obtained from the composition of vague rules, while the resulting output is a number in the domain of the fading set.

Results rule as above data is;

$$z = \frac{60,1,33 + 80,3,33}{1,33 + 3,33}$$

$$z = \frac{79,8 + 266,4}{4,66}$$

$$z = \frac{346,2}{4,66}$$

$$z = 74,29$$

So from the above experiments there is a value of 74.29 which is included in the potential of a good village.

4. Conclusion

From the results of research that has been done the authors conclude that the application of fuzzy logic method in determining the potential value of the village in accordance with the criteria has been successfully established, so that the fuzzy logic method is suitable for the calculation of the search results from the potential of Bulurejo village. In making the e-Government Information System in Bulurejo village there are still many things that must be developed, such as:

1. The need to increase the potential of the village well in order to achieve a better standard of living in the presence of web-based application system.
2. In order to improve the provision of information quickly and accurately then e-Government web admin is required to always update.
3. Need to be socialized to the community, so that the system has been built beneficial.

References

- [1]. Aklani, Syaeful Anas. Fuzzy logic method for evaluation of nurse service performance (case study: RSIA Siti Hawa Padang). *Edik Informatika Journal*. Vol 01. pp. 35-43. STKIP PGRI West Sumatra
- [2]. Hartati Sri, Ricky Wijaya. (2016). Implementation of Government Web As Information Media Potency of Desa Sukaraja. *TAM Journal*. Vol 7. Items 61-66. STMIK Pringsewu Lampung
- [3]. Andoyo Andreas, Ahmad Sujarwadi. (2014). Web Based Information System In Tresnomaju Village, Pesangara Subdistrict Kemmen District. *TAM Journal*. Vol 3. Page 1-9. STMIK Pringsewu Lampung
- [4]. Rachman Evarina Septiana, Beni Noviyanto. (2017). Utilization of E-Government in Wonokarto Village To Improve Accuracy and Information on Village Potential. *TAM Journal*. Vol 8. pp. 45-50. STMIK Pringsewu Lampung
- [5]. Hartati Sri, Putri Pertiwi. (2014). Utilization of Electronic Government in Government Empowerment and Potential of Web Based Village in Bogorejo Village Kec. Gedong Tataan. *TAM Journal*. Vol 3. pp. 11-20. STMIK Pringsewu Lampung
- [6]. Statistics-District-Districts-Gading-Rejo-2015 (Friday, September 08, 2017, 9:03:34 AM)
- [7]. Rosli, M.R.B., Salamon, H.B., and Huda, M. (2018). Distribution Management of Zakat Fund: Recommended Proposal for Asnaf Riqab in Malaysia. *International Journal of Civil Engineering and Technology* 9(3), pp. 56-64.
- [8]. Aminin, S., Huda, M., Ninsiana, W., and Dacholfany, M.I. (2018). Sustaining civic-based moral values: Insights from language learning and literature. *International Journal of Civil Engineering and Technology*. 9(4), 157-174.
- [9]. Maseleno, A., Pardimin, Huda, M., Ramlan, Hehsan, A., Yusuf, Y.M., Haron, Z., Ripin, M.N., Nor, N.H.M., and Junaidi, J. (2018a). Mathematical Theory of Evidence to Subject Expertise Diagnostic. *ICIC Express Letters*, 12 (4), 369 DOI: 10.24507/iceicel.12.04.369
- [10]. Maseleno, A., Huda, M., Jasmi, K.A., Basiron, B., Mustari, I., Don, A.G., and Ahmad, R. (2018b). Hau-Kashyap approach for student's level of expertise. *Egyptian Informatics Journal*, doi.org/10.1016/j.eij.2018.04.001.
- [11]. Maseleno, A., Huda, M., Siregar, M., Ahmad, R., Hehsan, A., Haron, Z., Ripin, M.N., Ihwani, S.S., and Jasmi, K.A. (2017). Combining the Previous Measure of Evidence to Educational Entrance Examination. *Journal of Artificial Intelligence* 10(3), 85-90.
- [12]. Huda, M., & Teh, K. S. M. (2018). Empowering Professional and Ethical Competence on Reflective Teaching Practice in Digital Era. In Dikilitas, K., Mede, E., Atay D. (Eds). *Mentorship Strategies in Teacher Education* (pp. 136-152). Hershey, PA: IGI Global. doi: 10.4018/978-1-5225-4050-2.ch007
- [13]. Huda, M., Teh, K.S.M., Nor, N.H.M., and Nor, M.B.M. (2018a). Transmitting Leadership Based Civic Responsibility: Insights from Service Learning. *International Journal of Ethics and Systems*, 34(1), 20-31.
- [14]. Huda, M., Maseleno, A., Muhamad, N.H.N., Jasmi, K.A., Ahmad, A., Mustari, M.I., Basiron, B. (2018b). Big Data Emerging Technology: Insights into Innovative Environment for Online Learning Resources. *International Journal of Emerging Technologies in Learning* 13(1), 23-36. doi:10.3991/ijet.v13i01.6990
- [15]. Huda, M., Maseleno, A., Teh, K.S.M., Don, A.G., Basiron, B., Jasmi, K.A., Mustari, M.I., Nasir, B.M., and Ahmad, R. (2018c). Understanding Modern Learning Environment (MLE) in Big Data Era. *International Journal of Emerging Technologies in Learning*. 13(5), 71-85. doi: 10.3991/ijet.v13i05.8042
- [16]. Huda, M. & Sabani, N. (2018). Empowering Muslim Children's Spirituality in Malay Archipelago: Integration between National Philosophical Foundations and Tawakkul (Trust in God). *International Journal of Children's Spirituality*, 23(1), 81-94.
- [17]. Huda, M., Jasmi, K. A., Mustari, M. I., Basiron, B., Mohamed, A. K., Embong, W., ... & Safar, J. (2017g). Innovative E-Therapy Service in Higher Education: Mobile Application Design. *International Journal of Interactive Mobile Technologies*, 11(4), 83-94.
- [18]. Huda, M., Siregar, M., Ramlan, Rahman, S.K.A., Mat Teh, K.S., Said, H., Jamsari, E.A., Yacub, J., Dacholfany, M.I., & Ninsiana, W. (2017j). From Live Interaction to Virtual Interaction: An Exposure on the Moral Engagement in the Digital Era. *Journal of Theoretical and Applied Information Technology*, 95(19), 4964-4972.
- [19]. Anshari, M., Almunawar, M. N., Shahrill, M., Wicaksono, D. K., & Huda, M. (2017). Smartphones usage in the classrooms: Learning aid or interference?. *Education and Information Technologies*, 22(6), 3063-3079.
- [20]. Huda, M., Sabani, N., Shahrill, M., Jasmi, K. A., Basiron, B., & Mustari, M. I. (2017a). Empowering Learning Culture as Student Identity Construction in Higher Education. In A. Shahriar, & G. Syed (Eds.), *Student Culture and Identity in Higher Education* (pp. 160-179). Hershey, PA: IGI Global. doi:10.4018/978-1-5225-2551-6.ch010
- [21]. Huda, M., Jasmi, K. A., Hehsan, A., Shahrill, M., Mustari, M. I., Basiron, B., & Gassama, S. K. (2017b). Empowering Children with Adaptive Technology Skills: Careful Engagement in the Digital Information Age. *International Electronic Journal of Elementary Education*, 9(3), 693-708.
- [22]. Huda, M., Shahrill, M., Maseleno, A., Jasmi, K. A., Mustari, I., & Basiron, B. (2017c). Exploring Adaptive Teaching Competencies in Big Data Era. *International Journal of Emerging Technologies in Learning*, 12(3), 68-83.
- [23]. Huda, M., Jasmi, K. A., Basiran, B., Mustari, M. I. B., & Sabani, A. N. (2017d). Traditional Wisdom on Sustainable Learning: An Insightful View From Al-Zarnuji's Ta 'lim al-Muta 'allim. *SAGE Open*, 7(1), 1-8.
- [24]. Huda, M., Jasmi, K. A., Embong, W. H., Safar, J., Mohamad, A. M., Mohamed, A. K., Muhamad, N. H., Alas, Y., & Rahman, S. K. (2017e). Nurturing Compassion-Based Empathy: Innovative Approach in Higher Education. In M. Badae, & M. Suditu (Eds.), *Violence Prevention and Safety Promotion in Higher Education Settings* (pp. 154-173). Hershey, PA: IGI Global. doi:10.4018/978-1-5225-2960-6.ch009
- [25]. Huda, M., Jasmi, K. A., Alas, Y., Qodriah, S. L., Dacholfany, M. I., & Jamsari, E. A. (2017f). Empowering Civic Responsibility: Insights From Service Learning. In S. Burton (Ed.), *Engaged Scholarship and Civic Responsibility in Higher Education*(pp. 144-

165). Hershey, PA: IGI Global. doi:10.4018/978-1-5225-3649-9.ch007

- [26]. Huda, M. (2018). Empowering Application Strategy in the Technology Adoption: Insights from Professional and Ethical Engagement. *Journal of Science and Technology Policy Management*. doi.org/10.1108/JSTPM-09-2017-0044.