Optimization of Expert System for Agriculture Development of Zalacca Tree in Srumbung: A Literature Study

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Abstract. The people of Srumbung need knowledge in determining the suitability of land for planting salak plants. This is due to the lack of information on determining the suitability of land for planting salak plants and the limited knowledge of the Srumbung community. So, we need a system that can help the community in determining the land for the development of zalacca plants. In this research, an expert system will be built that can help determine the suitability of land for zalacca plants. The method used is literature study, namely by analyzing the literature that has been selected from various sources through an online database. Based on the results of a review of several literature, it was found that an expert system of land adjustment for zalacca plants. The development of this expert system is expected to be a solution to community problems in determining the land to be used for planting zalacca.

Keywords: Expert system, land suitability, salak plants

1 Introduction

Zalacca plants are native to Indonesia, which are scattered in several provinces such as DKI Jakarta, West Java, Yogyakarta, East Java, North Sumatra, Maluku, Bali, NTB and Central Java. This plant is popular with Indonesians because the zalacca plant is a fruit commodity have good prospects to be cultivated. Zalacca cultivation in Central Java has been developed in Srumbung District, Magelang Regency.

Srumbung District is a strategic area with lowland to highland topography. Geographically, this district is located on the slopes of Mount Merapi so that it supports the cultivation of salak because the soil conditions contain lots of organic matter, are able to store water but are not easily flooded and the soil acidity level is neutral. Salak trees are suitable for planting with a soil height of 0-700 meters above sea level with a tolerance for increasing altitude of up to 200 meters above sea level, if planted at an altitude above 900 meters above sea level, then the barking plant will be difficult to bear fruit.

Srumbung district has a land area of 2,337 m2 and 1000 m2 of land area used for the development of salak plants with an altitude of 501 masl. Most of the people work as salak farmers who develop salak pondoh and honey salak as superior products. Salak honey is one of the fruits with high productivity, good quality, thick flesh with a soft texture and sweet taste. Likewise, with the salak pondoh plant which is one of the cultivars developed in the 1980s. Salak pondoh is characterized by sweet, crunchy, and not as healthy flesh as when it was young.

Based on this, more people of srumbung plant salak pondoh because it has better quality so that the level of sale is relatively higher than that of honey zalacca.

However, there are several criteria for land that can be planted with salak trees in Srumbung District, so it needs a land suitability analysis that can help the Srumbung community to determine suitable land for the development of salak plants. The analysis of this research will determine the level of soil pH, soil moisture and soil height in accordance with the suitability of the land for the development of salak plants.

Research conducted [1] related to soil with land suitability for salak plants aims to evaluate quantitatively and qualitatively the soil used for planting salak trees. The data collection process was carried out by interviewing and observing the salak tree growers and developers. Respondent farmers were randomly assigned, in addition to conducting interviews and discussions with agricultural officers. In determining land suitability, data from experts is also needed as material for calculating land adjustment. Therefore, this literature study provides an overview of land suitability analysis to make it easier for salak farmers to determine the land for planting salak plants in order to obtain good results.

2   Method

Method used in writing this research is literature study. This study is the result of an analysis of the literature related to land suitability expert systems in plants. This method is used to collect data from various sources through online databases such as google scholar in the form of journals and articles at national seminars, ranging from 2000-2020 as many as 9 journals. The data obtained is then processed as research material [2]. The articles used in this research are articles that discuss "expert systems", "salak", "land", "land suitability" and also the methods used in making expert systems.

3   Results and Discussion

The analysis carried out in 15 journals showed 3 journals about expert systems for disease detection in animals, 10 journals on expert systems for land suitability for plants and 1 journal on the effectiveness of using methods forward chaining and backward chaining in making expert systems and 1 journal about expert systems for controllers' gas. The method used in these research journals is dominated by using the forward chaining method and others using the method backward chaining.

The method forward chaining will work best when pooling information and then looking for conclusions drawn from the information that has been collected. This allows the system not to recognize some facts that are more important than others. Meanwhile, the backward chaining method provides a more accurate diagnosis because it aims to guide decisions based on reasoning. However, this method is less efficient when applied in the system, because if the rules are not met, the hypothesis cannot be determined.

Expert systems that have been created provide accuracy results ranging from 70-85% accurate. This shows that the expert system is suitable for community use. The results of the expert system can help the community to determine which plants to plant and on suitable land. The suitability of the land to its crops will also provide better crop yields with better product quality.

The weakness of this expert system is the use of few parameters of comparison so that it can affect the accuracy of the results of the expert system. The test data used in the Bayes method shows some data that cannot be tolerated so that it gives less than optimal results. Then the selection of methods must be tailored to the system requirements and the targets to be achieved. Table 1 show the details of the journal results of the main choice for literature study.

Table 1. Details of the journal results of the main choice for literature study.

No	Author / Years	Research Objectives Research	Methods	Strengths	Weaknesses	Research Results
	Yuli Syafitri/ 2020 [3]	Early detection of disease in broiler chickens is done with an expert system that can find out the symptoms and how to treat diseases that occur inchickens	Certainty Factor	The community can find solutions to diseases that attack chicken livestock and can find out how to raise chickens properly.	The rules used in the system are general rules in the forward chaining method, no rules from the expert system have been implemented yet.	Broiler Chicken Disease Diagnosis Expert System
	Khanan, Sri Kusumadewi, Intan Ruspita / 2020 [4]	The process of determining drugs for dental and oral diseases is not done manually, this process will be taken over by an expert system, so that the drug will be automatically determined by thesystem.	Backward Chaining	Data for disease diagnosis and medicine are made in detail. The test results are 75% accurate.	In this study, the user input the data consultation separately from thedata input medical record. Integration of expert systems required with dental electronic medical records is.	Expert system application for drug selection for patients with dental and oral diseases
	Irvan Muzakkir and Marniyati Husain Botutihe / 2020 [5]	Makes it easy for breeders to diagnose diseases in cows based on symptoms that occur	Case Based Reasoning Method	Calculation results from the CBR method get good results. well. The system logic flow is also very detailed, so that it has a good impact on the CBR calculation results.	The data is only obtained from the problems suffered by the cows, the influence of the environment and the food provided by the cows have not been included in the data for this case calculation	the results of the diagnosis analysis of the symptoms of the disease suffered by cows
	Heliza Rahmania Hatta,	Providing information to farmers to	The Forward	Rulein the expert system is made per	application of rules in the system has not	for decision support systems to

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	Septya Maharani, Zainal Arifin, Malik Annisa, Muhammad Rivani Ibrahim, Ramaulvi Muhammad Akhyar / 2017 [6]	determine suitable crops on dry land with decision support system tools	Chaining method	plant with detailed information so that high yield accuracy will be obtained. The	been tested on land suitability applications	determine suitable types of agricultural plants on dry land
	Ira Zulfa, Richa Septima, Irwin Syah / 2020 [7]	to Determine Soil Fertility Levels in Coffee Plants.	Fuzzy Logic	data retrieval using soil moisture detection tools that are taken coherently based on a certain distance ratio. The data taken then becomes one of the parameters for determining soil fertility, the	tools used in data collection do not yet have a detection area coverage. Another detection tool is needed that can measure the soil water content or other factors that can determine soil fertility.	Expert System To Know Soil Fertility Levels In Coffee Plants.
	Fitriana Susanti, Sri Winiarti / 2013 [8]	system is designed to determine the land for planting fruits based on the suitability of plant needs.	Forward chaining	with this system, we will find out what diseases attack fruit plants and know how to plant fruit according to the diagnostic results of	applying the rules in the new system, tested 1x, so the results are less accurate	Expert system for determining land suitability for fruit plant cultivation
	Yusuf Priyandari, Roni Zakaria, Abdan Syakura / 2017 [9]	developed a recommendation system for oil palm fertilization based on the facts gathered	Forward Chaining Method	Applications made using VBA in the spreadsheet application can helpmanagers oil palm plantationto find fertilization recommendatio	The rules used in the application are still few, so they affect the accuracy of the results of the	VBA application on a spreadsheet that can helpmanagers oil palm plantationto find fertilizer recommend

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				ns for Marihat plants.		ations for Marihat plants.
	Nina Sevani, Marimin, Heru Sukoco / 2009 [10]	determines the land suitability of food crops and is carried out through the determination of expert system that can be accessed online.	Methods Forward Chaining	in this system when testing with the parameter value that exceeds the value determined by the experts, the system will immediately give the conclusion that the land is not suitable for food crops	for the parameters used are still lacking, so the result is still less accurate	System expert determination suitability of land for food crops
	Ibnu Akil / 2017 [11]	analyzes the suitability of forward chaining and backward chaining methods in designing expert systems	Forward Chaining and Backward Chaining	methods can compare two methods simultaneously. Direct	data trial results are still less specific, so the results are less accurate.	Analysis of the effectiveness of the two methods in their use in expert systems
	Aseh Egasari, Diyah Puspitaningrum, Priyono Prawito / 2017 [2]	assists farmers in determining suitable land for plantation crops using theexpert system	Bayes Methodand Forward Chaining Inference theBayes	accuracy of system testing with thecalculation method reaches 75%.	can be developed with other calculation methods such as fuzzy which can tolerate some data that is considered inaccurate in the Bayes method. This expert system is not functioning in some fields, the decision support system should be an alternative for farmers to determine the land.	expert system for identification of land suitability for plantation crops
	Gilar Hadimuly	mapped the geographic area	Geographical	The results of the research are	method used is only based on a	the Geographic

No	Author / Years	Research Objectives Research	Methods	Strengths	Weaknesses	Research Results
	al, Sophia Dwiratna, and Kharistya Amaru / 2015 [12]	of the region according to the needs of the Salak slebong plant	Information System.	precise and detailed which is presented using geographic information. The	location survey conducted by researchers, data collection does not use soil texture detection tools, temperature or other parameters used in research, so that the accuracy of the data can easily change	al Information System for areas with the needs of slebong zalacca plants.
	Romy Aulia / 2018 [13]	provides information on land suitability with fruit plants that can make it easier for farmers to determine the types of plants to be developed.	Forward Chaining	data used are complete and the rules are made in the system is sufficient to make a decision so that in the form of a decision tree	some plants are classified into one type, for example bananas with rambutan are made into one category. It is necessary to reassess the land suitability data for plants that are categorized as the same in this study.	Expert system Det ermination of tropical fruit planting areas.
	R. Nouriana, S. Meysam Mousavib, S. Raissia / 2019 [14]	This research aims to develop a new fuzzy hybrid expert system as a support system decisions to mitigate risks associated with gas transmission stations. Knowledge-based systems designed to incorporate procedural and descriptive rules based on expert judgment to analyze complex relationships between various components of	Fuzzy Logic	Based on our knowledge, this is the first research to design and implement ES fuzzy for natural gas pressure reduction stations. The majority of previous research has focused only on certain components of a gas transmission system, for example a regulator or	The Future studies may discuss fuzzy development ES for more effective control of the other sub-components of CGS. ES designed basic features can be integrated with statistical process control techniques to find more realistic solutions for safety issues. Another area of future research will be	a new fuzzy hybrid expert system as a support system decisions to mitigate risks associated with gas transmissio n stations.

No	Author / Years	Research Objectives Research	Methods	Strengths	Weaknesses	Research Results
		reduction stations gas pressure.		safety valve. However, In this research, the control model is designed to provide a maintenance solution checks for all major components of the system in both periodic control situations and emergency.	application of a grouping algorithm to categorize a large number of generated rules by the system.	
	Budi Dwi Hartanto, I Ketut Sumantra Cokorda Javandira / 2017 [15]	provides an overview of the location of zalacca development by prioritizing the bestland for the type of sugar salak plant.	Scoring	The results obtained from precise and detailed research are presented using geographic information.	This research has not studied thevalue economi cof land clearing, such as socio-culture , politics and local policies that could be a determining factor for land suitability based on geographic information	Geographic al info on the suitability of Salak Gulapasi plantations
	Reza Adelia, I Nyoman Dibia I Made Mega / 2016 [16]	provides geographic information on areas with suitable land suitability for horticultural crops equipped with limiting factors for the development of plant species.	land suitability evaluation survey method	The results of the study are precise and detailed and are presented using information on land quality	This research only examines a few fruit plants,	Suitability of Horticultur al and Plantation Plant Land.

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4 Conclusion

Overall, the expert system is able to solve problems in land adjustment and make decisions. The expert system of land adjustment obtained in the journal review is a form of development of an expert system conceptualized to determine the suitability of land to certain plants. The need for plant growth will be adjusted to the availability of soil elements in the area. This land suitability expert system is then applied to the people in Srumbung who work as salak farmers. The system developed is able to assist farmers in determining the land for the development of zalacca plants. The community will certainly find it easier to diagnose suitable land and will get better results. Suggestions for further researchers are to maximize the use of expert systems to help solve problems related to decision making or solutions in determining decisions.

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