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Risk Analysis and Mitigation with Risk Assessment Method at PT. Semboro, Jember East Java

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Abstract

Make improvements to external matters related to the company and especially the company's internal, starting from the procurement of materials to the delivery of products to consumers. Industry in Indonesia every year has increased and decreased in the food, agriculture, plantation, handicraft, and other sectors. In the agricultural industry, especially sugarcane which is processed into sugar, demand is increasing. Sugar is one of the strategic commodities in the Indonesian economy. One of the sugar manufacturing industries in Indonesia is PG. Semboro is located in Jember. PG Semboro has been in existence since 1955 and started producing sugar in 1958. Intense competition and increasing uncertainty as well as rapid changes in the business environment will have an impact on the complexity of business risks that must be faced by the company. Therefore PG. Semboro needs to know the risks that occur and determine the steps that must be taken in handling these risks. This study aims to identify risks and mitigate the risks that occur. The method used in risk identification and mitigation is risk assessment. The results obtained are that there are 21 risk events with 5 priority risk events and 5 proposed mitigation action strategies to handle and minimize the impact and possibility of risk occurrence.

Keywords: Risk; Risk Management; Risk Mitigation.

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1. Introduction

In the agricultural industry, especially sugar cane, which is processed into sugar, demand is increasing, both for household consumption and as raw materials for the food, beverage, paper, pharmaceutical industry and so on. Sugar is one of the strategic commodities in the Indonesian economy. With an area of about 350 thousand hectares in the period 2000-2005, the sugar cane-based industry is a source of income for around 900 thousand farmers. The government imports to cover the shortage of sugar needs, both refined sugar and raw sugar which will later be processed to become crystal sugar by the factory [1]. PG. Semboro as a company that produces and markets white crystal sugar products in its operations always pays attention to quality aspects, provides satisfaction to customers and the community through quality products and services, prioritizes Occupational safety and health as well as environmental conservation. For this reason, in determining the direction of the business, always consider risk factors that have the potential to harm the company by first analyzing the risks. The increasing uncertainty and rapid changes in the business environment, both external and internal in particular, will have an impact on the increasingly complex business risks that must be faced by the company [2]. So that in order to improve the company's ability to face any changes, the implementation of risk management is an absolute necessity in order to reduce and prevent losses that interfere with business continuity [3]. Based on the existing problems, this study aims to identify risks and deal with the risks that exist in the Semboro Sugar Factory.

2. Materials and Methods

In general, risk is defined as a condition that can occur or arise due to uncertainty with all possible unfavorable consequences.

2.1. Risk management

Risk management process which includes identification, evaluation and control of risks that may threaten the continuity of the company's business or activities [4]. Risk management is a comprehensive set of policies, procedures, which an organization has, to manage, monitor and control the organization's exposure to risk [5].

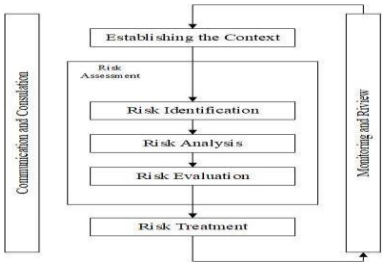

Figure 1: Risk management process

2.2. Methods

In this study, the research steps are represented as follows:

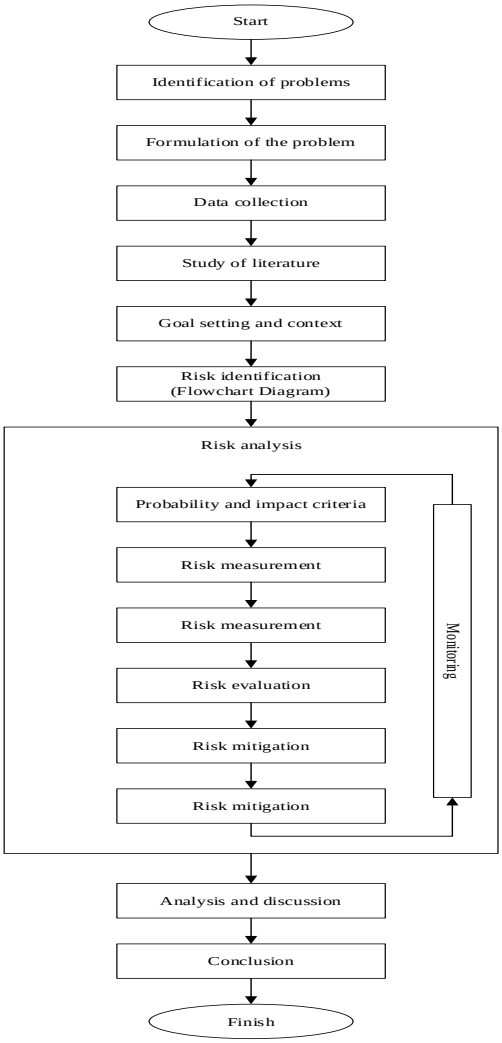

Figure 2: Research flowchart

This research was conducted in several stages, namely starting with identifying the problem in the object of research. Next, do the problem formulation on the object of research conducted to focus on the formulation of the problem in this research. The next stage is to collect data based on a literature study that aims to differentiate between the research to be conducted and existing research on risk management. In addition, data collection is also carried out in accordance with the formulation of the problem that has been made [6]. After obtaining all the necessary data, the risk management process is carried out using a risk assessment starting from risk identification to risk identification as shown in Figure 2.

3. Results

Risk identification is done through observation and interviews with experts. The identification of risk events in this study is based on Companies business processes. The company uses SCOR and determines the impact of risk using fishbone so that the risk register is obtained as shown in table 4.1. There are 21 types of risk events identified, which consist of 6 risks in the Plant Division, 11 risks in the Installation and Manufacturing Division, 3 risks in the Financial Accounting and Marketing Division, and 1 risk in the HR and General Division.

Table 1: Risk register

No	Sub-Process	Source of Risk	Risk Code	*An Event Risk*	*An Outcome (Risk Causes)*	Source Risk
1	Price agreement with SKW	Plant Division	T1	There is no standard price from the government and land conditions are not suitable	Officers being chased by the target area	External
2	Land inspection by team	Plant Division	T2	Land conditions that do not match the image submitted	Land owner cheating	External
3	Nursery planning	Plant Division	T3	Inappropriate variety composition and poor seed quality	Lack of supervision from SKB	Internal
		Plant Division	T4	Late delivery of seeds	Lack of seed cutting power	Internal
		Plant Division	T5	The need for the number of seeds is not met	Low seed breeding	Internal
4	Making Garden Budget	Plant Division	T7	The budget of the garden is not in accordance with the conditions of the land	Run out of money before the job is done	Internal
5	Employee Recruitment	HR and General Division	S1	An error occurred in the recruitment of employees	Does not involve related managers	Internal
					Hiring the services of recruiters from outside, where they have not been able to choose the best candidate	External
6	Planting	Plant Division	T9	Plant population is less dense	Lack of SKW supervision	Internal
7	Fertilization	Plant Division	T10	Improper fertilization, type and dose	Lack of fertilizer	Internal
					Never done soil analysis	Internal
8	Cut down	Plant Division	T11	Cutting and hauling cannot meet capacity grind	Lack of logging and trucking power	External
		Plant Division	T12	Cutting not CFS (Clean, Fresh, Sweet)	It's raining a lot	Internal
9	Sugarcane weighing	Plant Division	T13	There was a long queue at the time of weighing	The occurrence of equipment damage or power outages and shift change	Internal
		Installation	P3	The pressing of the milling machine	The mill setting doesn't fit	Internal

		Division and		is less		
10	Sugar cane milling into raw sap	Manufacturing Installation Division and Manufacturing Installation Division and Manufacturing	P4	Milling capacity is not met	Damage to equipment	Internal
			P5	Pol Dregs High	The mill setting is too big	Internal
					Giving imbibition is not evenly distributed	Internal
11	Purification of raw sap into sap watery		P6	Sulfuration pump malfunction	Broken / jammed valve	Internal
12	Evaporation of watery juice into thick juice				Dirty juice heating pipe	Internal
			P7	Little condensate produced	Less heating steam	Internal
					Low milling capacity	Internal
13	Cooking or crystallizing thick sap into *masscuite*			Uneven or sparse crystals	The seeds are not flat	Internal
			P8		Unskilled cook	Internal
14	Sugar screening		P9	Sugar is still brown and contains stroop	Rotary equipment malfunction or sudden power failure	Internal
			P10	Fine sugar mixed with production sugar	Torn filter	Internal
15	Sugar finishing and packaging		P11	Non-sugar ingredients mixed with production sugar	Not yet available tools to capture non-sugar	Internal
			P12	Plastic sacks are easy to tear	Poor quality sack	External
16	Work accident	Installation Division and Manufacturing	P13	There was an accident at work	Lack of discipline of employees in using safety devices	Internal
					Lack of socialization about the importance of wearing safety equipment such as helmets, shoes, gloves, and others	Internal
					The negligence of employees working not according to the SOP	Internal
17	Storage of sugar products in warehouse	Installation Division and Manufacturing	P14	Sugar production in warehouse is damaged	Humidity too high (basic sugar)	Internal

18	Sugar harvesting by farmers and auction winners	Financial Accounting Division and Marketing	A4	Sugar pick-up is slow/exceeding the warehouse rental limit	Limited means of transportation	Internal
19	Sales of packaged sugar to outlets	Financial Accounting Division and Marketing	***A5***	There was a delay in delivery to the outlet	Limited means of transportation	Internal
20	Sales of packaged sugar on credit	Financial Accounting Division and Marketing	A6	Payment of sugar purchases on credit exceeds the due date	Don't have cash because sugar hasn't been sold Lack of collectors	External Internal
21	Small pack sugar return from buyer	Installation Division and Manufacturing	P15	There is no stock of the desired size	Lack of packaging availability	Internal

Based on the results of observations and interviews with experts, the impact of each Risk Event is obtained. The impact of risk events on PG. Semboro can be seen in the following table:

Table 2: Risk impact

No	Risk Event	Causes of Risk	Impact
1	There is no standard price from the government and the land condition is not suitable	Officers being chased by the target area	The high cost of renting land
2	Land conditions that do not match the image submitted	Land owner cheating	Soil fertility and poor crop yields
3	Inappropriate variety composition and poor seed quality	Lack of supervision from SKB	Poor harvest
4	Late delivery of seeds	Lack of seed cutting power	Sugarcane harvest time is back
5	The need for the number of seeds is not met	Low seed breeding	Production target is not met
6	The garden Expenditure Budget plan is not in accordance with the condition of the land	Run out of money before the job is done	Lack of cost or loss
7	An error occurred in the recruitment of employees	Does not involve related managers Hiring the services of recruiters from outside, where they have not been able to	Employees are incompetent and often make mistakes

		choose the best candidate	
8	Plant population is less dense	Lack of staff supervision	Reduced sugarcane yield
9	Improper fertilization, type and dose	Lack of fertilizer Never done soil analysis	Sugarcane quality, lower production
10	Cutting and hauling cannot meet milling capacity	Lack of logging and trucking power	Production process setbacks
11	Cutting not CFS (Clean, Fresh, Sweet)	A lot of rain	Increase the burden of transportation costs (tops, kicks, trash come along harvested)
12	There was a long queue at the time of weighing	The occurrence of tool damage or power outages and shift changes	Production process delay
13	The pressing of the milling machine is less	The mill setting doesn't fit	Production process delay
14	Milling capacity is not met	Damage to equipment and operational errors	Production process delay
15	High dregs	The mill setting is too big Giving imbibition is not evenly distributed	Financial loss (sugar carried by bagasse, reduced sugar recovery)
16	Sulfuration pump malfunction	Broken / jammed valve	Production process delay
17	Little condensate produced	Dirty juice heating pipe Less heating steam Low milling capacity	Decreased sugar quality (poor production)
18	Uneven or sparse crystals	The seeds are not flat Unskilled cook	Decreased sugar quality (poor production)
19	Sugar is still brown and contains stroop	Rotary equipment malfunction or sudden power failure Torn filter	Consumer interest in sugar (consumers move)
20	Fine sugar mixed with production sugar	Not yet available tools to catch non-sugar ingredients	Sugar quality
21	Plastic sacks are easy to tear	Poor quality sack	Financial loss
22	There was an accident at work	Lack of discipline of employees in using safety devices Lack of socialization about the importance of wearing Personal Protective Equipment Negligence of employees working not according to	Accident Condition

		Standard Operating Procedures	
	Sugar production in warehouse is damaged	Humidity too high (basic sugar)	Farmers' satisfaction and trust
23	Sugar withdrawal is slow/exceeding the warehouse rental limit	Limited means of transportation	Financial loss
24	There was a delay in delivery to the outlet	Limited means of transportation	Delays in delivery
25	Payment of sugar purchases on credit exceeds the due date	Don't have cash because sugar hasn't been sold Lack of collectors	Affect the company's cash flow
26	There is no stock of the desired size	Lack of packaging availability	Product replacement delay

Based on the table above, it can be seen that there are 21 risk events with different impacts. So that interviews with experts were conducted to find out the criteria for each impact generated as shown in the table 3. After conducting interviews and observations and interviews with experts, a list of risks that occurred, impacts, causes, and possible risks were obtained. After that, the expert filled out a questionnaire to determine the impact and likelihood of each risk so that the level of each risk was obtained as shown in the table 4.

Table 3: Risk impact criteria

Impact	**1**	**2**	**3**	**4**	**5**
Assessment criteria	**Very low (insignificant)**	**Low (Minor)**	**Medium (Moderate)**	**Height (Major)**	**Very high (Catastrophic)**
Land rental fee	An increase of 0-500 thousand per hectare per year	Increase of > 500 thousand to 1 million per hectare per year	Increase > 1-2 million per hectare per year	Increase > 2-3 million per hectare per year	Increase > 3-4 million per hectare per year
Soil fertility, poor harvest	Brix content 20% and Pol 16%	Contents of Brix 18-19.99% and Pol 15-15.99%	Contents of Brix 16-17.99% and Pol 14-14.99%	Contents of Brix 15-16,99% and Pol 13-13,99%	Contents Brix < 15% and Pol <13%
Harvest schedule delay	1-2 days delay	3-5 days delay	6-10 days delay	11-14 days delay	>14 days delay
Production targets	Fulfilled 95-100%	Fulfilled <95-90%	Fulfilled <90-80%	Fulfilled <80-70%	fulfilled <70%
Budget increase	0-5% increase from budget	Increase >5-10% of budget	Increase >10-15%	Increase >15-20% from budget	Increase >20% from budget
Late auction	0-1 weeks	>1 week- 2 weeks	>2 weeks - 3 weeks	>3 weeks - 5 weeks	>5 weeks

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Table 5: Risk level

No	*Risk Events*	*Score (Inherent Risk)*		Risk Level
		Likelihood	*Impact*	
T1	There is no standard price from the government and the land condition is not suitable	3	4	12
T2	Land conditions that do not match the image submitted	2	3	6
T3	Inappropriate variety composition and poor seed quality	4	4	16
T4	Late delivery of seeds	3	4	12
T5	The need for the number of seeds is not met	3	5	15
T7	The budget of the garden is not in accordance with the conditions of the land	3	3	9
S1	An error occurred in the recruitment of employees	2	4	8
T9	Plant population is less dense	4	5	20
T10	Improper fertilization, type and dose	4	5	20
T11	Cutting and hauling cannot meet milling capacity	3	4	12
T12	Cutting not CFS (Clean, Fresh, Sweet)	5	5	25
T13	There was a long queue at the time of weighing	4	4	16
P2	Lack of electricity and steam supply	4	5	20
P3	The pressing of the milling machine is less	3	5	15
P4	Milling capacity is not met	3	5	15
P5	Pol Dregs is High	5	5	25
P6	Sulfuration pump malfunction	3	4	12
P7	Little condensate produced	4	4	16
P8	Uneven or sparse crystals	3	4	12
P9	Sugar is still brown and contains stroop	4	5	20
P10	Fine sugar mixed with production sugar	3	5	15
P11	Non-sugar ingredients mixed with production sugar	2	5	10
P12	Plastic sacks are easy to tear	3	4	12
P13	There was an accident at work	3	4	12
P14	Sugar production in warehouse is damaged	3	4	12
A4	Sugar pick-up is slow/exceeding the warehouse rental limit	3	3	9
A5	There was a delay in delivery to the outlet	3	4	12
A6	Payment of sugar purchases on credit exceeds the due date	4	4	16
P15	No stock of desired size (return)	3	2	6

After measuring the risk using the impact and likelihood criteria, the next step is to conduct a risk evaluation to obtain a risk map as shown in Figure 2 above. Each risk has a different level after being entered into the risk map. Risk mapping is carried out to make it easier for the company to see the position of each risk so that the priority risks that must be handled can be identified first.

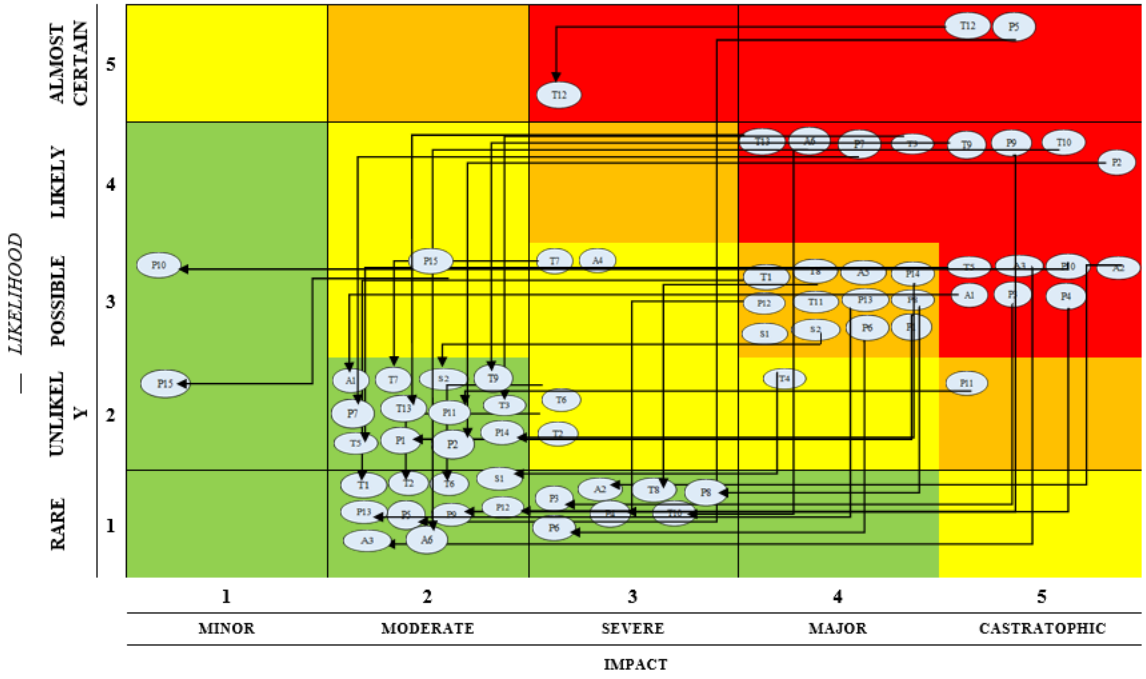

Figure 2: Risk map of PT. Semboro

Based on the risk map after controlling, the risk priority that will be mitigated is obtained, mitigation is carried out on the risk that has the highest value using Pareto diagram tools. The picture below is the order or priority of risk in PG. Semboro:

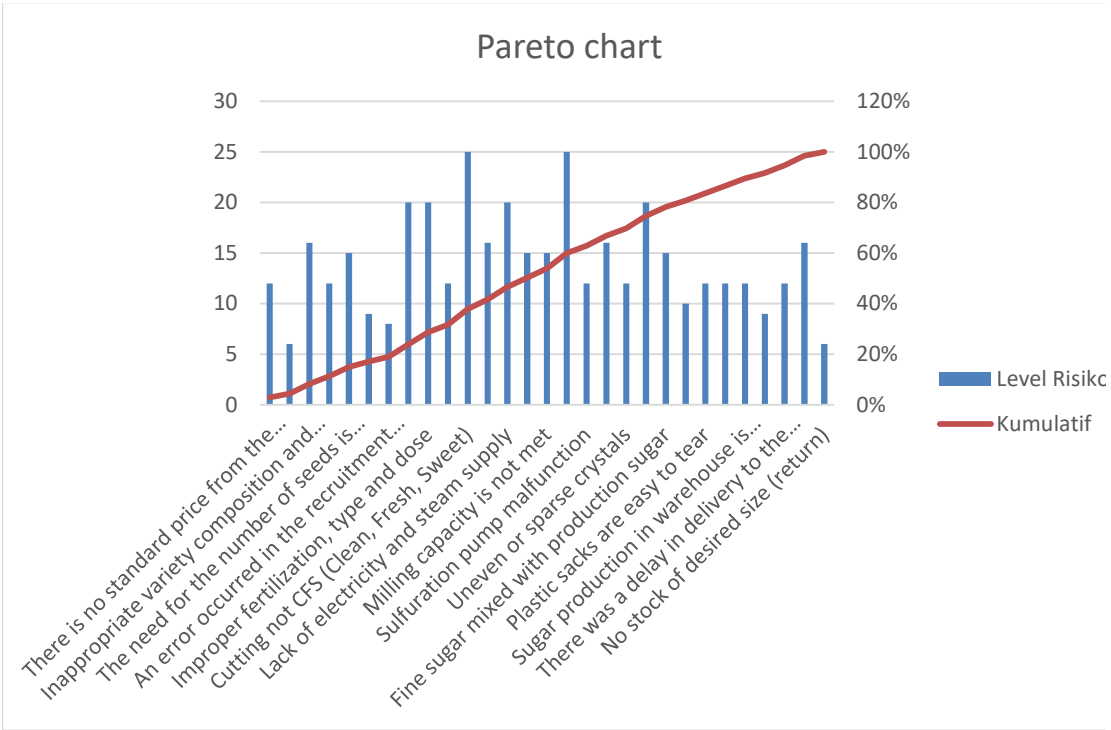

Figure 3: Pareto chart of PT Semboro

Based on the control results, it can be seen from the table above that the priority risks are Late seedling delivery (T4), Cutting and transporting cannot meet milling capacity (T11), Cutting without BSM (Clean, Fresh, Sweet) (T12), Delivery delays (A5) with a risk value of 12 and Sugar withdrawal is slow/exceeds the Warehouse rental limit (A4) with a risk value of 9.

4. Discussion

4.1. Risk Identification Analysis

In PG. Semboro and risk are divided according to the department or Division that handles activities that cause risk events, namely the Plant Division, Installation and Manufacturing Division, Financial Accounting and Marketing Division as well as HR and General Division. After knowing the risk that occurs (risk event), then an analysis of the causes of risk (risk cause) is carried out using a cause-and-effect diagram or a fishbone diagram (Fishbone Diagram). Furthermore, data collection on the impact (impact) and likelihood (likelihood) of the risk is carried out.

4.2. Risk Evaluation Analysis

The result of the risk evaluation stage is the risk map as shown in Figure 4.7. Each color in the risk map has a meaning, green means low risk, yellow means moderate risk, red means high risk and red means extreme risk.

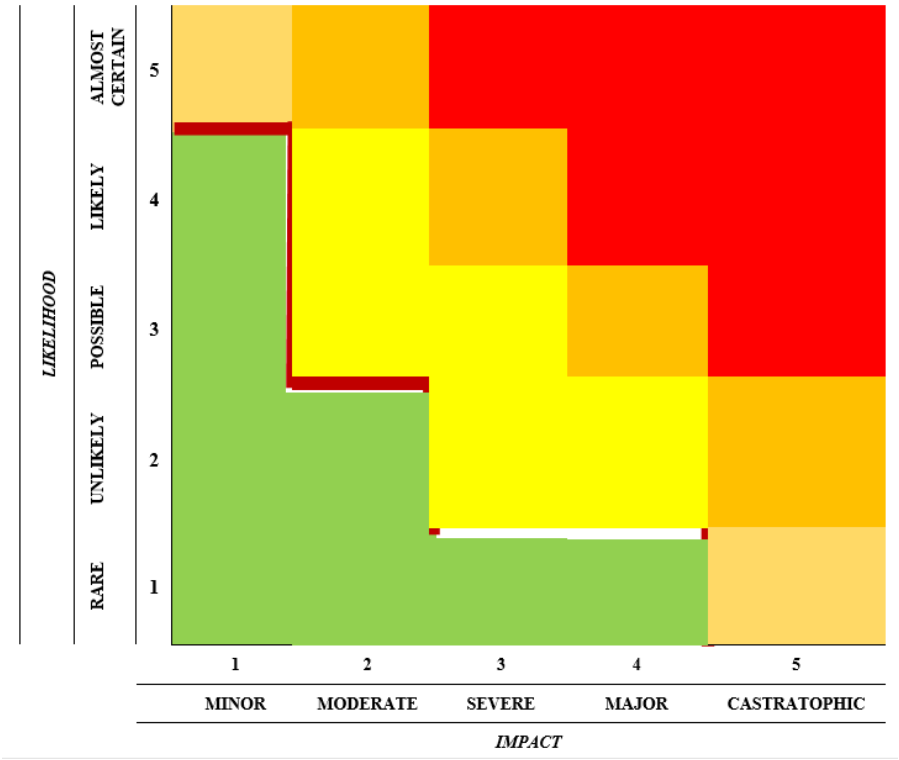

Figure 4: Risk Map Risk Tolerance Limit

After knowing the value of each risk, controlling is carried out by the company so that some risks experience a decrease in risk value. However, after controlling, there are still five risks that have a value above the risk

tolerance limit as shown in Figure 4 so that mitigation is carried out on these 5 risks.

4.3. Risk Mitigation Analysis

Mitigation actions in this study have not been carried out, due to time constraints. So that risk mitigation is only a proposal. Based on the order of priority in table, the order of risks is obtained starting from high value risk to low value. Proposed mitigation actions are carried out on five risks that have the highest value and exceed the risk tolerance limit. Proposed mitigation actions have been discussed with PG. Semboro, so the proposal can be made by the PG. Semboro in the future. The following are risk events and proposed mitigation actions taken:

- At the risk with Code T4, mitigation actions are carried out in the form of adding seed cutting staff by making an announcement that it requires sugarcane seed cutting staff
- Late Seed Delivery (T4)

This risk arises because of the lack of power to cut seedlings, so far PG. Semboro harvests the seeds in cooperation with the foreman. Cutting can be done if there is already an SPA (Transport Order) issuance, the issuance is carried out to facilitate the administration of the distribution of the transportation allotment for each foreman [7]. But in this way PG. Semboro is still experiencing a shortage of cutting power.

4.4. Risk Monitoring Analysis

The monitoring stage is carried out on the risks that are carried out by mitigation actions or the risks that have the highest value after controlling by the company. Monitoring is carried out to monitor mitigation targets or risk management so that they can run as planned. In this study, there was limited time so that monitoring was only limited to scheduling activities [8].

5. Conclusion

Based on the results of data processing and analysis carried out, the conclusions obtained in this study are as follows:

- There are 21 identified risks, 14 risk events and risk sources identified in the Plant Division, 6 risk events and risk sources identified in the Installation and Manufacturing Division, 11 risk events and risk sources identified in the Financial Accounting and Marketing Division and 1 risk events and sources of risk are identified in the HR and General Division. Based on the calculation and analysis results obtained 5 risks with the highest value, namely 3 risks in the Plant Division and 1 risk in the Financial Accounting and Marketing Division.
- Mitigation or mitigation action strategies carried out against risks in the supply chain in PG. Semboro is to prioritize the risk with the highest value and the risk that is above or exceeds the risk tolerance limit.

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