EXPERT SYSTEM FOR DETECTING DISEASES OF PALM OIL WITH FORWARD CHAINING METHOD ANDROID BASED

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Abstract : Coconut plantation palm has a very strategic role in the development of the Indonesian economy. Coconut palm that is processed becomes oil cook and material burn. To produce product quality derivatives from coconut palm this needs proper handling in its maintenance. On plantation coconut palm lots were found to cause coconut infected palm disease, so this will hinder productivity of the plantation. Handling is not appropriate to coconut infected palm disease and can result in losses that don't little. To overcome the problem, they make it a system android based expert. System experts can diagnose disease with detect the symptoms shown coconut palm moment attacked disease, so taking decision for handling furthermore will be more accurate that will impact on results maximum harvest.

Keywords *:* android; coconut palm; disease; system expert.

Abstrak : Perkebunan kelapa sawit memiliki peranan yang sangat strategis dalam pembangunan ekonomi Indonesia. Kelapa sawit ini banyak diolah menjadi minyak masak dan bahan bakar. Untuk menghasilkan produk turunan yang berkualitas dari kelapa sawit ini maka membutuhkan penanganan yang tepat dalam pemeliharaannya. Pada perkebunan kelapa sawit banyak ditemukan kasus kelapa sawit yang terserang penyakit, sehingga hal ini akan menghambat produktivitas perkebunan. Penanganan yang tidak tepat terhadap kelapa sawit yang terserang penyakit dapat mengakibatkan kerugian yang tidak sedikit. Untuk mengatasi masalah tersebut dibuatlah sistem pakar yang berbasis android. Sistem pakar dapat mendiagnosis penyakit dengan mendeteksi gejala-gejala yang ditunjukan kelapa sawit saat terserang penyakit, sehingga pengambilan keputusan untuk penanganan selanjutnya akan lebih akurat yang akan berdampak pada hasil panen yang maksimal.

Kata Kunci : android; kelapa sawit; penyakit; sistem pakar.

INTRODUCTION

In Indonesia when this coconut palm is wrong one commodity owned plantation plays a strategic role in the development economy. Coconut palm is one of the biggest it can grow in Indonesia. Coconut palm is grown and cultivated by individuals and companies [11]. Coconut palm is useful as producer oil cook, oil industry, as well material burn [1]. Potency oil coconut palm is wrong. One material substitutes biofuel feedstock material to burn oil earth or fossil make request will oil coconut palm world the more tall [4].

However, there are influencing factors that reduce the growth and productivity of coconut palm [7]. This was caused by a disease plant [10]. Loss consequence exists disease late plant the handler and already reach a stage very critical can result in failed harvest. Farmers often ignore this because of his ignorance and consider symptoms that already normally happen at planting time [9].

So it is necessary to become a system expert. System expert is a branch from intelligence artificial and field emerging knowledge along the development of the times [15]. System expert is a system based computer that uses knowledge, facts and technique reasoning in solving problem [13]. With the use of a system expert then the farmers can detect existing diseases on coconut palm plants so that will get a solution to get over it (Ahmad & Iskandar, 2020).

System experts made on study this machine forward chaining method the inference use specified information by user For move to finite AND and OR logic determined an object [6]. In study this will build system expert diagnosis disease plant coconut palm android based. Several studies that support this writing are related to oil palm disease detection expert systems and forward chaining methods, namely [5], [14], [4], [11], [6], [9], [8], [3], [15], and [12].

METHOD

Forward Chaining is a forward application method that makes facts as knowledge representations to draw conclusions. Searching with facts provided by the user beforehand for testing using rules (rules) that ends in a conclusion based on existing facts. Starting from the left side (IF) which is a matching of facts or statements, namely facts from information where these facts will be input for the user, then will lead to conclusions or derived information (THEN).

Every condition added to the system will be processed. If a new condition is found from the requested conclusion, the system will return to step 2 and look for the rules in the knowledge base again. If there are no new conclusions, the session ends. Study this use method development system namely the *waterfall* model. The steps taken can be seen in Image 1.
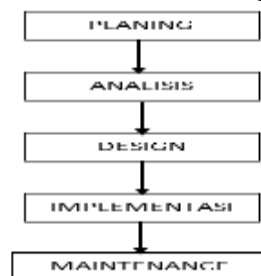

Image 1. Development Model System Use *Waterfall*.

Planning : Stages where researchers do a planning system you want developed with methods to collect data to be required.

Analysis : Method for solving a problem with a description system and study component to reach an objective from the development system.

Design : Stages create mockup designs from results of the required analysis in planning application.

Implementation : Stages researcher can implement design from stages previously And do development systems that will be made.

Maintenance : Do maintenance system to stay work in a manner to the maximum in ability system.

RESULT AND DISCUSSION

Implementation system created in the system expert this is stage final in the development process system. Activity detection disease can be done right on the field or in the garden coconut palm.

Table 1. Type of Disease

Disease Code	Type of Disease
P1	Leaf Spot
P2	Stem Base Rot (Ganoderma)
P3	Head Disease
P4	Leaf Rust
P5	Pupus Rot Disease
P6	Anthracnose
P7	Rotten Fruit (Marasmius Palmivorus)

Table 2. Symptom

Symptom Code	Symptom
G1	Brown spots
G2	Dark brown spots with yellowish margins
G3	Severe leaf spot
G4	The plant turns yellow almost all of the leaf midrib
G5	TBM plants have leaf necrosis and the accumulation of spear leaves is more than 3
G6	All the fronds were broken, rotting occurred at the base of the stem and the plant fell
G7	The fronds are bent and the leaflets are small or torn
G8	Appears on immature plants / young plants
G9	The folded leaves still look rotten at the corners or in the middle
G10	Old leaves are dull, dirty and red
G11	Algae colonies coalesce to cover the surface of the leaf blade
G12	Young rust is gray green while the old one is brick red
G13	Some of the leaves and spears rotted and dried up
G14	Decay continues to occur causing the spear leaves to be easily removed
G15	the appearance of chlorosis / necrosis spots on spear leaves
G16	The symptom is dry rot that starts at the edges of the leaves and progresses towards the center
G17	Diseased tissue results in plant death
G18	The flesh of the fruit becomes mushy and changes color to blackish brown
G19	The disease attacks fruit that is 2-4 months old
G20	There are traces of white mushroom mycelia spreading on the skin of the fruit in one unripe bunch

Table 3.Table Rule and Symptoms

Symptom Code	Disease Code							Facts Yes	Facts No
	P1	P2	P3	P4	P5	P6	P7		
G1	✓							G2	G4
G2	✓							G3	G4
G3	✓							0	G4
G4		✓						G5	G7
G5		✓						G6	G7
G6		✓						0	G7
G7			✓					G8	G10
G8			✓					G9	G10
G9			✓					0	G10
G10				✓				G11	G13
G11				✓				G12	G13
G12				✓				0	G13
G13					✓			G14	G16
G14					✓			G15	G16
G15					✓			0	G16
G16						✓		G17	G19
G17						✓		G18	G19
G18						✓		0	G19
G19							✓	G20	G21
G20							✓	0	G21

The movement of data moves from one node to the next based on the rules that have been given and if the node stops at a node that is given the final node index then the disease can be detected or vice versa the disease cannot be detected. The rules and symptoms of infectious diseases using the Forward Chaining method are as shown in table 3.

The rules that will be used in diagnosing diseases in oil palm plants.

Rule 1: IF Brownish spots AND Dark brown spots with yellowish margins AND Severe intensity Leaf spots THEN Leaf spots.

Rule 2: IF Plants turn yellow in almost all of the leaf sheaths AND TBM plants have necrosis of leaves and accumulation of spear leaves of more than 3 AND Breaks off all midribs, decay occurs at the base of the stem and the plant falls THEN Stem Rot.

Rule 3: IF The fronds are bent and the leaflets are small or torn AND Appears on immature plants / young plants AND The folded leaves still look rotten at the corners or in the middle THEN shoot disease.

Rule 4: IF Old leaves are not shiny, dirty and red in color AND Algae colonies coalesce to cover the surface of the leaf blade AND Young rust is gray-green while old leaves are brick red THEN Leaf Rust.

Rule 5: IF Some of the leaves and spears rot and dry up AND Decay continues to

occur causing the spear leaves to be easily removed AND chlorosis / necrosis spots appear on the spear leaves THEN Late Rot Disease.

Rule 6: IF Symptoms of dry leaf rot that starts from the edge of the leaf and spreads to the center AND Diseased tissue causes the death of the plant AND The flesh of the fruit becomes soft and turns black and brown THEN anthracnose disease.

Rule 7 : IF Disease attacks fruit aged 2-4 months AND there are traces of white fungal mycelia spreading on the fruit skin in one unripe bunch THEN Rotten Fruit (Marasmius Palmivorus).

Implementation System
Main Menu page

Main menu page consists of three main menus in the application system expert, namely the list menu illness, consultation plant and about application.

Image 2. Main Menu page

Page List Disease

Page list disease containing a number of type list possible disease can happen in plants coconut palm. As for list disease in the application as following :

Pedicab Leaves, Rotten Base Stem (Ganoderma), Disease Crown, Leaf Rust, Disease Rotten Extinct, Anthracnose, Rotten Fruit (Marasmius Palmivorus).

Image 3. Page List Disease

Disease Details Page

Disease details page is a detail of a number of diseases from page list disease. On the disease detail page This contains an explanation about disease plant coconut palm and method of handling each disease.

Image 4. Page List Disease

Page Consultancy Plant

Page consultancy plants containing

various types of frequent symptoms arise in coconut palm. Diagnosis inside a consultation plant can choose a maximum of 3 symptoms that occur in plants. A number of type system diagnostics application this is as following :
Symptoms beginning form spotting colored brownish, symptoms carry on form spotting colored chocolate old with edge colored yellow, symptom beginning on plant yellow almost whole midrib leaves, diseased tissue resulting in dead plants, some sheet leaf spear rot and yellowing, colonies algae merges cover surface sheet leaves.

Image 5. Page Consultation Plant

Page Results Diagnosis Plant
Page this is results from diagnosis on the consultancy menu page. On results diagnosis can be known diseases that occur in plants' palms. On the page this contains an explanation about diseases that arise in plants, as well can make diagnosis repeat and can see how many percentage plants the infected disease.

Image 6. Page Results Diagnosis

CONCLUSION

An expert system for diagnosing palm oil based on Android provides information to users about palm oil diseases and their symptoms, disease names, causes and ways to control them. This system is Offline so that users can use this system application even though there is no network in the oil palm plantations. The way this expert system diagnosis works is by entering the symptoms that occur in oil palm trees as input and healing solutions as output, so that appropriate and fast handling can be carried out and can minimize crop failure.

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