

EXPERT SYSTEM DEVELOPMENT FOR IMPROVING QUALITY AT RICE MILLING UNIT

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ABSTRACT

Percentage of broken rice and rice yield are examples of quality characteristics in rice milling process. This paper presented knowledge codification of rice milling process using expert system to decrease broken rice percentage and increase yield of rice. Case study at CV. Mustika Asih rice milling unit, which was located at Soreang Bandung. The methodology consist of several steps. Those are gaining tacit knowledge by interviewing expert in rice milling process, designing logic tree for broken rice, rice yield, and also determination of unhulled rice quality and rice quality. Expert system was designed in web based. The result showed that expert system could be used to convert tacit knowledge to explicit knowledge of rice milling process.

Keywords : expert system, rice milling unit, yield of rice, broken rice

1. INTRODUCTION

Agroindustry is one of the important industry because it is related to the main need for human. Therefore, rice milling is one of the important industry. To produce a good quality rice, it does not only depend on the quality of paddy but also depend on the rice milling process. Rice milling is a process which starts from receiving grain from farmers until the rice produced.

The errors in the rice milling process lead to poor quality of rice anyway. The quality of rice milling can be seen from the percentage of yield and the high percentage of broken rice. The decreasing yield and the high percentage of broken rice indicates that there are some problems in the rice milling.

This expert system is built to provide the information and knowledge about the emerging problems and the solutions to increase the quality of rice milling which is gained from the experts before. The implementation of expert system is web-based so that can be accessed and used by wider community.

This web-based expert system is expected to provide a solution to increase the yield, to decrease the broken rice, to determine the quality of grain and semi-

finished rice to the rice milling owner by accessing through website.

2. THEORETICAL BACKGROUND

2.1. Expert System

According to Marimin (1992), the expert system is a computer software system which use the knowledges, facts and thinking techniques in decision making to solve the problems which usually are solved by the experts only.

2.2. The Yield of Rice

According to Nugroho *et al.* (1998), the value of the yield of rice is influenced by some factors that are divided into three groups. The first group is the factors that affect the yield through its effect on the quality of grain as a raw material in the milling process which includes varieties, cultivation techniques, environment, agro-ecosystems, and climate. The second group is the yield determine factor which is involved in the process of converting paddy to rice, it is a technique of milling and its tools. The third group shows the quality of the rice milling especially the desired milling degree, because the higher the degree of milling, the lower the yield produced.

Based on the requirements issued by Bulog, head rice is the rice which is greater than 6/10 parts of intact rice. Broken rice is about 2/10 until 6/10 parts of intact rice.

2.3. FMEA (Failure Mode and Effects Analysis)

FMEA is a structured procedure to identify and prevent as much as possible the failure mode. A failure mode is anything about failure includes the defects, the out of specification conditions, or changes in the product that causes the disruption of the product function (Gasperz, 2002).

2.4. Previous Research

Research about expert system development based on FMEA had been done by Barkai (1999) and Sugiarto (2012). Sugiarto (2012) made expert system about solving defects problems at latex glove industry.

3. RESEARCH METHOD

The steps of developing the web-based expert system are problem identification, knowledge acquisition by interviewing expert, FMEA development, logic tree development, expert system web based programming and verification.

4. RESULT AND DISCUSSION

The information about the rice milling process is necessary to know how the rice milling process so it can affect the yield of rice and the rate of broken rice produced. The information and knowledge about the rice milling was obtained directly by interviews with the rice milling owners as an expert on the rice milling process and also by collecting the information and knowledge about the rice milling process obtained from literature.

The information and knowledge which are gained before are analyzed using the FMEA The use of FMEA is to identify and analyze the failure and the effects of the rice milling

The knowledge which is gained in this phase will be used as a knowledge base in an expert system, especially in preparing the flow charts. Here it is a representation of

information and knowledge from experts in the form of a flow chart as shown in the figure below.

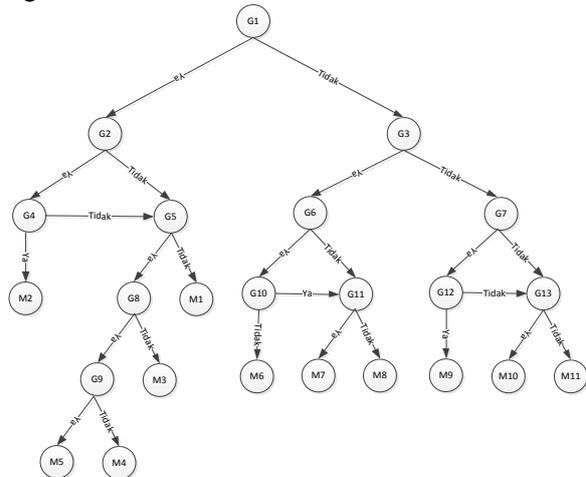


Figure 1. Flowchart of Decreasing Broken Rice

The lists of symptoms :

1. G1 : Does the broken rice occur in large amount from the polishing ?
2. G2 : Is the polishing machine setup already right ? (Not too tight and not too loose)
3. G3 : Does the broken rice occur in large amount from the husking ?
4. G4 : Does the polishing process do twice ?
5. G5 : Is boring on polishing machine in good condition ?
6. G6 : Does the rollers roll set appropriately ?
7. G7 : Does the grain dry on 2 days ?
8. G8 : Is the polishing system in the engine still good ?
9. G9 : Is the shape of milling unit oval ?
10. G10 : Is the husking system in the husker in a good condition ?
11. G11 : Check the condition of the rubber roller, is it still left?
12. G12 : Does the grain dry stackedly ?
13. G13 : Does the grain expose by water or rain ?

The lists of problem and solutions :

1. M1 : The boring is worn and should be replaced
2. M2 : The polishing must be done twice with 1 day lag time
3. M3 : ... in the polishing machine should be replaced

4. M4 : Replace the milling with round shape
5. M5 : The broken rice is not caused by polishing process.
6. M6 : ... in the husker must be fixed
7. M7 : The broken rice is not caused by husking process.
8. M8 : The rubber roll runs out and should be replaced.
9. M9 : The grain should be dried flatly
10. M10 : The grain which is exposed by rain water will be easily broken. The semi-dried grain should be avoided from the rain.
11. M11 : The broken rice is not caused by drying process.

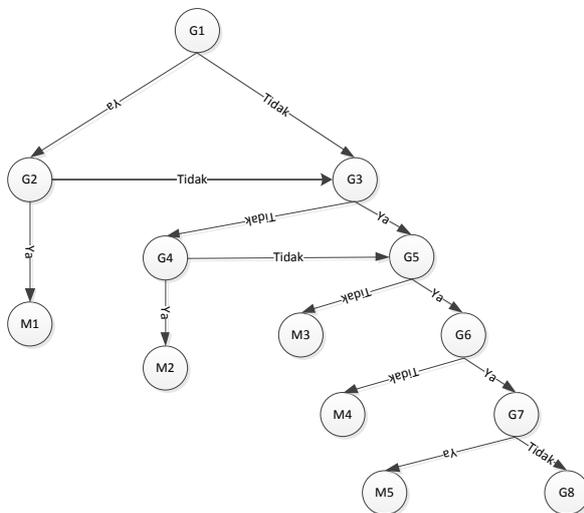


Figure 2. Flowchart of Increasing Yield of Rice

The lists of symptoms :

1. G1 : When the grain is received from farmers, is the amount of straw large ?
2. G2 : Is the husk difficult to seperate ?
3. G3 : Is the grain dried immediately after receiving from the farmer ?
4. G4 : Is the grain stacked ?
5. G5 : Is the weather is scorching and the floor dry when drying process ?
6. G6 : Does the drying flat and unstacked ?
7. G7 : Is the drying process done more than 24 hours ?

The lists of problem and solutions :

1. M1 : Grain has a thick husk. It impacts on the yield of rice.
2. M2 : Grain should be leveled so that the rice does not accumulate and damaged.

3. M3 : Grain takes longer to dry
4. M4 : The grain does not dry and it must be leveled so it can dry spreadly.
5. M5 : The grain is drier and lighter

The figures below is the flowchart for determining the quality of grain and semi-finished rice.

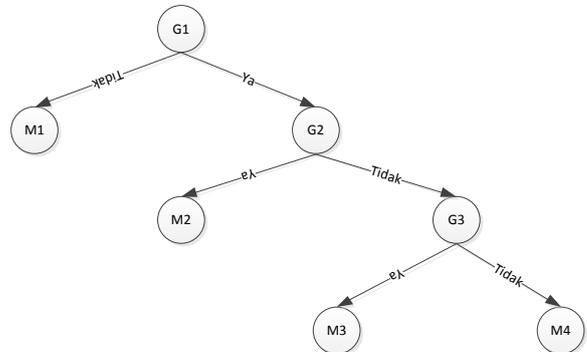


Figure 3. Flowchart for Determining the Quality of Grain

The lists of symptoms :

1. G1 : Check the condition of the grain, knead the grain until the rice is obtained, is the rice white translucent ?
2. G2 : Is the color of rice grains opaque ?
3. G3 : Are there black spots on rice grain ?

The lists of problem and solutions :

1. M1 : The grain quality is not good so it can lead to low price.
2. M2 : The grain quality is not good so it can lead to low price.
3. M3 : The grain quality is not good so it can lead to low price.
4. M4 : The grain quality is good and sometimes it is more expensive.

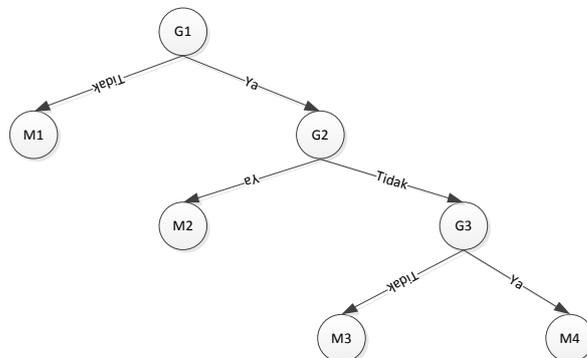


Figure 4. Flowchart for Determining the Quality of Semi-finished Rice

The lists of symptoms :

1. G1 : Clutch the semi-finished rice, does it feel hard ?
2. G2 : Is the color of semi-finished clean white ?
3. G3 : Is the semi-finished meaty ?

The lists of problem and solutions :

1. M1 : The quality of semi-finished rice is not good because it has empty-contained rice. It will lead to low price
2. M2 : The quality of semi-finished rice is not good because it has empty-contained rice. It will lead to low price
3. M3 : The quality of semi-finished rice is not good because it has empty-contained rice. It will lead to low price
4. M4 : The quality of sei-finished rice is good and it has a higher price.

The expert system must be verified to the experts later. Verification is done to avoid the error in the information and the knowledge which is gained in the previous step. After that, the expert system is uploaded into the web. The figure below shows the screen view of the expert system in www.pasarindukberascipinang.org The stages of building the web-based expert system in www.pasarindukberascipinang.org:

1. Build the expert system based on the category of problem.



Figure 5. expert category

2. Input the questions according to the category which has been built previously.

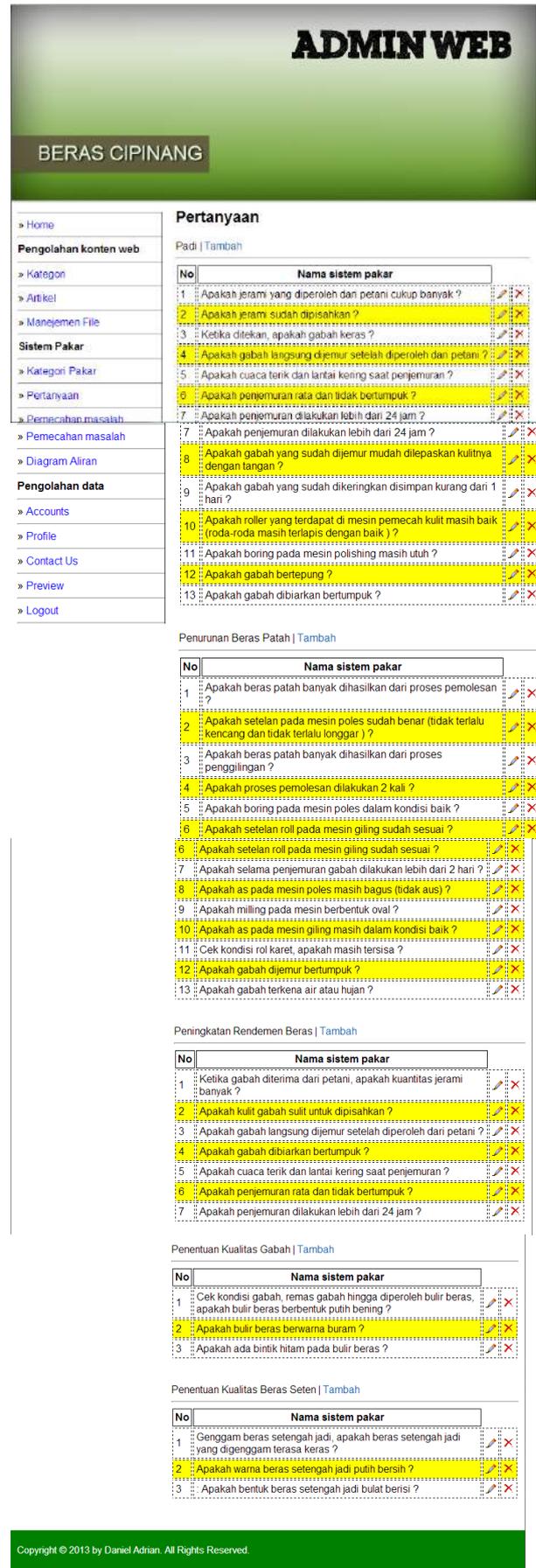


Figure 6. Question

3. List the problem solving and the solutions according to the category which has been built before.

BERAS CIPINANG

- > Home
- Pengolahan konten web
- > Kategori
- > Artikel
- > Manajemen File
- Sistem Pakar
- > Kategori Pakar
- > Pertanyaan
- > Pemecahan masalah
- > Diagram Aliran
- Pengolahan data
- > Accounts
- > Profile
- > Contact Us
- > Preview
- > Logout

Pemecahan Masalah

Padi | Tambah

No	Masalah	
1	Jerami yang terlalu banyak akan menyebabkan gabah cenderung lebih basah. Solusi : Pisahkan jerami terlebih dahulu.	✗
2	Gabah tidak berisi/kosong, kualitas gabah buruk Solusi : Gabah akan menjadi lembab sehingga mudah patah saat digiling	✗
3	Gabah membutuhkan waktu yang lebih lama untuk kering Solusi : Menggunakan alas yang lebih kering.	✗
4	Gabah kering tidak merata dan masih terdapat gabah yang belum kering. Solusi : Gabah dikeringkan lebih lama lagi.	✗
5	Gabah menjadi lebih kering sehingga rentan patah. Solusi : Gabah harus dikeringkan lebih lanjut.	✗
6	Gabah belum benar benar kering Solusi : Gabah harus disimpan lebih lama.	✗
7	Gabah masih hangat pasca pengeringan sehingga rentan patah. Solusi : Roller bermasalah.	✗
8	Roller harus diganti.	✗
9	Boring bermasalah. Solusi : Boring harus diganti.	✗
10	Gabah sudah rusak Solusi : Gabah mudah patah	✗
11	Gabah harus di keluarkan dan jangan dibiarkan bertumpuk Solusi : Gabah menjadi lembab	✗
12	Gabah harus segera dijemur. Solusi : Tidak ada masalah	✗
13	Solusi : -	✗
14	Solusi : -	✗

Penurunan Beras Patah | Tambah

No	Masalah	
1	Boring dalam kondisi aus Solusi : Boring harus diganti	✗
2	Pemolesan beras kurang dari 2 kali Solusi : Pemolesan harus dilakukan 2 kali dengan jeda waktu 1 hari.	✗
3	As pada mesin poles bermasalah Solusi : As pada mesin poles harus diganti.	✗
4	Milling tidak sesuai Solusi : Ganti milling dengan bentuk bulat	✗
5	Beras patah tidak disebabkan dari proses pemolesan beras Solusi : Cari penyebab lain	✗
6	As pada mesin giling bermasalah Solusi : As pada mesin giling harus diperbaiki	✗
7	Beras patah tidak disebabkan dari proses penggilingan gabah. Solusi : Cari penyebab lain	✗
8	Roll karet sudah habis Solusi : Roll karet harus diganti	✗

9	Penjemuran gabah bermasalah Solusi : Gabah harus dijemur secara rata dan tiap 15 menit dibalik Gabah yang terkena air hujan akan menjadi mudah patah	✗
10	Solusi : Gabah yang sudah setengah kering harus dihindari dari hujan. Beras patah tidak disebabkan dari penjemuran.	✗
11	Solusi : Cari penyebab lain	✗

Peningkatan Rendemen Beras | Tambah

No	Masalah	
1	Gabah memiliki kulit yang tebal, hal ini akan berdampak pada rendemen beras. Solusi : Atur penggilingan sedemikian rupa sehingga kulit gabah mudah dipisahkan	✗
2	Permasalahan pada penyimpanan beras Solusi : Gabah harus diratakan agar tidak menumpuk dan padi tidak rusak	✗
3	Permasalahan pada penjemuran gabah Solusi : Gabah harus dikeringkan lebih lama	✗
4	Solusi : Gabah harus diratakan sehingga tidak ada bagian gabah yang tidak terjemur dan gabah yang terjemur tidak menjadi terlalu kering.	✗
5	Gabah menjadi lebih kering sehingga menjadi ringan. Hal ini berdampak pada rendemen Solusi : ---	✗
6	Tidak ada masalah pada cara pengolahan padi. Solusi : ---	✗

Penentuan Kualitas Gabah | Tambah

No	Masalah	
1	Kualitas gabah tidak baik sehingga dapat menyebabkan nilai jual gabah rendah. Solusi : Jangan beli gabah dengan harga terlalu tinggi	✗
2	Kualitas gabah tidak baik sehingga dapat menyebabkan nilai jual gabah rendah. Hal ini disebabkan karena penumpukan gabah yang terlalu lama Solusi : Jangan beli gabah demikian dengan harga yang tinggi	✗
3	Kualitas gabah tidak baik sehingga dapat menyebabkan nilai jual gabah rendah. Solusi : Jangan beli gabah demikian dengan harga yang tinggi	✗
4	Kualitas gabah baik. Harga gabah dengan kualitas demikian biasanya memiliki nilai jual paling tinggi. Solusi : Pertahankan gabah demikian. Biasanya harganya tinggi	✗

Penentuan Kualitas Beras Seten | Tambah

No	Masalah	
1	Kualitas beras setengah jadi tidak baik karena banyak yang kosong. Solusi : Jangan beli beras setengah jadi demikian dengan harga yang terlalu mahal	✗
2	Kualitas beras setengah jadi tidak baik. Solusi : Jangan beli dengan harga yang tinggi	✗
3	Kualitas beras setengah jadi kurang baik sehingga dapat menyebabkan nilai jual gabah rendah. Solusi : Jangan beli dengan harga yang tinggi	✗
4	Tidak ada masalah dengan kualitas beras setengah jadi demikian. Solusi : Pertahankan beras demikian. Biasanya memiliki nilai jual yang paling tinggi.	✗

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Figure 7. Solution

4. Creating a flowchart based on the selected category. The flowchart will link the question, problem solving and the solutions together.

5. CONCLUSION

One of the effort to spread the information and the expert's knowledge about rice milling process is by developing the web-based expert system so it can be accessed widely by the community. This web based-expert system is useful as the media to spread the information and knowledge and it also requires the monitoring and updates in the future so the knowledge of rice milling process can be developed by web based knowledge sharing.

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