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Identification of Sundep, Leafhopper and Fungus of Paddy by Using Fuzzy SAW Method

SATRIA ABADI¹, AKMAL HAWI², AKLA³, IHSAN DACHOLFANY³, MIFTACHUL HUDA⁴,
KAMARUL SHUKRI MAT TEH⁵, JAKI WALIDI⁶, WAHIDAH HASHIM⁶, ANDINO MASELENO*

¹Department of Information Systems, STMIK Pringsewu, Lampung, Indonesia

²Universitas Islam Negeri Raden Patah Palembang, Indonesia

³State Institute of Islamic Studies Metro, Lampung, Indonesia

⁴Universiti Teknologi Malaysia, Malaysia

⁵Universiti Sultan Zainal Abidin Malaysia, Malaysia

⁶Institute of Informatics and Computing Energy, Universiti Tenaga Nasional, Malaysia

E-mail id : andimaseleno@gmail.com

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ABSTRACT

The process of disease identification of paddy must be in accordance with predetermined criteria. To assist in selecting the determination of participants, they must identify disease characteristics, a decision support system is needed. One method that can be used for decision support systems is FMADM (Fuzzy Multiple Addictive Decision Making). Where in this study using the method of SAW (Simple Addictive Weighted) is to find the best alternative from several alternatives. Where the best alternative is based on predetermined criteria. This method was chosen because it was able to choose the best alternative, namely the best identification based on the criteria entered, then look for the weight score of each attribute, after the process of looking for ranking to get the best alternative, namely disease in paddy.

Keywords: simple additive weighting, disease identification, paddy plant

INTRODUCTION

Technology is the whole means to provide goods needed for human life survival and comfort. The use of technology by humans begins with the conversion of natural resources into simple tools. Prehistoric discovery about the ability to control fire has increased the availability of food sources, while the creation of wheels has helped human to travel and to control their environment. The latest technological development, including printing machine, telephone, and the Internet, has reduced physical barrier to communication and enable human to interact freely on a global scale. The development of the times and technological advancements encourages us to always strive to improve the ability in terms of mastering information technology. Based on the results of interviews and direct observations of farmers, the core of the problem, farmer still use simple characteristics, so it is still difficult to recognize the characteristics of the disease in paddy. With the identification process of sundep, leafhopper and fungus on paddy taken by direct observation to the farmers, it is expected that farmers ease in identifying the characteristics of pests and diseases that attack the rice plants and increase yields. By storing information and combined with a set of

reasoning rule which is sufficient to allow the computer to give conclusions or make decisions like an expert, then the author makes a system in a computer that can solve problems and provide solutions on how to detect diseases in paddy.

Problem Formulation

Based on the background above, it can be formulated the problem as follows

1. How to ease in disease identification process of sundep, leafhopper and fungus of paddy.
2. How the farmers know the characteristics of sundep, leafhopper and fungus disease of paddy.
3. How to develop application based on fuzzy law.

Objectives

As for the objectives of this research were :

1. It was expected it can increase the performance in preventing pest and it can increase paddy yeild.
2. Presenting system using fuzzy saw method.

Research benefit

Based on above explanation, the benefits of this research are :

1. Can improve performance in preventing pest and can increase the yield.

2. Can ease the farmer performance.

Literature Review

Definition of Identification

According to Koenjtaraningrat, identification is a form of recognition of a social characteristic from social phenomenon in a clear and detailed manner (Koenjtaraningrat, 1987: 17). Recognize the overall symptoms that occur in the community by looking at them through the same symptom.

Definition of Paddy Disease

According to Jakes Seto (2011) Paddy is the most important cultivated crop in the civilization. Paddy is capable of producing rice which is the staple food of Indonesian people, there are many pests and diseases that attack the paddy, so that it can reduce the production of paddy, while in remote area in Indonesia, there are still many farmers do not know the types of pests and diseases that attack paddy, such as sundep, leafhoppers and fungus. In addition, they do not know the characteristics of the types of diseases that attack the growth of rice. The failure of harvest greatly affects farmers and the wider community because of the foodstuff decrease.

Definition of Artificial Intelligence

H. A. Simon [1987]

Artificial intelligence (AI) is an area of research, application and instruction related to computer programming to do something that -in human view is intelligent

Rich and Knight [1991]

Artificial Intelligence is a study of making computers do things that at this time can be done better by humans.

Encyclopedia Britannica:

Artificial Intelligence is a chapter of computer science which in representing knowledge uses more forms of symbols than numbers, and processes information based on heuristic methods or based on a number of rules.

Simple Addtive Weighting (SAW) Method

The SAW method or Simple Additive Weighting is a method often known as a weighted addition method. The purpose of the weighted sum is to find the sum weighted from the rating in each alternative on all attributes / criteria. The result / total score obtained for an alternative is to add all the multiplication results between rating / compared to the cross attributes and weights of each attribute. Ratings on each of the previous attributes must have been through the normalization process. The SAW method requires the process of normalizing the decision x matrix to a scale that can be compared to

the existing alternative ratings. The SAW method is formulated with the following formula:

$$r_{ij} = \begin{cases} \frac{x_{ij}}{\text{Max}_i x_{ij}} \\ \frac{\text{Min}_i x_{ij}}{x_{ij}} \end{cases}$$

Description: rij is normalized performance rating from Ai alternative of Ai criteria/attributes, Cj; i=1,2,3...,m dan j=1,2,3...,n. For each alternative is given preference score (Vi) with formula as follows:

$$V_i = \sum_{j=1}^n w_j r_{ij}$$

Then it will be obtained ranking process, v is highest score with best alternative.

Research Methodology

Data Collection Method

From observation result and direct quiz with farmer, as for the obstacles faced in detecting the charateristics of disease attack paddy plant so the farmer is difficult to determine the type of medicine to prevent it.

Table 1. Charateristics of disease attack paddy plant

No	Description
1	Leaf Blotch
2	Plant Neck Broken
3	Yellow Leaf
4	Dry Stem
5	Broken Leaf Bud

System Development Methodology

In designing system, the selection used the SAW fuzzy method. Whereas in the fuzzy concept, SAW required criteria and weight score for each criterion to perform calculations so that the best alternative would be to determine the identification of disease characteristics in paddy. In the SAW fuzzy concepts there are various criteria needed in identifying the characteristics. The criteria can be seen in the points below:

1. Leaf blotch
2. Plant Neck broken
3. Rolling stem .
4. Dry leaf.

5. Leaf bud broken.

Determination of these criteria will be used as a reference in decision making. After completing the determination of criteria, there will be a weight value for each criterion. Weight values measured based on criteria. For weighting criteria can be seen in the table 2.

3	C3	10-80%
4	C4	20-80%
5	C5	5-70%

Table2. Criteria and Weight Value

No.	Criteria	Description
1	C1	Leaf blotch
2	C2	Plant neck broken
3	C3	Yellow leaf
4	C4	Dry rice stem
5	C5	Leaf bud broken

Weighting

Table 1 explains some criteria in identifying disease characteristics of paddy where each criterion has weight score according to importance level of each criteria by sampling more than 100 persons. Table 3 shows weight score.

Table3. Weight Score

No.	Criteria	Description
1	C1	10-70%
2	C2	15-75%

Data analysis

In identification system creation of paddy disease characteristic it was needed internal and privat data.

Internal Data

Internal data is data that have been exist in organization. In this research, internal data is paddy disease data.

Private Data

Privat data is opinion data from user. In this research, the privat data is criteria data that have been set to be used in solving problem.

Implementation and System Analysis

System analysis

According to Kristanto (2003), analysis of the system is a process collecting data and interpreting existing realities to solve problems and using both to improve the system, to choose alternatives to solve problems and solving these problems using computer.

Decipherment

Identification data

Data were used to display identification data and criteria score to be tested

First step in scoring criteria

Data were taken by sampling 100 farmers using questionnaire as shown in table 4.

Tabel4. Scoring

No.	Criteria	C1	C2 (persons)	C3 (persons)	C4 Persons	C5 Persons
		(person s)				
1	Caterpillar	15	8	72	10	11
2	Sundep	10	15	8	15	63
3	Fungus	65	68	11	9	16
4	Leafhopper	10	9	9	66	10

Second step namely weighting

Weighting was taken from the greatest sample from 100 farmers as shown in table 5.

Table 5. Weighting table

No	Criteria	C1(persons)	C2(persons)	C3(persons)	C4(persons)	C5(persons)
1	Caterpillar	15	8	72	10	11
2	Sundep	10	15	8	15	63
3	Fungus	65	68	11	9	16
4	Leafhopper	10	9	9	66	10
Weighting		65	68	72	66	63

Third step in determining weight score. Determination of scoring was determined based on scoring criteria as shown in table 6.

Table 6. Weighting and scoring table

No.	Criteria	Description
1	50-60	Less close
2	60-70	Close
3	70-80	Very close

From testing above, weight from identification was taken from 100 farmers resulted the criteria as shown in table 7.

Table 7. Weighting and criteria

No	Criteria	Weight	Description
1	Leaf blotch	65	Close
2	Plant neckbroken	68	Close
3	Rolling leaf	72	Very Close
4	Dry stem	66	Close
5	Broken leaf bud	63	Close

From these criteria, it was made importance level of criteria based on the weighted score that has been determined into the SAW method. From each criterion, it will be determined the weights. The weight consists of six fuzzy numbers, namely less close (KM), close (M), and very close (SM).

Conclusion

Based on the results of identification, sample of disease of paddy using fuzzy SAW method, author draws some conclusion namely:

1. By using fuzzy SAW method, it can be built a decision support system by comparing scoring input category and ratio weight that has been determined before.
2. This system can help farmer in identifying the characteristics of paddy disease according to scoring category inputted to the system.
3. Output results is real decision according to sample from 100 farmers obtained from comparison weight lamda score scoring category with determined ratio weight .

Suggestion

The suggestion for development and identification process of disease characteristics of paddy for next research can be completed by Geographic information system (GIS) to know the pattern, so that farmers can know the characteristic of striking disease of paddy easily.

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