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Artificial Intelligence Diagnosys System of Ribbon Diseases using forward Chaining Method (Case study of Pringsewu District)

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Abstract
The large number of buffaloes in the Pringsewu Regency is not matched by the number of veterinarians. Department of Fisheries and Animal Husbandry (Dinkanak) of Pringsewu District recorded 961 cases of buffalo sick with 39 types of buffalo disease in 2016, plus the cost of bringing in doctors to treat buffalo sick was still expensive for farmers. To overcome this problem, this study aims to create a website-based expert diagnosis of Buffalo disease using the Forward Chaining method to help Buffalo farmers identify Buffalo disease and its treatment. For the development of expert systems this research uses the RAD (Rapid Application Development) method. To ensure the quality of the expert system, testing using three approaches of Validation comparing the results of the Expert System diagnosis with the doctor where the accuracy of the expert system diagnosis is 85% that the application can help to diagnose Buffalo disease and the expert system is quite easy to operate.

Keywords: *Artificial Intelligence, RAD, Buffalo Disease, Forward Chaining*

1. INTRODUCTION

1.1. Background

According to Budianto (2015) livestock in Indonesia is one aspect of business for the population of Indonesia for survival, and where animals are also very beneficial to plants (dung). According to Tinaliah (2015) buffalo is a livestock that has a high economic potential, both as a breed of livestock and as animal products that can be taken meat, milk, and others. According to the Animal Husbandry and Animal Health Statistics 2017, in 2016 the national population of buffalo experienced an increase in population compared to the population in 2015 with the following details: buffalo cut 16,004 million head (3.79 percent increase) and dairy buffalo 0.534 million tail (an increase of 2.89 percent, according to Dewi et al (2015) one factor that needs to be considered in raising buffalo cattle is the health of the livestock itself.

Buffalo is a livestock that has many benefits for humans ranging from meat, milk, even to the droppings. Buffaloes are bred in many places in Indonesia, one of which is Pringsewu District which has quite large livestock potentials with superior products including dairy buffaloes and cut buffaloes, development of cut buffaloes in 2014 as many as 12,247 and increased in 2015 to 15,886 [1]. The number of buffaloes in Pringsewu is not matched by the large number of veterinarians. From interviews with the Pringsewu District animal husbandry department, there are 8 veterinarians in Pringsewu at home.

Based on data obtained from the Department of Animal Husbandry and Fisheries of Pringsewu, buffalo disease itself has 39 types of diseases that occurred in Pringsewu District with 961 cases in 2016. Limited knowledge of breeders about buffalo disease, most of the farmers rely on previous experience experienced in handling livestock Buffaloes that experience symptoms

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of a disease, this causes farmers to misdiagnose. From the results of interviews with veterinarians, breeders once diagnosed Buffalo buffalo snoring (Septicaemia Epizooticae), so that farmers treated buffalo based on their illness, but after being examined by the doctor, they suffered pneumonia. Misdiagnosis like this causes the disease suffered even worse. Circumstances like that that need to be prevented so that farmers do not experience losses. if the buffalo is attacked by a disease, they report it to the vet by telephone or visit the animal health post, long distances become an obstacle for farmers and veterinarians to treat buffaloes with the disease. To overcome the problem of breeders in Pringsewu District, an expert system was designed using Forward Chaining method to diagnose buffalo disease. A computer system that can have the ability of an expert. It is expected that this expert system provides information about various types of diseases that attack buffalo animals and their treatment.

Based on previous research, the Forward Chaining method is considered suitable in this study because this method collects based on existing symptom data and then tries to draw conclusions to get the type of disease that attacks and how to treat it. From the results of the study using the Forward Chaining method for Designing a Expert System for Diagnosis of Buffalo Diseases website-based. This research only discusses Anthrax, Mouth and Nail Disease, Surra, Inflammation of the Thighs, Brucellosis, Bedbugs, Liver Worms, Stomach Worms, Lung Worms, Septichaema Epizootica (SE) Disease, Bloating) from the results of this study. i.e. displays the diagnosis results

Disease that attacks buffalo cattle, does not discuss the treatment of buffalo cattle [2]. The expert system has been widely applied in various fields, one of Wahyudi, Utami & Rudiyanto's research [3] which applies an expert system in the field of tourism, the research uses the Forward Chaining method and the deep first search method, this research produces an expert system for selecting tourist objects based on criteria tourist attraction in Yogyakarta. Expert system is built based on responsive websites because it is very easy to access on various devices, responsive website display follows the size of the screen size on devices from smartphones, computers and other devices [4].

1.2 Problem Formulation

Based on the background above, problems can be formulated to be resolved, namely:

1. how to know the disease using an expert system?
2. how to find out the cure?

1.3 Limitation Problems

The limitations of the problem are:

1. This research only covers the diagnosis of buffalo disease.
2. The method used is the Forward Chaining Method.

1.4 Research Objectives

The purpose of this study was to create an expert system for diagnosing diseases to make it easier to find out the symptoms and diseases of Buffalo.

1.5 Research Benefits

The benefits expected from this study are:

1. As an alternative to help diagnose buffalo disease.
2. To make it easier to know the disease in Buffalo.

1. LITERATURE REVIEW

2.1 Expert System Definition

Siswanto (2005) said, "Expert systems or knowledge-based systems are the most widely applied in helping to solve problems in the real world. This software can be run once by a personal computer device, so for artificial intelligence applications this can be done easily and at a relatively lower cost. "

Computer-based expert systems are computer programs that have knowledge that comes from people who are knowledgeable in a particular domain, knowledge here is human knowledge that is very minimal spread, expensive and difficult to obtain.

The basic concept of an expert system contains expertise, expertise, skill transfer, inference, rules, and the ability to explain. Expertise is an excess of mastery of knowledge in a particular field gained from training, reading or experience. Examples of forms of knowledge that include expertise:

1. Facts about the scope of a particular problem.
2. Theories on the scope of certain problems.
3. Procedures and rules regarding the scope of a particular problem.
4. Global strategies for solving problems.
5. Meta-Knowledge (knowledge of knowledge).

These forms enable experts to make decisions faster and better than someone who is not an expert

2.1 Database Definition

Kristanto (2004: 10) said, "a collection of files that have links between one file with another file so as to form a data building to inform an agency company, within certain limits".

The database is the most important component in the development of information systems, because it becomes a place to accommodate and organize all data in the system, so that it can be explored to compile information in various forms. A database is a set of interrelated data groups, the data is organized in such a way as to avoid unnecessary duplication, so that it can be processed or explored quickly and easily to produce information

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1. RESEARCH METHOD

3.1 Forward Chaining Methods

According to Giarratano and Riley [5], Forward Chaining is one of the methods of an expert system that searches for or traces solutions through problems. In other words, this method makes consideration of facts which then leads to a conclusion based on the facts. This method is the opposite of the backward chaining method which does a search that starts from the hypothesis to the facts to support the hypothesis. Forward Chaining is also called bottom-up reasoning or bottom-up consideration, because this method considers the evidence at the bottom level, the facts, leading to conclusions at the top level based on facts.

3.2 System Development Methods

In this research, the development method used is Rapid Application Development (RAD). The choice of the RAD model because the stages are very structured, software development can be done in a fast time and the main reason for using the RAD development model is that this development will work well when applied to small-scale applications [6]. RAD has 3 stages in system development

Picture3.1.System Development Cycle model RAD [7]

1) Planning Phase Terms

In this phase, it will outline the planning process phase of the requirements, i.e. identify objectives and will identify the requirements of those objectives. users and analysts meet to identify the goals of the application or system and to identify the information requirements arising from those objectives. The orientation in this phase is solving company problems. Although information technology and systems can direct a portion of the proposed system, the focus will always remain on efforts to achieve company goals.

2) Design Workshop

This phase is the phase to design and improve which can be described as a workshop. Analysts and programmers can work to build and show users visual designs and work patterns. This design workshop can be held for several days depending on the size of the application to be developed. During the RAD design workshop, the user responds to the existing prototype and the analyzer improves the modules that are designed based on the user's response. In this phase will design this Information System as a solution for the development of the previous system.

3) Implementation / Implementation Phase

In the implementation phase, researchers work intensely with users during workshops and design business and non-technical aspects of the company. As soon as these aspects are agreed upon and systems are built and filtered out, the system designed or tested will then be implemented

1. RESULTS AND IMPLEMENTATION

4.1 System Analysis

Website-based Buffalo Disease Expert System Development uses Rapid Application Development (RAD) method. RAD is classified as incremental or multilevel techniques, this model emphasizes a short development cycle.

4.1.1 Planning Phase Terms

This stage is the stage of setting goals, requirements and system requirements to solve problems.

a) System Objectives. This system aims to assist Buffalo Farmers in diagnosing Buffalo disease, and how to treat it. b) Terms of Information. The website-based Buffalo Disease Expert System Development must meet the requirements that include the completeness of data, software, hardware and knowledge from the buffalo disease experts. The complete data used for the development of the system are as follows:

- Symptoms data

Symptom data is data from disease symptomsthat often occur in Banyumas Regency. Symptoms experienced by buffalo include: decreased appetite, fever, weakness, lethargy, inflammation of the milk ducts, milk comes out abnormally, red milk glands and when touched feels hot, when milked out the milk clots, liquid comes out of the eyes and nose, excessive saliva, the body of the Buffalo trembles, stiffness of limbs until limping, hair loss, difficulty breathing, Buffalo often coughs, there is no sign of animals attacked by brucella spp bacteria, pale mucous membranes, constant tear discharge, stiff skin and thick, the left abdomen expands, buffalo sounds abnormally, comes out flowing / mucus from the vagina, rapid breathing, around the wet mouth, mucous membranes and eye valves become swollen, the eye mucosa and nose experience congestion, gray

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skin surface, swelling in the joints occurs (Hygroma), red urine, white and runny stools, possible opacity in the eyes, eyes and nose mucopurulent discharge, festering ah on the skin, often farting, pregnant patients may experience miscarriage / abortion at the age of pregnancy over 4 months, miscarriage inpregnant animals 3 weeks, Buffaloes look weak and dehydrated, eye drops may become mucopurulent, superficial lymp glands are swollen, rubbing abdominal body 3 weeks, buffalo looks weak and dehydrated, eye drops may become mucopurulent, superficial lymp glands are swollen, rubbing body rubs 3 weeks on the walls of the cage, in males occur orchitis and infertility, respiratory disturbances and snoring sounds, the kidneys appear streaked and thin buffalo

- Diagnosis Data

Diagnosis data are diagnoses that are filled in by veterinary services veterinarians. The diagnosis also includes how to treat Mastitis, Ephhemeral Fever (three-day fever), Scabies, Bloat, Pneumonia (pneumonia), Brucellosis (infectious Kluron), Septicemia Epizooticae (Snoring Buffalo), Leptospirosis, Colibaclillosis, Pink Eye and Malignant Catarrhal Fever.

- Relationship data Relationship data is data used to link disease and diagnosis so that decision trees can work. This data is sourced from books, experts and extension modules. The following is Table 1. Relationship between disease and diagnosis.

No.	Disaese	The Symptoms	Treatment
1	*Mastitis*	Decreased appetite, Inflammation of the milk ducts Milk exits abnormally, The red milk glands and when touched feels hot, When milked out the milk clots	Akhiri masa laktasi Kerbau, antibiotik brood Spectrum, Chloram phenicol ±4 mg/kg B.B.I.M, Penicillin, Streptomy cine ±5-8 mg/kg B.B.I.M
2	*Ephhemeral Fever* (Demam tiga hari)	Fever, discharge from the eyes and nose, excessive salivation, the body of the buffalo trembles until the limbs stiffenlimping	Prescription of antibiotics, Symptomatic medicine
3	*Scabies*	Gray surface of the skin, festering on the skin, rubbing the body against the walls of the soil, stiff and thick skin, feathers fall ou	Give antihistamines, apply steroid creams on the surface of the skin affected by scabies, to reduce the itching give pills steroids
4	*Bloat*	Decreased appetite, Farting often, difficulty breathing, stomach left expanding	Provides diluted Anti-Bloat and Wonder Athympanicum
5	*Pneumonia* (Pneumonia)	Decreased appetite, fever, thin buffalo, abnormal sounding buffalo, buffalo often coug	Giving antibiotic vaccine, borogluconate Ca and vitamin C intake regularly during the treatment period
6	Brucellosis (Kluron	Swelling in the joints (Hygroma), Pregnant patients can experience miscarriage / abortion at the age of pregnancy	After the buffalo has a miscarriage, farmers are expected to report it to the livestock service, because the

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	menular)	over 4 months, in males occur Orchitis and infiltration, There is no sign that animals are attacked by Brucella spp bacteria, out of discharge / mucus from the vagina	disease requires special examination and through laboratory testing
7	Septicaemia Epizooticae (Kerbau Ngorok)	Decreased appetite Fever, Lackiness, lethargy, Impaired respiration and snoring sounds, rapid breathing	Decreased appetite Fever, Lackiness, lethargy, Impaired respiration and snoring sounds, Breathing faster
8	Leptospirosis	Decreased appetite, Fever, Red urine, Miscarriage in pregnant animals for 3 weeks, Streaked kidneys	Decreased appetite, Fever, Red urine, Miscarriage in pregnant animals for 3 weeks, Streaked kidneys
9	Colibaclillosis	Stools are white and runny, Buffalo looks weak and dehydrated, Pale mucous membranes, Around wet mouth	White and liquid feces, Buffalo looks weak and dehydrated, Pale mucous membrane, Around wet mouth
10	Pink Eye	The mucous membranes and eye valves become swollen. Opacity may appear to the eye. Mucous eyes may become	The mucous membranes and valves of the eyes become swollen. Opacity may appear to the eye. Moles may become
		mucous	mucous-purulent. Continual discharge of tears continuously
11	Malignant Catarrhal Fever	Fever, mucosa of the eyes and nose experiencing congestion. Eyes and nose come out mucopurulent gland Lympe gland, superficial	Fever, eye and nose congestion. Eyes and nose splash out, Lympe gland.

Officer data is data for storing officers who will log into the system.Login is needed to verify user data that will enter the system. Because those who can enter and manage disease data, diagnosis and relationships are veterinarians.

c)System Requirements Analysis
The consultation process will take place online. Farmers will access the website and consult their livestock. Doctors only enter disease data, symptoms and relationships that the expert system will later work on in forming a decision tree and the breeder will consult the expert system that has been created in Figure 3.
Figure 3. Decision Tree Expert System Diagnosis of Buffalo there are 11 diseases and 42 symptoms of Buffalo disease

- The rules of production
In Table 3. describes the production rules presented in the rules in the form of action conditions. Sorted by Disease Number 1 (P1) Next to see the buffalo disease rule can be seen in Table 2

No	Rule Penyakit Kerbau
P1	IF Nausea Decreases And Inflammation In The Milky Way Of The Normal Milky Way Out Of The Normal Gland And When It Feels Hot And When It Comes Out The Milk Compresses Then Mastitis
P2	IF Fever And Exit fluid from eyes and nose And Excessive saliva And Excessive saliva And Strength of limbs until lame Then Ephhemeral Fever

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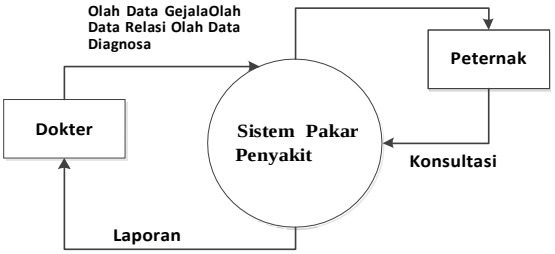
P3	IF The surface of the skin is grayish and fester on the skin and rubbing the body against the walls of the soil and the skin is stiff and thick and the hair falls out Then Scabies
P4	IF Reduced appetite and farting often And difficulty breathing And the left abdomen expands Then Bloat
P5	IF Eating Disorders And Fever And Skinny Buffalo And Abnormal Speaks And Buffaloes Cough Later Pneumonia
P6	IF There is swelling in the joints (Hygroma) And pregnant women can experience a miscarriage / abortion at the age of pregnancy over 4 months And in males occur Orchitis and infertility And There is no sign of an animal attacked by bacteria Brucella spp And out of discharge / mucus from the vagina Then Brucellosis
P7	IF There is swelling in the joints (Hygroma) And pregnant women can experience a miscarriage / abortion at the age of pregnancy over 4 months And in males occur Orchitis and infertility And There is no sign of an animal attacked by bacteria Brucella spp And out of discharge / mucus from the vagina Then Brucellosis
P8	IF Reduced appetite And Fever And Red urine and Miscarriage in animals that are pregnant for 3 weeks And the kidneys are streakedThen leptospirosis
P9	IF Stools are white and runny and buffalo look weak and dehydrated and pale mucous membranes around the mouth and wet. Then Colibaclillosis
P10	IF mucous membranes and eye valves become swollen. Possible opacity in the eyes. And eye drops may become muco-purulent
P11	IF Fever and mucosa have congestion in the eyes and nose. Eyes and nose come out mukopurulent. Lympe glands And superficial swelling. Then Malignant Catarrhal Fever

4.2 Implementation

Software design is a multi-step process that focuses on the design of software development including data structures, software architecture, interface representations and coding procedures. The following design stage include:

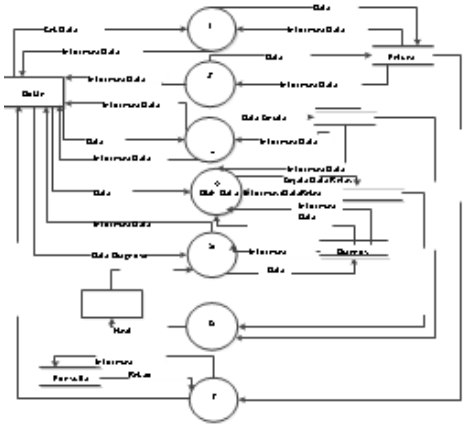
a. Designing Data Flow Diagrams

1. Expert system context diagram



Picture 4.2. DFD level 0 Diagram konteks

2.Picture DFD Level 1



Picture 4.3. DFD level 1 Diagram konteks

1) Implementation
Main menu page

Figure 4.4 Main Menu Page

The main menu page functions to display menus in the application that will be called. Menus contained in the main form above are masters consisting of: symptoms data page, diagnosis, relations and consultation page

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a. Simptoms page

Picture 4.5Simptom page

Symptoms data page serves to enter data on symptoms of a diseas.

b. Diagnosis page

Picture4.6. Diagnosis page

Diagnosis The diagnosis page is used to see the results of the diagnosis given after consultation.

c. Relation page

Picture4.7. Relation page

Relation page serves to provide information about the symptoms of a disease.

d. Consultation page

Picture4.8. Consultation page

The consultation page functions to provide questions about the symptoms experienced.

5. Conclusions and Suggestions

5.1. Conclusion

From the results of the discussion above it can be concluded as follows:

1. Website-based expert diagnosis of buffalo disease uses Forward Chaining method to diagnose buffalo disease and treatment that can help farmers to diagnose buffalo disease based on symptoms that appear.
2. This system can provide information about buffalo disease, symptoms, causes, description, methods of treatment and pictures of the disease.

5.2 Suggestions

As for some suggestions that can be submitted to develop the next expert system in the form of:

1. The accuracy of the data and the security system needs to be updated regularly.
2. This expert system can be developed using other methods or a combination of several methods

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