DESIGN OF EXPERT SYSTEM DIAGNOSIS OF CATFISH DISEASE WITH FORWARD CHAINING METHOD

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ABSTRACT

The expert system can be used as a means for consulting and assisting experts and catfish breeders who are experiencing problems in identifying catfish diseases and their solutions. So that this expert system can be accessed easily by anyone and anywhere connected to the internet network, this expert system is made web-based. The MySQL database used in this system will store facts that were built using the PHP programming language. Likewise, system development is only limited to diagnosing catfish diseases. The output of this system is in the form of disease information in catfish and how to handle it. The form of research used by the author is a literature study and is applied to experimental research. The software development method used by the author is to use the Forward Chaining method which consists of rules. The results of the research that have been made, it is found that this website and expert system make it easy for ordinary people or beginners to cultivate catfish in order to produce healthy and superior catfish.

Keywords: *expert system, catfish disease, forward chaining.*

1. INTRODUCTION

1.1 Background

Indonesia is a vast country and rich in biodiversity, for example catfish. But there is also the problem of the failure of this catfish maintenance. One of the causes of the failure of this activity is due to disease. The emergence of disease disorders in catfish is a risk that must always be anticipated. The emergence of this disease is an unbalanced result in weak fish aquatic ecosystems and deteriorating environmental quality. Catfish disease is almost the same as the disease found in other freshwater fish. There are many ways to create software, one of which is using Visual Basic Net. With Net Framework-based software, it makes it easy for users to build software with a very good GUI and software reliability.

Catfish cultivating in the Krian sub-district in the Tanah Sedengan village, Mijen. According to one source, a catfish cultivator named Suhermanto who is located in Sedengan Mijen village. The success of catfish farming is caused by the location, the size of the pond, water, pest attacks (diseases) and maintenance methods. According to Suhermanto's experience, there has been a mass death of about 300 to 400 catfish with no known cause of death. Catfish cultivating in the Krian sub-district in the Tanah Sedengan village, Mijen. According to one source, a catfish cultivator named Suhermanto who is located in Sedengan Mijen village. The success of catfish farming is caused by the location, the size of the pond, water, pest attacks (diseases) and maintenance methods. According to Suhermanto's experience, there has been a mass death of about 300 to 400 catfish with no known cause of death.

To solve this problem is to ask experts to provide knowledge about how to cultivate catfish that is good and right. Experts can also provide knowledge about the various diseases that can attack catfish and how to prevent and overcome them. In that way, prospective catfish cultivators can start a business well, and catfish cultivators can identify diseases that attack catfish and take prevention or control so that the amount of production is maintained.

To solve this problem is to ask experts to provide knowledge about how to cultivate catfish that is good and right. Identify diseases that attack catfish and take prevention or control so that the amount of production is maintained. The author's consideration for making the title **"Designing an Expert System for Diagnosing Catfish Disease Using Forward Chaining Methods"** in Sedengan Mijen Krian Sidoarjo village as a way to help the community know about how to deal with disease problems in catfish, for that with this application the problem of shortage of experts can be solved. Solved, with this expert system the user can interact with the system like interacting with an expert. This application uses the forward chaining method if the user knows the symptoms of the disease but does not know the type of catfish disease.

1.2 Research Objectives

The purpose of the implementation of the final project research is as follows:

1) make an application of an expert system for diagnosing catfish disease as a tool in providing consulting services for catfish disease.
2) implement the application of an expert system for diagnosing catfish disease with the forward chaining method that can help diagnose catfish disease before consulting with experts.

1.3 Problem Limitation

The problem limits on the Catfish Disease Consultation Expert System adhere to the reference book entitled "Peel and Complete Catfish Cultivation and Business" are as follows:

1) Diseases are discussed in accordance with the symptoms that arise.
2) The method used in making this application uses the Forward chaining method.
3) This application is specifically for catfish cultivators

2. SYSTEM ANALYSIS AND DESIGN

2.1. System Analysis

Before determining the existing problems, it is necessary to conduct an analysis or observation with the priority of the existing problems and to determine how the right solution to solve the problem is. In systems analysis, you will learn how a system works and how the processes that occur when the system works.

2.2 Disease Symptoms Data

In this conceptualization stage, it is determined what elements are related to the type of disease and the symptoms it causes. This theory is sourced from knowledge obtained from book references and consultations with experts.

Table 1 Catfish Disease Table

NO	Type of disease	Cause	Disease Symptoms
1	Bacterial Infection	*Pseudomonas*	Attacking catfish of all sizes
			Ulcers on the skin
			Bleeding skin, liver, kidneys, spleen
			Weak, thin, lost appetite
2	Bacterial Infection	*Aeromonas hydrophyla*	Attacking seeds size 1-12 cm
			Dark skin, rough and bleeding
			Weak and hard to breathe
			bleeding in the liver, kidneys and spleen
3	Bacterial Infection	*Aeromonas punctata*	Attacking seeds size 1-12 cm
			Infection of scalp, hind body, gills and fins
			Loss of appetite
4	Bacterial Infection	*Columnaris (Suhu dingin 20˚C)*	Attacking catfish of all sizes
			Bleeding and skin/flesh ulcers
			Bleeding in the liver, kidneys and spleen

5	Bacterial Infection	*Penduncle (suhu dingin 16˚C)*	Attacking catfish of all sizes
			Bleeding and skin/flesh ulcers
			Bleeding in the liver, spleen and kidneys
6	Bacterial Infection	*Edwardsiella*	Protruding eyes and side body
			Dark skin tone
			Skin ulcers and bleeding
7	Bacterial Infection	*Tubercolosis*	Attacking catfish of all ages
			Dark skin tone
			Swollen belly
			Spotted heart
8	Mushroom Attack	*Saprolegnia* (jamur putih seperti kapas)	Attacking injured and weak fish
			Egg attack
			The head, gill cover and fins are covered with fine threads like cotton
9	Mushroom Attack	*Ichyophtirius multifilis*(bercak putih dan gatal)	Attacking catfish of all sizes
			The catfish is weak and comes to the surface
			White spots appear on the fins and gills
			Fish rub their bodies on the bottom and walls of the pond
10	Parasite Attack	*Trichodina sp*	Weak and skinny catfish
			The catfish rubs its body against a hard object
11	Parasite Attack	*Gyrodactilus sp & Dactilogyrus sp*	Dull catfish skin
			Thin body
			Falling fins
			rubbing his body against a hard object
12	Parasite Attack	*Lernae sp*	Attaches and pricks themselves on the gills, fins for 25 minutes
			The part that is pasted will become a wound

2.3 Calculation of Rules

Hartati, et al, 2008, Forward chaining is a tracing process that begins by displaying a collection of convincing data or facts towards a final conclusion. Forward chaining starts from the premises or input information (if) first then leads to conclusions or derived information (then) or can be modeled as the following: IF (input information) THEN (conclusion) Input information can be in the form of data, evidence, findings, or symptoms. While conclusions can be in the form of goals, hypotheses, explanations or diagnoses. So that the direction of tracing forward starts from data to goals, from evidence to hypotheses, or from symptoms to diagnosis.

In the rule set forward chaining there are many rules in it, here are some examples of the rules contained in the rule set forward chaining:

forward chaining:

Rule 2
ELSE IF G17 == True AND G8Rule 1
IF G16 == True AND G4 == True
AND G25 == True AND G11 == True
THEN Penyakit = " P1 "
== True
AND G12 == True AND G25 == True
THEN Penyakit = " P2 "
Rule 3
ELSE IF G17 == True AND G6 == True
AND G24 == True
THEN Penyakit = " P3 "
Rule 4
ELSE IF G16 == True AND 27 == True
AND G26 == True
THEN Penyakit = " P4 "
Rule 5
ELSE IF G16 == True AND 27 == True
AND G26 == True
THEN Penyakit = " P5 "
Rule 6
IF G18 == True AND G31 == True
AND G3 == True AND G13 == True AND G26 == True
THEN Penyakit = " P6 "
Rule 7
IF G19 == True AND G31 == True
AND G28 == True AND G5 == True
THEN Penyakit = " P7"

Rule 8
IF G20 == True
AND G23 == True AND G9 == True
THEN Penyakit = " P8 "
Rule 9
IF G16 == True AND G14 == True
AND G30 == True AND G7 == True
THEN Penyakit = " P9"
Rule 10
IF G32 == True AND G15 == True
THEN Penyakit = " P10"
Rule 11
IF G10 == True AND G1 == True
AND G29 == True AND G21 == True
THEN Penyakit = " P7"
Rule 12
IF G22 == True AND G2 == True
THEN Penyakit = " P12"

2.4 System Flowchart

System Flowchart system is a graphical depiction of the steps and sequences of procedures from a program. The system flowchart helps analyze and solve problems into smaller segments and helps in analyzing other alternatives in the operation of the program.

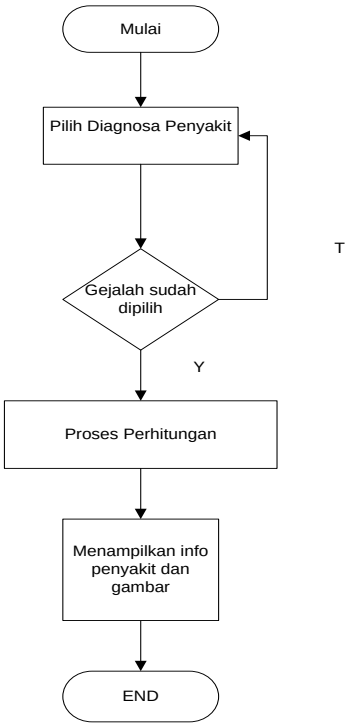

Figure 1. Flowchart Forward Chaining

2.5 Data Flow Diagrams

Data flow diagram abbreviated DFD or data flow diagram is a diagram that describes the flow of data in a system. In this system, there are several levels of DFD which are described below.

2.6 Data Flow Diagram Level 0 (DFD 0)

Level 0 (DFD 0) Data Flow Diagram level 0 or DFD 0 is a Data Flow Diagram that describes the processes that exist in the context diagram. The following is an overview of DFD 0 of the system to be made:

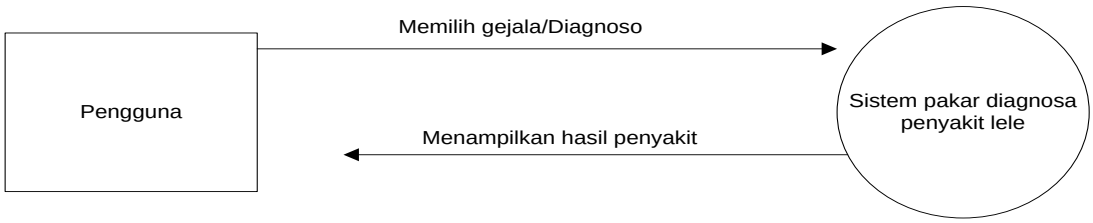

Figure 2. Data Flow Diagram Level0 (DFD 0)

The following is an explanation of DFD 0 above:

a) Adding stock index data, the process of adding a company's stock index to be forecasted
b) Forecasting stock index, prediction calculation process and will be displayed with a graphic diagram.

2.7 Data Flow Diagram Level 1 (DFD 1)

Data Flow Diagram level 1 or DFD 1 is a Data Flow Diagram that describes the Dynamic Programming process flow. The following is an overview of DFD 1 of the system to be made:

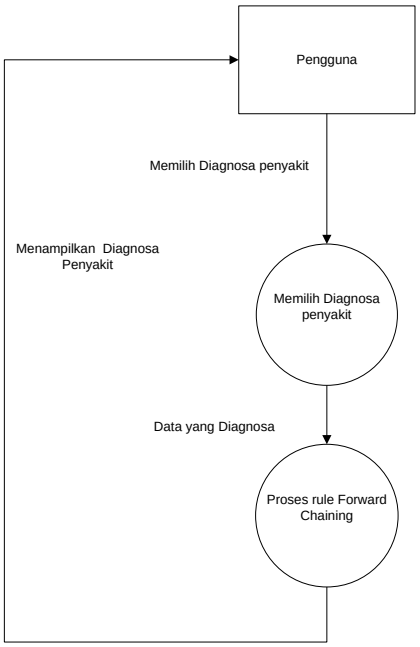

Figure 3. Data Flow Diagram Level 1 (DFD 1)

3. SYSTEM TEST

3.1 System Test

The trial consultation menu on the expert system for diagnosing catfish disease is the initial display of the system, where fish farmers conduct consultations that connect to the system program window. The diagnosis menu connects to the process of symptoms experienced later showing the results of the diagnosis. The purpose of system testing is to find out whether the system that has been made is functioning as planned. The running of the system is indicated by a screen shot of the system display.

3.2 Experiment

The initial display on the diagnostic menu when it is running, by one of the people who owns a catfish farm shown by the disease table filling system is shown in Figure 1.

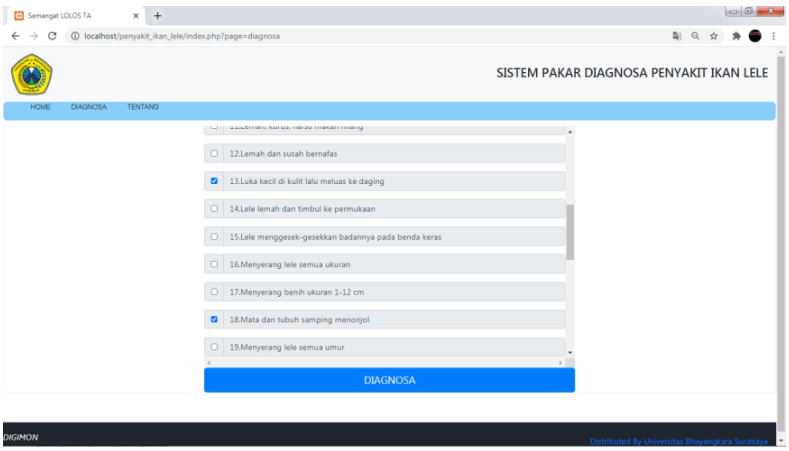

Figure 4. Display of catfish disease diagnosis

In Figure 4 it is explained choosing the path of catfish disease according to the symptoms of the fish disease suffered. After filling out the diagnosis form, Mr. Mamat will be directed to the stage of the flow of results in Figure5.

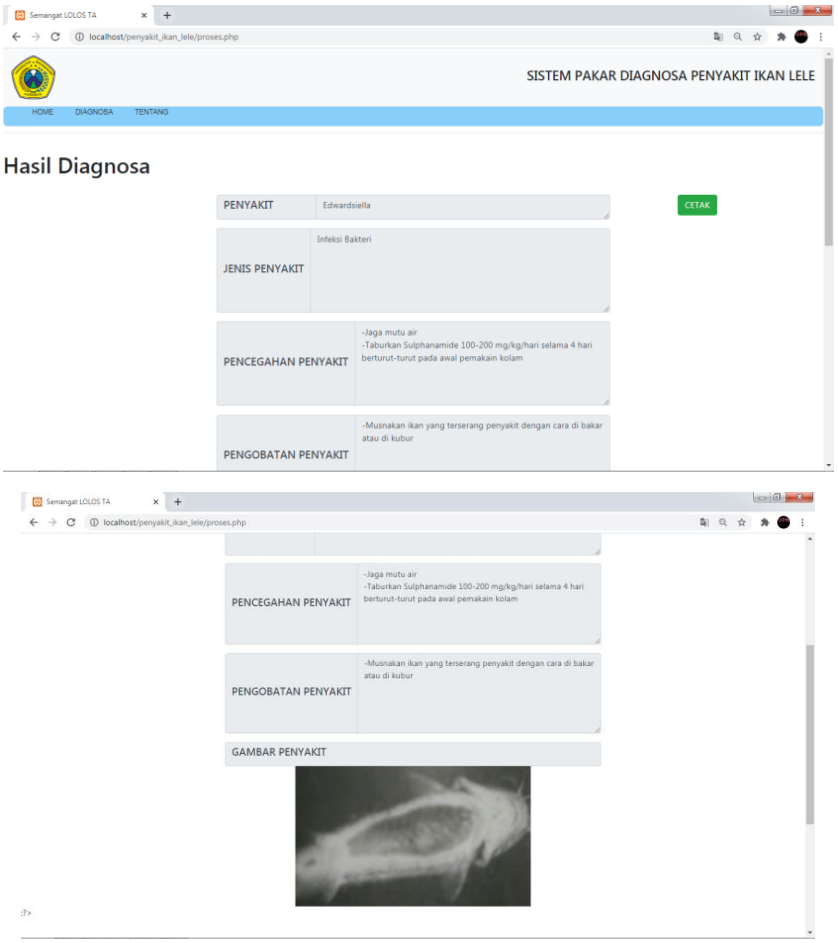

Figure 5. Results of Experimental Catfish Disease Diagnosis 1

The results of the consultation in Figure 2 explain the results of the diagnosis of Edwardsiella's disease diagnosis from the symptom consultation. In the analysis of the diagnosis of catfish disease, there is a description of the diagnosis, prevention and treatment that must be followed.

4. CLOSING

4.1 Conclusion

Based on the research that has been done, the following conclusions can be drawn:

1) This expert system makes it easier to carry out the diagnosis process, because the table of symptoms associated with the disease is experienced.
2) Ordinary people who want to cultivate catfish can use this application easily to find out the type of catfish disease experienced, because the display is easy to understand and simple.
3) The results of the diagnosis of catfish disease use the Forward Chaining method as a decision making from the diagnosis.

4.2 Suggestions

In this study there are several suggestions for better application development, including:

1) The need for additional features and functionalities in the application so that the information conveyed to users is more complete.
2) This application is expected to be developed also in the android version.

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