Fuzzy Multi Criteria Decision Making To Determine The Best Rice Quality in Riau Island

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Abstract: Indonesia as maritime country has designed national food security plan not only in sea food resources it also in mainland food resources such as rice crops that will produce rice (staple food source) which is intended as consumption of staple food source of the people of Indonesia. This research aimed to help the national food security plan which is to determines the superior quality of various types of rice and rice varieties that exist in this maritime country through Fuzzy Multi Criteria Decision Making method (FMCDM) as a applied method to determine of high quality rice. In this method researchers have been able to determine some types of seeded rice that has been through the process of calculating the fuzzy logic system which later can be utilized in the needs of the wider community, in the hope that the government can used this method to the selection of superior rice quality.

Keywords: Fuzzy Multi Criteria Decision Making (FMCDM)

1. Introduction

Farmers are one of the most important factors in the region of Indonesia relying on its life as a rice farmer. But often people have a lot of difficulty in determining what rice they will use in farming. Rice crops basically have a way of determining their own characteristics or characters to determine whether the rice is good or good and deserves to be consumed. Rice is the main food crop in Indonesia because most of Indonesia's population is mainly rice. Many farmers or rice enthusiasts are difficult to determine the best rice. The best selection of the best rice is one of the efforts made by the farmers or rice enthusiasts to solve the problem, the lack of interest of farmers or people who consume to choose the best rice available. Decision-making refers to the selection or ranking of available alternatives by using several criteria for selection consideration. As for rice farmers basically have a way to determine the characteristics of its own or the character to determine the good or good rice and deserve to be consumed. Many sometimes farmers or rice enthusiasts are hard to determine the best rice. With the existing alternative on decision support system with FMCDM method to choose the best rice.

The Decision Support System (DSS) is a system intended to support managerial decision-makers in semi-structured decision situations, in order to be a tool for decision-makers to expand their capabilities, but not to replace their assessment of these currencies in (Muqtadir A. and Purdianto I., 2013). Problem solving not only refers to the solution of the problem area / difficulties but also includes an investigation of the opportunities that exist. Definition of ideal decision support system is:

a. DSS is a computer-based system with an interface between machine / computer and user.
b. DSS is intended to assist decision makers in solving a problem at various levels of management and not to change the position of humans as decision makers.
c. DSS is able to provide an alternative solution for semi / unstructured problems for both individuals and groups and in a variety of processes and decision-making styles.
d. DSS uses data, databases and analysis of decision models (Marto, 2012).
The system is a collection of different components that are interconnected, work together and support each other to achieve a certain goal (Munir, Usman M. and Angriswono, 2013), while according to this rate states the System is a unity of component procedures that are related to each the other, work together in accordance with the rules applied so as to form a common goal, where in a system if there is one part that is not working or damaged then a goal can occur error results or output, the system is a collection of elements that mutually (Ardiansyah, 2013). While the system is an order or alignment consisting of a number of functional components (with units of functions or special tasks) that are interconnected and together aims to fulfill a process or work certain. Fuzzy Multi Criteria Decision Making (MCDM) is a decision-making method that aims to define the best alternative decision of the number of alternatives based on certain criteria to be considered (Kahar N. and Fitri N., 2011). And Fuzzy Multi Criteria Decision Making (MCDM) is a decision making method to establish the best alternative of a number of alternatives based on certain criteria. Criteria are usually in the form of measures, rules or standards used in decision making (Puspitorini S. and Sitohang S.A., 2011).

2. Methodology

The research methodology is a description of the steps that will be implemented in conducting the research. The steps of this research will be further illustrated in the form of a research framework. This methodology needs to be established so that research can be conducted in a structured way. Steps that will be done must include starting from studying the problem to the creation of a system that can solve the problems that exist. Using Fuzzy Multi Criteria Decision Making (MCDM) is one of the methods that can help decision makers on some decision alternatives to be taken with some criteria and the degree of compatibility of each alternative. In the best rice selection process using Fuzzy Multi Criteria Decision Making, criteria are needed, the importance of each criterion and the rating of an alternative match against the criteria for calculation so that the best alternative will be obtained.

3. Results and Discussion

In this case the data source can be from the Office of Agriculture Asahan, therefore the researchers wrote that A1 is the same as alternative 1, researchers also grouped between A1 with existing data sources can be seen in table 4.1 below:

| Alternatif | Information          |
|------------|----------------------|
| A1         | Rice Situ Bagendit   |
| A2         | Inpari Rice          |
| A3         | Ciherang rice        |
| A4         | Cibogo Rice          |
| A5         | Cigeulis Rice        |
| A6         | Mekongga Rice        |

While the criteria used are shown in the following table:
Table 2. Criteria

| Kriteria | Information       |
|----------|-------------------|
| C₁       | Plant Age         |
| C₂       | Forms of Plants   |
| C₃       | Plant height      |
| C₄       | Productive Seedlings |
| C₅       | Texture of Rice   |
| C₆       | Weight of Grain   |
| C₇       | Average Results   |
| C₈       | Potential Result  |
| C₉       | Resistance to pests |
| C₁₀      | Illness           |
| C₁₁      | Advice Planted    |

Where Table 4.2 explains that the best rice is rice that has been decided as the best rice among various types of rice (alternative) along with these criteria comes from the Department of Agriculture Kab. Asahan. Whereas UT = Planting Age (C1), BT = Plant Form (C2), TT = Plant height (C3), AP = Productive tiller (C4), TN = Texture Rice (C5), BB = Weir Grain (C6), RRH = Average Results (C7), PH = Potential Result (C8), H = Pest (C9), P = Disease (C10), AT = Cultivation (C11), are part of predetermined criteria. Rice Situ Bagendit (A1), Inpari Rice (A2), Rice Ciherang (A3), Cibogo Rice (A4), Cigeulis Rice (A5) and Mekongga Rice (A6) is an alternative to determine the best rice to be determined. Multi Criteria Decision Making fuzzi model can be seen in Figure 4.2 below:

Then the degree of matching alternatives with the decision criteria are: T (match) S = {SK, K, C, B, SB}, by SK = Very Less; K = Less; C = Enough; B = Good; and SB = Very Good; which are each represented by the triangular fuzzy numbers as follows:

1. SK = (0.5, 0.5, 0.75)
2. K = (0.5, 0.75, 1)
3. C = (0.75, 1, 1.5)
4. B = (1, 1.5, 2)
5. SB = (1.5, 2, 2)
Figure 2. Model Fuzzy Multi Kriteria Decision Making

Table 3. Index Matches For Any Alternative

| Alternatif | Fuzzy Matching Index | $Y_1$ | $Q_1$ | $Z_1$ |
|------------|----------------------|-------|-------|-------|
| $A_1$      |                      | 0,857954545 | 1,670454545 | 2,534090909 |
| $A_2$      |                      | 0,869318182 | 1,625 | 2,534090909 |
| $A_3$      |                      | 1,386363636 | 2,659090909 | 3,636363636 |
| $A_4$      |                      | 0,971590909 | 1,852272727 | 2,840909091 |
| $A_5$      |                      | 1,011363636 | 1,954545455 | 3,045454445 |
| $A_6$      |                      | 1,113636364 | 2,159090909 | 3,363636364 |

In completing the results of interviews in rice research obtained several alternatives as well as criteria or characteristics of rice that has various types of variation, apart from that in the determination of the assessment from the lowest level to the highest level. Basically the result of the value of table 3 above is a problem of confused farmers in choosing rice crops and the most sought after by consumers. To solve the problem the first point is to collect the next alternative to collect the criteria, then get the membership results.
To get the final result like table 3 above do multiplication of value between interest rating and match rating value, then all the result of multiplication are mutually added and multiply with result of alternative division and criteria. To produce the final result in the need to distribute the fuzzy match index, and by taking the optimum degree ($\alpha = 0$ (not optimistic), $\alpha = 0.5$ and $\alpha = 1$ (very optimistic), it will obtain the integral value for each alternative. In the column $\alpha = 0$ in use all match results are added and shared to $\frac{1}{2}$ and to find the results in columns 0.5 and 1 using the same way.

4. Conclusions

Based on the results of the discussion from the previous chapter it can be concluded as follows:

a. The application of the Fuzzy Multi Criteria Decision Making Method can help determine the best alternative in a decision-making system for the best rice selection.

b. Fuzzy Multi Criteria Decision Making using decision support system can generate criteria and weights on each criteria.

c. Fuzzy Multi Criteria Decision Making by utilizing Software Tools Web Browser this system can we apply only as a tool for decision makers in determining the best rice.

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