Expert System Diagnosing Disease of Honey Guava Using Bayes Method

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Abstract. Honey Guava Fruit (Green Guava Deli) is one of the fruit that are very popular, liked, and consumed by the people. The problems that cause a decline in the quality of guava due to honey guava plants can also be attacked by disease. The limited access information about honey guava disease is one of the obstacles, while the number of agricultural experts is still insufficient. In this study a media system will be built with an expert system approach. The application development phase begins with the system analysis stage, namely data analysis and system requirements description, building a knowledge base, Data Flow Diagram, Entity Relationship Diagram, and creating a table structure, table design, and interface menu design. After the design phase is complete, it is continued to the implementation and testing phase of the application. This application uses Visual basic.Net as a programming language and Sql Server as a database. The research was conducted to make Honey Guava Disease Diagnosis System Expert System software that can work like an agricultural expert. The system is able to diagnose as many as 3 diseases using the Bayes Theorem method.
4. Introduction

Honey Guava Fruit (Green Guava Deli) is one of the fruit that are very popular, liked, and consumed by the public. Guava fruit is shaped like a bulb, the base is small and the wide end is like a top. Soft fleshy, contains lots of water and has an attractive color. Guava comes from Southeast Asia, including Indonesia. At this time, guava has spread throughout the world [1][2].

The problem with the guava tree is susceptible to interference with the roots and interference with the fruit, such as disturbance to the roots due to inadequate fertilization of the guava will damaged the roots of the plant, then the flower or guava can fall out. All can occur considering of the plant does not get enough water and food supplies and it is should be through damage to the root. In addition, excessive soil water supply can also erode flowers or fruit, consequently the water makes the roots hard to breathe and invites fungi can rot the roots. While the interference with the fruit causes the caterpillar (fly) fruit and a type of fungus that results in fruit fall out and rot, and this attack directly attacks the fruit with the characteristics of brownish or blackish stains on the surface of the fruit [3].

The solution to these problems applies how to care for honey guava trees and fruit, so it can facilitate guava fruit farmers to know these symptoms, and make or build a system to make decisions or draw conclusions based on knowledge through expert systems, and implement a system that is used by using the Bayes method it is easily used by anyone [3].

The design of expert system software on guava fruit disease can make it easier for honey guava farmers to find out the symptoms of the disease that is affected in the trees and guava fruit. This software output will be in the form of the types of diseases that arise on the tree and the guava fruit in the form of a form. The rapid advancement of computer technology can help human life even in fields outside the computer science discipline [4][5].

5. Related Works

Expert systems are computer software based on expert knowledge that provides expert quality solutions for specific specific problems. Artificial intelligence is one of the fields of computer science that utilizes computers so they can behave smartly like humans. Computer science develops software and hardware to mimic human actions. Human activities are imitated such as reasoning, vision, learning, problem solving, natural language understanding and so on. In accordance with this definition, artificial intelligence technology was studied in areas such as: Robotics (Computer Robotics), Computer Vision, Natural Language Processing, Pattern Recognition, Artificial Neural Systems ), Speech Recognition and Expert System [6][7].

6. Research Methodology

The research method used in this study is an expert system of disease diagnosis of guava plants using the Bayes method which is implemented with the Visual Basic 2010 programming language. The system created is expected to help farmers and experts (agricultural experts) in diagnosing honey guava disease. Bayes Probability is one way to overcome data uncertainty using the Bayes formula which is stated as follows:

\[
P(H|E) = \frac{P(E|H)P(H)}{P(E)}
\]

where:

- \(P(H|E)\): Probability of H hypothesis if given evidence E
- \(P(E|H)\): Probability of the emergence of evidence E if H hypothesis has known
P(H) : Probability of H hypothesis regardless of any evidence
P(E) : Probability of evidence E

The use of Bayes analysis is carried out after collecting data relating to research. The method used for the data collection process in this study is the triangulation process, like:
1. Interview, is to do a question and answer with experts who know about the honey guava plant disease and how to overcome it by looking at the symptoms that occur in the cashew plant that is attacked by the disease.
2. Observation, is observing / seeing the operational system that is running where the research is carried out. observations were made at the Binjai City Agriculture and Fisheries Service.
3. Documentation the collection of data by recording existing data, which has been investigated in the field.
4. Collect and study, data collection conducted in library research (library research) is by collecting reading material in the form of theoretical work as a theoretical basis or framework in accordance with the titles and problems raised and literature studies that can be generated from browsing on internet sites.

The hardware specifications used to diagnose diseases of honey guava plants are as follows:
1. Pentium IV 1.8 GHz
2. Memory 512Mb
3. Hardisk 80 Gb
4. Monitor
5. Keybord/ standard mouse

Whereas the software needed is with the following specifications:
1. OS : Microsoft Windows
2. Language program : Base on VB.NET 2010
3. Word processor : Microsoft office word
4. Database processor : SQL Server 2008

4. Result and Discussion
This Expert System is an application that can diagnose and provide information about the disease of honey guava plants based on symptom data chosen by the user. In this case it will be discussed how the system can interact with the database used by the system. The implementation result of the system built from the author of this thesis is an expert system to diagnose honey guava disease. Expert system diagnosing honey guava consists of Login form, main menu form, disease data form, remedy form. After the system design is complete, the writer shows. The following is the interface display design and explanation that the author designs are:

a. Form Login
This form will appear when the admin clicks on Login. This page is used as the entrance to the main page where only the admin with the correct username and password can access it.

b. Main Page Form
When the expert system application is first run, the Main Menu Form will appear, which is the main menu for the user and admin. This form is used to display application program menus that have been designed to run the honey guava expert system program.

c. Disease Data Input Form
In the form of disease input functions as a procedure for inputting honey guava disease, input causes, treatment, prevention and display as a entire.

d. Input RoleForm
The role form is a representation of the results of the knowledge acquisition process wherein the acquisition of knowledge is carried out collecting knowledge data which is a problem of an expert and used as documentation to be processed and organized into knowledge. Rule form is the percentage display of each disease divided by the number of research objects. Suppose the study was carried out on
100 trees, based on the rule: Normal 48/100 = 0.48, rod fungus 31/100 = 0.31. Crustal fungus 12/100 = 0.12, root rot 9/100 = 0.09.

e. Result of Honey Guava Diagnosis Form
The diagnostic form in the first table (start) will display the diagnosis of the symptoms and diseases entered through the form and the deterrent. The second table will display all the same symptoms and diseases after being diagnosed. In the column the number of digits is obtained from the number of diagnoses, for example the diagnosis of Stem Mushroom Disease is 31 divided by 100. (number of trees in the study) the probability of the disease being 0.31 is obtained, and in the results column the number of diagnoses of a disease is added and the number of probabilities divided by the number of symptoms, for example fungal rod disease 0.31 + 0.31 + 0.31 + 0.31 + 0.31 + 0.31 = 1.86 / 7 = 0.26571.

5. Conclusion
Based on the research that has been done, software is produced to diagnose the disease of honey guava plants using the Bayes method, during the design process to the implementation of the expert system, the following conclusions can be drawn:
1. Expert application to diagnose disease symptoms of honey guava as many as 16 symptoms, number of diseases as many as 3 types of diseases, and the number of solutions / countermeasures as many as 3 countermeasures, inference supported by bayes theorem.
2. The resulting application is in the form of an expert system that is able to identify the honey guava plant disease based on the symptoms entered and provide solutions to overcome it like an expert.
3. The information produced is expected to help farmers / users and can be used as expert conclusions about the number of honey guava plants including symptoms, name of the disease and how to surmount it.

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