

# Risk Management in Palm Fruit Harvesting Activities using the Hirarc Method PT. Prima Artha Dynamics

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**Abstract:- Risk Management in Palm Oil Fruit Harvesting Activities Using the Hirarc PT method. Prima Artha Dynamics.**

*Assessment, Control.*

This research is motivated by a source of danger in oil palm fruit harvesting activities with the risk of work accidents in oil palm fruit harvesting activities. Therefore, the aim of this research is to analyze the main causes of the risk of work accidents in oil palm fruit harvesting activities, to analyze the severity of the risk of work accidents in oil palm fruit harvesting activities, To determine the steps taken to control the risk of work accidents in oil palm fruit harvesting activities. This research uses the HIRARC (Hazard Identification Risk Assessment Risk Control) method, namely by identifying sources of danger, analyze the level of risk and risk control efforts. Data was obtained through interviews with 18 harvest employees.

From the results of this research, there are main causes that are a source of danger and risk for oil palm fruit harvesting activities, namely slippery land, palm fruit bunches, sharp objects, palm fronds, snake droppings/powder, centipedes and wasps. The main causes that are the source of danger and the occurrence of risks have a mild level of risk, namely falling/slipping, being hit by fruit when removing fruit to TPH, being hit by fronds during harvest, falling into the eyes of droppings, being stung by centipedes and being stung by wasps and for moderate risks, namely being injured/injured by sharp objects. Efforts to control the risks of oil palm fruit harvesting activities include the use of complete Personal Protective Equipment (PPE), upaya lain yang dilakukan adalah pembersihan lahan yang semak agar tidak menjadi sarang ular.

**Keywords:-** *Hirarc, Hazard Identification, Risk*

## I. INTRODUCTION

The community economy has an important role. One important development is in the plantation sector, especially oil palm plantations. Oil palm plants (*Elaeis guineensis* Jacq) produce vegetable oil with enormous prospects (Pahan, 2008). The national palm oil industry is a strategic industry in regional economic development and poverty reduction. The palm oil industry has a strategic role as a foreign exchange earner, driving the national economy and helping to absorb labor in the macro economy (Gapki, 2017). The increasing domestic demand for palm oil and the large potential for exports of palm oil (CPO) have triggered rapid growth in the area of oil palm plantations in the country. In oil palm production activities, harvesting Fresh Fruit Bunches (FFB) is very important. Harvest determines the quality and quantity of oil produced from palm oil fruit.

Harvesting activities have risks for harvest workers. Dangerous risks faced by palm oil harvesters include falling coconuts or palm fruit stalks, falling fruit pods or pollen, being pricked by palm thorns, slipping or falling, and injuries due to work tools. The risk of danger in harvesting oil palm fruit needs to be analyzed to minimize the risk of danger so that the quantity and quality of the harvest can be increased.

In this study, researchers used the HIRARC method because the HIRARC method is one way of identifying potential dangers contained in a job (Urrohmah, Riandadari 2019). This research only discusses the main causes of the risk of work accidents in oil palm fruit harvesting activities, the level of risk in harvesting activities and the actions taken to control the risk of danger in harvesting activities. This research is limited to the risk of work accidents faced by

harvest workers, and this research is limited to one division at PT. Prima Artha Dynamics.

The aim of this research is to analyze the main causes of occupational risks in oil palm fruit harvesting activities, analyze the severity of work accidents in oil palm fruit harvesting activities and determine the steps taken to control risks in oil palm fruit harvesting activities.

The expected results in this research can be a contribution to the development of science in the context of community development, nation and state, especially in the oil palm plantation sector and it is also hoped that it can help increase knowledge for parties related to the oil palm plantation business, namely to know the occupational risks in oil palm fruit harvesting activities and their severity and how to control these risks.

## II. RESEARCH METHODS

### A. Place and Time of Implementation

The implementation of this research is planned at PT. Dinamika Prima Artha division 1 This activity lasts for two months, starting from 1 November to 31 December 2023

### B. Tools and Materials

The tools used in this research activity are stationery, cell phone camera and question sheets that have been provided.

### C. Data Collection Method

1.

#### ➤ Interview

Interviews were conducted by asking and answering questions directly to harvest employees regarding work accidents that occurred during oil palm fruit harvesting activities.

#### ➤ Field Observations/Observations

Field observations are carried out directly when collecting data through activities in the field. Observations include field conditions and work activity processes.

### D. Population and Sample

#### ➤ Population

The population in this study were harvest employees taken 6 people from each foreman A B and C in division 1 at PT. Prima Artha Dynamics.

#### ➤ Sample

The sample or respondents in this research were 18 people consisting of harvest employees.

### E. Work Procedures

In this research there are stages of activity procedures carried out as follows:

➤ Researchers select and formulate problems regarding work risks when carrying out oil palm fruit harvesting activities.

- Researchers compiled a literature review regarding risks in oil palm fruit harvesting activities.
- Researchers choose the data collection tools that will be used based on research literature that has been seen and studied previously as a reference or guide.
- Preparation of tools and materials that will be used for research.

#### ➤ Implementation

The implementation of this research consists of

- *Site survey*

A location survey was carried out to see and determine a suitable place needed for research.

- *Determination of population and sample*

This activity was carried out to determine the number of harvest employees who will be researched.

- *Data collection*

Conduct interviews, make observations and collect them for processing in order to find answers to the problem formulation.

- *Analyzing data*

### E. Data Analysis

The data analyzed by researchers was carried out using the HIRARC technique:

#### ➤ Identify Hazards

Hazard identification is an effort to find out whether there are dangers caused by equipment, workplaces and the rules in a system that is implemented. Hazard identification is carried out by:

- Collect all information regarding hazards in the workplace
- Carry out hazard inspections in the workplace
- Identify the dangers of work accidents
- Conduct investigations on every incident that occurs
- Identify hazards associated with emergency situations and non-routine activities
- Group the nature of identified hazards, determine temporary control measures, and determine priority of hazards that require permanent control

#### ➤ Risk Assessment

Risk assessment is an effort made to decide whether existing risks are acceptable or not based on evaluated data and calculating the adequacy of risk control measures. Risk assessment is carried out using a risk matrix. The Risk Matrix is a risk assessment that is the product of the frequency value and the severity value of a risk

- The chance or possibility of an accident with danger Likelihood, namely the chance or possibility of an accident/loss occurring or a measure of the possibility or degree of uncertainty of an event that will occur in the future can be seen in Table 1 below.

Table 1 Likelihood Level Assessment

Tiers	Tiers	Explanation
A	Almost Certain to Happen	An event will definitely occur in all conditions/every activity carried out
B	Often occur	An event that often occurs in almost all conditions
C	Possible	An event that may occur under certain conditions or may occur occasionally
D	Rarely happening	An event may occur under certain conditions, but the probability of it occurring is small
E	Almost Didn't Happen	Can only occur in certain circumstances or almost never occurs

Source: AS/NZS 4360: 2004

• *Severity and lost work days*

Severity is the first step in analyzing risk, namely calculating how much the impact or intensity of the event affects the outcome of the process, or it can be interpreted as consequences, namely the level of severity/loss that may occur from an accident, this can be related to humans, property, the environment and others. Examples of fatalities or death, disability, medical treatment, first aid can be seen in Table 2 below.

Table 2 Severity Level Assessment

Tiers	Description	Explanation
1	Not significant	There were no injuries, material loss was very small
2	Small	Requires first aid treatment, small financial loss
3	Currently	Requires medical treatment and results in temporary loss of work days, major financial losses
4	Heavy	Injuries that result in disability/total loss of body function, production processes not working, large financial losses
5	Disaster	Requiring serious medical treatment or causing death, financial losses are very large

Source: AS/NZS 4360: 2004

• *Risk Level Assessment*

After classifying the sources of danger and risks obtained, the risk level is then assessed by calculating the value according to the risk matrix table in Table 3 below:

Table 3 Risk Matrix

Likelihood (Possibility)	Severity (Severity)				
	Not significant (1)	Small (2)	Currently (3)	Heavy (4)	Disaster (5)
Almost Sure (A)	M	H	VH	VH	VH
Certain (B)	L	M	H	VH	VH
Possible (C)	L	M	H	VH	VH
Step (D)	L	L	M	H	VH
Very Step (E)	L	L	M	H	H

Source: AS/NZS 4360: 2004

✓ *Information:*



The way to assess risks and hazards is: Risk Value = (Likelihood) Likelihood x (Severity) Severity

➤ *Risk Control*

Hazard control is an effort made to reduce the risks that occur in an activity to a lower level. Risk control is carried out in the following way:

- Elimination, risks are avoided by eliminating sources of danger
- Substitution, replacing materials, tools or working methods with others so that the possibility of accidents can be minimized
- Engineering control, reducing risks by carrying out technical engineering on tools, machines, infrastructure, environments and/or buildings

- Administrative controls, reducing contact between recipients and sources of danger. For example: rotation and placement of workers, regular maintenance of equipment, and monitoring the effectiveness of controls that have been implemented
- Personal Protective Equipment reduces risks by using PPE such as safety helmets, masks, safety shoes, protective clothing, safety glasses and others.

### III. RESULTS AND DISCUSSION

#### A. Research Result

##### ➤ Company Overview

PT. Dinamika Prima Artha is located in Tepian Langsat Village, Bengalon sub-district, East Kutai Regency, East Kalimantan Province. PT. Dinamika Prima Artha has oil palm plantations which are divided into 4 (eight) core divisions and are supplemented by 3 (three) Plasma Divisions.

##### ➤ General Description of Respondents

Table 4 Respondent Data

No	Name	Employee status	Last education	Age	Long Work
1	Julius	Harvester	SD	37	4 Year
2	Agustinus	Harvester	SD	38	
3	Aris	Harvester	SMP	34	2 Year
4	Agustinus manek	Harvester	SMP	38	3 Year
5	Yabes	Harvester	SMA	25	2 Year
6	Yohanes	Harvester	SMP	27	3 Year
7	Kayetrus	Harvester	SMP	20	1 Year
8	Immanuel	Harvester	SD	43	10 Year
9	Martinus L	Harvester	SD	30	6 Year
10	Antonis	Harvester	SMP	40	5 Year
11	Vinsensius	Harvester	Tidak sekolah	30	5 Year
12	Yater s	Harvester	SMA	27	2 Year
13	Ismail	Harvester	SMP	30	3 Year
14	Yuven	Harvester	SD	33	4 Year
15	Gasvier	Harvester	SD	40	5 Year
16	dominggus	Harvester	SMP	42	11 Year
17	Irfan	<b>Harvester</b>	SD	31	3 Year
18	Fransiskus R	Harvester	SMA	45	8 Year

Source: Researcher's preparation, 2024

Based on the table above, the number of respondents interviewed was 18 people. Respondents consisted of 18 permanent daily employees who were interviewed regarding the risk of work accidents experienced in the process of harvesting oil palm fruit and how severe or how often they occurred Pahan (2008).

##### ➤ Risk Management

##### • Risk Identification

From the results of the identification carried out, it was found that risk factors that could cause accidents during the harvest of oil palm fruit include being pricked by thorns, being stung by wasps, being bitten by snakes, being bitten by centipedes, slipping due to slippery conditions and being hit by a machete when cutting fruit stalks.Limbong (2022)

Table 5 Sources of Hazards and Risks

NO	Source of danger	Risk
1.	<ul style="list-style-type: none"> <li>• Slippery Land</li> <li>• Wasp sting</li> <li>• Being bitten by a snake</li> </ul>	<ul style="list-style-type: none"> <li>• Slipped/Failed (Sprained/Injured)</li> <li>• Swelling</li> <li>• Snake bite (injury/life-threatening)</li> </ul>
2.	<ul style="list-style-type: none"> <li>• Wasp sting</li> <li>• Slippery Land</li> <li>• Sharp objects (eggreks)</li> </ul>	<ul style="list-style-type: none"> <li>• Swollen</li> <li>• Slip/fall (sprain/injury)</li> <li>• Wounds or Injuries</li> </ul>
3.	<ul style="list-style-type: none"> <li>• Slippery ground</li> <li>• Wasp</li> <li>• Palm Fruit Bunches</li> </ul>	<ul style="list-style-type: none"> <li>• Slip/fall (sprain/injury)</li> <li>• Fever and Swelling</li> <li>• Hit by Fruit</li> </ul>
4.	<ul style="list-style-type: none"> <li>• Benda Tajam (eggrek)</li> </ul>	<ul style="list-style-type: none"> <li>• Wounds and injuries</li> </ul>

5.	<ul style="list-style-type: none"> <li>Falling dirt/powder</li> <li>Planting object (machete)</li> </ul>	<ul style="list-style-type: none"> <li>Glittering eyes</li> <li>Swelling Wounds/injuries</li> </ul>
6.	<ul style="list-style-type: none"> <li>Wasp</li> </ul>	<ul style="list-style-type: none"> <li>Swollen</li> </ul>
7.	<ul style="list-style-type: none"> <li>Falling dirt/powder</li> <li>Slippery ground</li> </ul>	<ul style="list-style-type: none"> <li>Swollen/swollen eyes</li> <li>Slipped/Failed (Sprained/Injured)</li> </ul>
8.	<ul style="list-style-type: none"> <li>Snake</li> <li>Wasp</li> </ul>	<ul style="list-style-type: none"> <li>(injury/takes life)</li> <li>Swollen</li> </ul>
9.	<ul style="list-style-type: none"> <li>Planting object (machete)</li> </ul>	<ul style="list-style-type: none"> <li>Wounds and injuries</li> </ul>
10.	<ul style="list-style-type: none"> <li>Falling dirt/powder</li> <li>Slippery ground</li> </ul>	<ul style="list-style-type: none"> <li>Swollen/swollen eyes</li> <li>Slip/Fall (Sprain/Injury)</li> </ul>
11.	<ul style="list-style-type: none"> <li>Palm Fronds</li> <li>Planting object (machete)</li> </ul>	<ul style="list-style-type: none"> <li>Pricked by a thorn</li> <li>Wounds/injuries</li> </ul>
12.	<ul style="list-style-type: none"> <li>Slippery Land</li> </ul>	<ul style="list-style-type: none"> <li>Slipped/Failed (Sprained/Injured)</li> </ul>
13.	<ul style="list-style-type: none"> <li>Palm Fronds</li> <li>Falling dirt/powder</li> </ul>	<ul style="list-style-type: none"> <li>Pricked by a thorn</li> <li>Swollen/swollen eyes</li> </ul>
14.	<ul style="list-style-type: none"> <li>Planting object (machete)</li> <li>Falling dirt/powder</li> </ul>	<ul style="list-style-type: none"> <li>Wounds/Injuries</li> <li>Glittering eyes</li> </ul>
15.	<ul style="list-style-type: none"> <li>Centipedes</li> </ul>	<ul style="list-style-type: none"> <li>Fever and Swelling</li> </ul>
16.	<ul style="list-style-type: none"> <li>Palm Fruit Bunches</li> </ul>	<ul style="list-style-type: none"> <li>Hit by Fruit (Wound/Injury)</li> </ul>
17.	<ul style="list-style-type: none"> <li>Palm Fronds</li> <li>Wasp</li> </ul>	<ul style="list-style-type: none"> <li>Pricked by thorns and injured</li> <li>Swollen</li> </ul>
18.	<ul style="list-style-type: none"> <li>Palm fruit bunches</li> <li>Centipedes</li> </ul>	<ul style="list-style-type: none"> <li>Being hit by fruit (wound/injury)</li> <li>Swelling and fever</li> </ul>

Source: Researcher's Preparation, 2024

Based on Table 5, it can be concluded that there are 8 sources of danger. The number of findings for each source of danger can be seen in Table 6.

Table 6 Dangers by Source

No	Hazard Source	Interview result
1.	Slippery Land	6
2.	Palm Fruit Bunch	3
3.	Palm frond	3
4.	Sharp object	6
5.	Snake	2
6.	Wasp	7
7.	Centipede	2
8.	Powder/dirt	4

Source: Researcher's preparation, 2024

• *Risk Assessment*

Risk assessment is carried out using a risk matrix. The risk matrix is a risk assessment resulting from the product of the probability value of occurring and the severity value of a risk.

Table 7 Risk Assessment

Risk Assessment			
No	Risk	Possible Occurrence	Severity Level
1.	Falling/Slipping	C	1
2.	Fruit hit when removing fruit to TPH	C	1
3.	Fallen fronds during the harvest of oil palm fruit	C	1
4.	Wounded/Injured due to sharp objects (egrek, machete, axe)	D	3
5.	Snakebite	D	3
6.	Wasp Sting	B	1
7.	Stung by a centipede	D	2
8.	Dirt/powder fallout	B	1

Source: Researcher's preparation, 2024

• *Risk Control*

Hazard control is an effort made to reduce the risks that occur in an activity to a lower level. In risk control activities at PT. Dinamika Prima Artha has several ways to reduce this risk.

Table 8 Risk Control

Risk	Control measures
Falling/Slipping	• Elimination Control
Fruit hit when removing fruit to TPH	• Use PPE • Administrative control
Falling off palm fronds when lowering palm fruit bunches from the palm tree	• Use of PPE • Administrative control
Wounded/Injured due to sharp objects (egrek, machete, axe)	• Use of PPE
Snakebite	• Use of PPE • Elimination Control
Wasp Sting	• Use of PPE • Elimination Control
Stung by a Centipede	• Use of PPE
Eyes get dirt/powder	• Use of PPE

Source: Researcher's preparation, 2024

**IV. DISCUSSION**

➤ *Identify Risks.*

In palm oil fruit harvesting activities there are several sources of risk experienced by harvest employees at PT. The dynamics of Prima Artha when harvesting Fresh.

• *Slippery Land*

Land conditions that are slippery due to rain can be a source of danger for harvesters when harvesting oil palm fruit, namely they can slip or fall which can cause injuries or sprains so that employees can lose days of work. Limbong (2022).

• *Palm Fruit Bunch*

Palm fruit bunches are a source of danger when releasing the fruit to the TPH. The fruit falls from the artco which is upside down or in the wrong position and falls on the leg which results in injury or damage.

• *Palm Fronds*

Palm fronds have thorns so they can be a source of danger. When preparing the fronds, if you are not careful or don't use harvesting gloves, you can get pricked by the thorns on the fronds, causing swelling and even infection.

• *Sharp Object*

Sharp objects such as egrets, machetes and axes are a source of danger when harvesting oil palm fruit. When the

harvester handles the egret's eyes without gloves, it can cause cuts or injuries. Using a machete incorrectly when cutting palm fronds It can also cause cuts or injuries. Cutting fruit stalks in TPH using an ax if you are not careful can also cause cuts or injuries. Kementrian Pertanian (2021).

• *Snake*

Snakes can be a source of danger when harvesting oil palm fruit when the snake attacks the harvester. This is because the conditions of the land are bushy and lush. If an employee is bitten by a snake, it can cause injury and can also result in death.

• *Wasp*

Wasps are animals that are often encountered during oil palm harvesting activities. Wasps can attack when their presence is disturbed. If a harvester is stung by a wasp it can cause the body to swell and he can also experience a fever.Hadigman (2009).

• *Centipede*

Centipedes are very often found in oil palm plantations and have a venomous bite that can cause fever.

• *Dirt/Powder*

Dirt/powder produced from palm armpits during the harvesting process can also be a source of danger if the dirt/powder gets into the eyes and can cause irritation and swelling,Pemerintan Indonesia (2012).

➤ Risk Assessment

Table 9 Risk Assessment and Risk Level

Risk Assessment				
No	Risk	Possible Occurrence	Severity Level	Information
1.	Falling/Slipping	C	1	Light
2.	Fruit hit when removing fruit to TPH	C	1	Light
3.	Tipped palm fronds	C	1	Light
4.	Sharp objects (egreks, machetes, axes)	D	3	Currently
5.	Snakebite	D	3	Currently
6.	Wasp sting	B	1	Light
7.	Stung by a centipede	D	2	Light
8.	Dirt/powder and loose fruit gets into the eyes	B	1	Light

Source: Researcher's preparation, 2024

• Information :

Low	:		Light risk
Medium	:		Medium Risk
High	:		High Risk
Very High	:		Extreme risk

Based on Table 8 above, there are several levels of risk from mild risk to severe risk. However, based on the research results, two levels of risk were found, namely mild risk and moderate risk.

• Mild Risk

The mild risk level consists of three risks, namely falling or slipping, being hit by fruit when removing the fruit to the TPH, being pricked by midrib thorns, being stung by wasps, being stung by centipedes and being hit by dirt/powder in the eyes. This risk is said to be mild because it only causes minor injuries and occurs once or not often in a year and the loss of working days is less than three days and the economic loss is small PPKS(2007).

• Medium Risk

The moderate risk level consists of three risks, namely:

- ✓ *Wounded/Injured Due to Sharp Objects (Egrek, Machete, Axe)*

This risk is classified as moderate because it can cause serious injury and loss of 3 to 5 days of work and large economic losses.

- ✓ *Snakebite*

This risk is still classified as moderate but the impact is very severe or could result in loss of life but the possibility of this happening is small so it is still categorized as moderate.

- *Risk Control*

Risk control is a stage that must be carried out to reduce the impact of risks that occur. The controls carried out can be seen in Table 10.

Table 10 Risk Control

NO	Risk	Control Measures
1	Falling/Slipping	• Elimination Control
2	Hit by fruit releases fruit to TPH	• Use PPE (boots and trousers) • Administrative control
3	Covered with palm fronds	• Use of PPE (boots, gloves) • Pengendalian administrasi
4	Wounded/Injured due to Sharp objects (egrek, machete, axe)	• Use of PPE (Gloves, boots)
5	Snakebite	• Use of PPE (boots, long trousers) • Elimination control (Cleaning up bushy and overgrown land)
6	Wasp Sting	• Use of PPE (helmet, boots, long-sleeved shirt and long trousers) • Elimination control (Removal of wasps by fumigation)
7	Stung by a centipede	• Use of PPE (helmet, boots, long-sleeved shirt and long trousers)
8	The eyes are swollen/swollen due to dirt/powder when cutting the fruit	• Use of PPE (helmet and goggles)

Source: Researcher's preparation, 2024

Based on Table 10 above, control consists of three methods, namely using PPE, clearing bushes and overgrown land and expelling wasps by fumigation. These control measures emphasize the use of PPE.

- *Use of PPE*

Personal protective equipment is very important to use in oil palm fruit harvesting activities to minimize or suppress the impact of risks that may occur and protect workers from danger. The PPE that workers must wear when harvesting oil palm fruit is a helmet, gloves, boots, long shirt and trousers. Hebdra, dkk(2009).

- *Cleaning Bushy and Overgrown Land*

Cleaning bushes and overgrown land must be carried out so that the land is clean so that it does not become a breeding ground for snakes and other animals, so that employees can carry out oil palm fruit harvesting activities safely and comfortably without any fear of being attacked by dangerous animals.

- *Removal of Wasps by Fumigation*

This method is used to drive wasps from their nests so that employees can harvest oil palm fruit in the wasp nest area.

- *Occupational Safety and Health (K3) Training*

K3 training aims to reduce accidents that occur as a result of work. The training carried out is explaining and demonstrating correct harvesting techniques and methods as well as the correct use of PPE training. K3 training at PT. Dinamika Prima Artha is held every two years (Pemerintah Indonesia (2021).

- *Providing Signs*

Providing these signs provides important information regarding potential dangers and workers can be more aware of their work environment Ramli (2010).

## V. CONCLUSION

Based on the results of the research conducted, it can be concluded that:

- The main causes that are the source of danger and risk of oil palm fruit harvesting activities at PT. The dynamics of Prima Artha Division I are slippery land, palm fruit bunches, sharp objects, palm fronds, snakes and wasps..
- Types of risk with a mild level, namely falling/slipping, being hit by fruit when removing fruit to the TPH and being stung by a wasp. For moderate level risks, namely being injured/injured by sharp objects (egreks, machetes, axes), snake bites and being pricked by thorns.
- Efforts to control the risks of oil palm fruit harvesting activities at PT. Prima Artha's dynamic is the use of complete PPE. Other efforts made are clearing bushy land so that it does not become a nest for snakes, as well as fumigation to repel wasps if wasp nests are found in oil palm trees. This control effort involves the foreman and employees and is known to the division assistant and K3 assistant.

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