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Optimization of the Near Miss Reporting System in Achieving Zero Accidents at PTPN IV ADOLINA Garden (SIRISKA Online Smart Application)

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***Abstract*— A large number of accidents begins with the number of near misses and the magnitude of work risks experienced by workers, so control efforts are needed as early as possible. This study uses quantitative research using the SIRISKA smart online application (Occupational Risk Mapping System) involving sections clerks and oil palm harvesters as respondents. There were 3 cases of work accidents, and there was a near-miss hazard at each stage of oil palm harvesting. The near-miss hazards that can occur are being cut by an sickle or an axe, falling by an sickle, being crushed by a frond, being hit by a fibre, or being pierced by a palm thorn which must be recorded and reported. By optimizing the reporting system using the SIRISKA smart online application, it is hoped that zero accidents can be achieved at PTPN IV Adolina Garden.**

***Keywords*— Near miss, harvester, palm, siriska**

I. INTRODUCTION

Near-miss is an almost unavoidable event that does not cause injury, occupational disease (OD) or death. Near misses do not cause significant injuries and losses. Still, if the factors that cause near misses are left without corrective action, then the possibility of near misses can cause severe losses and injuries.[1]

A near miss is not a coincidence, but three factors cause a near miss in the workplace: unsafe acts, unsafe conditions, and being in a hurry or being desperate to do a job to get it done quickly, and take shortcut in completing work without regard to safety aspects.

Thus, it is noted that when near-miss incidents are not reported or neglected, it may result in more serious injuries. In addition, it is noted that accurate tracking of near-miss incidents and injuries can help reduce injuries on the working site. The findings show that organizations need to ensure reporting on more near-miss incidents for the purpose of improvement of overall safety environment. Tian et al..[2]

Near-miss reporting can help identify weaknesses in operational procedures, such as deviations from normal good practice, which may rarely occur but have a high potential for consequences. Near miss, reporting is a criticism to prevent work accidents because near miss reporting provides information about the causative factors and root causes of work accidents.

According to the East Cambridgeshire District Council, a near miss or hazardous event can result in injury [3]. Similarly, the university of Bristol defines a near miss as an event that does not directly cause injury but has the potential to cause it. These events must be monitored and investigated to ensure corrective action is taken to prevent similar accidents[4]. Near miss is an unplanned event that did not result in injury, illness, or damage but had the potential to do so .[5]

One of the many near-miss incidents in the workplace is due to the complicated form of the near-miss report. This makes workers lazy to report unsafe conditions and near-miss events that they experience, so a simple and easy-to-use report form is one of the solutions that can encourage workers to report near-miss events.

Near-miss events can be optimized with a near-miss reporting system. By using existing data from the reporting, near-miss events can be suppressed. By suppressing near-miss events, it is hoped that the company will receive a zero-accident award.

Reporting of near misses is not required by law, but the application and use of available information reflect the good practice of safety management in the company. Reporting near misses can help identify weaknesses in operations, such as Deviations from normal good practice that may be rare but have a high potential for consequence. Near-miss reporting is very important to prevent workplace accidents because near-miss reporting provides information about the causes and root causes of workplace accidents.(spine society)[6]

Zero accident is an effort to prevent, reduce, or even eliminate this risk. Enforcement of these cannot be considered a precaution. Occupational accidents and occupational diseases cost companies a lot. Still, they should be viewed as a form of long-term investment that will benefit you in the future regarding job security.

Annazmi (2017) say, "There are five factors that influence the achievement of zero accidents, namely company

commitment, occupational safety and health policies, occupational safety and health communication and training, occupational safety and health inspections and accident investigations, and safety and health evaluations".[7]
(Zhang et al., 2019) discussed a system for automatic detection of near miss falls, integrating mobile technologies to detect such events and artificial neural network for identifying them.[8]
(Teizer and Cheng, 2015) focused on detecting proximity near misses by an automatic location tracking system related to workers-on-foot and construction site layout and equipment: the model integrates a proximity hazard indicator that is dynamically calculated for each worker.[9]
The zero accident target is used as an indicator to determine the occurrence of work accidents and near misses[1]. Hoped that with this zero accident target, companies or workplaces can create appropriate programs to reduce hazards in the workplace.

A. Aspects of Occupational Safety and Health

Occupational safety and health is one aspect of worker protection regulated in Law Number 13 of 2003. It is intended that workers and other people in the workplace are always safe and healthy and all production sources can be used safely and efficiently.[10]
Overcome Occupational Health and Safety problems in the workplace has two aspects: Safety Psychology/causes of accidents and Industrial Clinical Psychology/decreased employee performance. Both of these aspects have factors that build these aspects. One factor that makes safety psychology is accident/near-miss reports and statistics. Reporting all accidents and near misses is essential to a safety program[11].
Labour is a company asset that must be given protection against K3 aspects, considering the potential hazards associated with work (PP RI No. 50, 2012). Construction workers are involved in many activities with serious risks, such as falling from heights, unguarded machinery, being struck by heavy equipment, electrical hazards, dust exposure, etc.[12]
Vitality is the key to preventing accidents and ensuring workers' safety. Low-alert workers have difficulty controlling their work, which increases the risk of accidents. Factors causing accidents caused by the negligence of workers, fewer hours of sleep, over time, monotonous working conditions, psychophysiological conditions, entertainment, age and seniority. To see also overtime can make workers feel exhausted. Efficient work for workers is 7 hours a day and a maximum of 8 hours a day.
The number of reported accidents can be used as a guide to finding potential accidents so that ways to anticipate these accidents can be developed. [1]

II. MATERIAL METHOD

The type of research used in this study is a quantitative research using the SIRISKA smart online application (Occupational Risk Mapping System) involving sections clerks and oil palm harvesters as respondents. The types of data are primary data and secondary data. Preliminary data consists of data on the characteristics of respondents, risk behaviour of workers and OHS risks. Secondary data is data on the number of oil palm harvesters at PTPN IV Adolina Plantations obtained from the HR department of PTPN IV Adolina Plantations.

This study's stages of data collection were inputting K3 risk data and the coordinate points for work accidents by oil palm harvesters in plantations using the SIRISKA Smart Online application. For implementation guidelines, see the following manualbook: https://bit.ly/ManualbookSIRISKA. The tools and materials used in data collection in this study were cell phones, cameras, and GPS.

III. RESULTS AND DISCUSSION

A. General Descripton of the Application

The SIRISKA application (Occupational Risk Mapping System) is an application to measure and map work accidents and area-based accident risk factors. Workers who experience near misses or work accidents can directly input real-time data into this application.

The advantages of the SIRISKA online intelligent application are: more accessible application support systems, data processing requires less time, more practical data processing, and data visualization is easier to read and can be carried and accessed regardless of space and time.

B. Job Descripton of Oil Palm Harvesters

The stages in harvesting oil palm at PTPN IV Adolina Plantations are as follows:

1. Midrib Cutting Stage

Cutting the fronds is the first part of the oil palm harvesting process. The stage starts with taking fibre and then raising the fibre upwards to approach fresh fruit bunches (FFB). After that, the fronds are cut to see the maturity level of the fruit by using an sickle by pulling it downwards.

2. FFB Cutting Work Activities

Cutting fresh fruit bunches is the process of cutting ripe fruit from oil palm trees that are ready to be harvested. The method of cutting fresh fruit bunches is carried out after missing the palm fronds covering the fresh fruit bunches.

3. FFB Stalk Cutting Work Activities

The purpose of cutting fresh fruit bunches is to separate the fresh fruit bunches from the fresh fruit bunches.

4. FFB Transportation Activities

Transportation of fresh fruit bunches is the transportation of fresh fruit bunches that have been cut from the stalks of fresh fruit bunches to wheelbarrows using buckle.

5. Work Activities Transferring Palm Fruit Bunches to Yield Collection Places

The transfer of fresh fruit bunches to the yield collection point is moving the Palm Fruit Bunches using a wheelbarrow to the yield collection site.

C. Hazard Analysis

The hazard analysis at each stage of the oil palm harvester work at PTPN IV Adolina Plantation is as follows:

1. Midrib Cutting Stage

The following analysis of the hazards obtained in the process of cutting the fronds can be seen in the following table:

TABLE I .

ANALYSIS OF HARVESTERS OCCUPATIONAL SAFETY HAZARDS AND NEAR MISS OCCURENCES IN THE FROND CUTTING PROCESS

Worker Activities	**Actual Condition**	**Potentional Hazard**		**Near Miss Accident**
		Yes	**No**	
Take Fiber	• Worke r holding fiber		✓	
Connecting fiber with sickle	• Workers bind fiber with sickle using rubber tires		✓	
Removing the sickle shield	• Workers remove the sickle shield	✓		Almost cut by an sickle
Raising the fiber towards the top of the frond	• Workers lift the fiber towards the top of the tree	✓		Glare eyes exposed to the sun
Putting sickle to the tree's frond	▪ The worker directs the sickle blade to ▪ tree fronds	✓		Almost got hit by an sickle blade
Adjusting the position with an angle of 90∘.			✓	
Cut the fronds with sickle	Workers cut the stem of the frond	✓		1. Almost got hit by a frond 2. The eye is almost hit by pollen 3. Barely hit by fiber 4. The sickle almost fell
Hooking an sickle in a tree frond	Workers put the sickle blade in the frond of the tree	✓		Almost got hit by an sickle blade
Picked up an axe on the whellbarrow	Workers Hold an axe	✓		Almost got hit by an axe
Putting the axe blade on the midrib that has been cut	The worker directs the axe blade at the midrib that has been cut	✓		
Cut fronds that have been cut into 3 parts fronds with a frequency of 2 times cut	Workers cutting fronds	✓		1. Almost got hit by a palm thorn 2. Almost got hit by an axe
Putting the axe in the wheelbarrow	Workers put axes	✓		Nearly got hit by an axe
Arranging fronds in the dead yard	Workers carry out the preparation of fronds	✓		Almost got hit by a palm thorn

Workers carry fibre to where the trees will be harvested. When removing the sickle protector, workers are very vulnerable to being cut by the sickle on the hands if they do not use safety gloves. When lifting the fibre upwards, it is possible that the sickle will fall because the sickle's bond with the fibre is not tightly tied. When cutting the fronds, workers are very vulnerable to being crushed by the fronds, exposed to flower pollen, and fibre on the head, eyes, body and legs if they do not use safety helmets, gloves, shoes, and goggles. When cutting fronds, workers are vulnerable to axes or palm thorns if they don't use safety shoes or gloves and when assembling fronds, workers are very susceptible to palm thorns.

2. FFB Cutting Stage

Hazard analysis in the process of cutting fresh fruit bunches can be seen in the following table:

TABLE II

ANALYSIS OF HARVESTERS OCCUPATIONAL SAFETY HAZARDS AND NEAR MISS OCCURENCES IN THE FFB CUTTING PROCESS

Worker Activities	**Actual Condition**	**Potentional Hazard**		**Near Miss Accident**
		Yes	**No**	
Picking up an sickle in the frond of a tree	• Workers take sickle that are stuck in trees	✓		Almost got hit by a fiber Almost got hit by an sickle Glare eyes exposed to the sun
Putting the sickle's blade on the FFB stalk on the tree	The worker directs the eyes of the sickle towards the	✓		Almost got hit by an sickle

	FFB stalk			
Adjust the position by the angle 90^o	The worker walks to the right		✓	
Cutting FFB with sickle	Workers cut FFB using sickle	✓		1. Almost got hit by FFB 2. The eye is almost hit by pollen 3. Barely hit by fiber 4. The sickle almost fell
Involved sickle in the fronds of trees	Workers lay sickle	✓		The eye is almost hit by palm pollen

The sickle is slung over the front of the tree; then, workers take the sickle to be directed to the Fresh Fruit Bunches (FFB), which are ready to be harvested. When picking up sickle, workers are vulnerable to being crushed by fibre and stabbed by sickle. Workers also have the potential danger of being crushed by fresh fruit bunches when cutting fresh fruit bunches, and when attaching the sickle, there is a possibility that the sickle will fall on the worker

3. FFB Stalk Cutting Stage

Hazard analysis in the process of cutting fresh fruit bunches stalk cutting can be seen in the following table:

TABLE III.

ANALYSIS OF HARVESTERS OCCUPATIONAL SAFETY HAZARDS AND NEAR MISS OCCURENCES IN THE FFB STALK CUTTING PROCESS

Worker Activities	**Actual Condition**	**Potentional Hazard**		**Near Miss Accident**
		Yes	**No**	
Picking axe	• • Workers take axes in wheelbarrows • • Workers holding axes		✓	
Stepping on FFB by foot	• • Workers' feet are raised above the FFB	✓		Almost got hit by a palm thorn Nearly bitten by a leech
Swinging an axe	• • The worker swings the axe upwards	✓		Nearly got hit by an axe
Cut the FFB stalks using an axe	• • The worker swings the axe downwards • •	✓		Nearly got hit by an axe blade
	Workers cut the FFB stalks			
Put an axe in a wheelbarrow	• • Workers return the ax to the wheelbarrow		✓	

4. FFB Transportation Stage

Hazard analysis in the process of transporting fresh fruit bunches can be seen in the following table:

TABLE IV.

ANALYSIS OF HARVESTERS OCCUPATIONAL SAFETY HAZARDS AND NEAR MISS OCCURENCES IN THE FFB TRANSPORTATION PROCESS

Worker Activities	**Actual Condition**	**Potentional Hazard**		**Near Miss Accident**
		Yes	**No**	
Took buckle to lift fresh fruit bunches	Workers holding buckle		✓	
Swing the buckle upwards	Workers raise buckle to the top		✓	
Plug in the TBS using buckle	The worker swings the pole downwards, Workers stick buckle into the fresh fruit bunches	✓		1. Almost got stabbed by a buckle in the leg 2. Nearly bitten by an animal
Lifting FFB that has been plugged into a wheelbarrow	• Workers transport FFB	✓		1. Almost got hit by FFB 2. Almost got hit by buckle
Putting FFB into the wheelbarrow	Workers put FFB	✓		1. Nearly got hit by a wheelbarrow

After cutting the stalks of fresh fruit bunches, workers take the buckle at the time of taking buckle. Then the worker plugs the fresh fruit bunches using a buckle. Workers have the potential to be exposed to feet by canes and animals. Workers lift fresh fruit bunches with both hands. When transporting fresh fruit bunches, workers are very prone to hitting their heads in an accident due to being detached from the fresh fruit bunches and crushed by the fresh fruit bunches. Workers put fresh fruit bunches in a wheelbarrow; when putting fresh fruit bunches in a wheelbarrow, workers are at risk of being hit by the wheelbarrow due to slipping.

5. Transfering FFB Collection Point Stage

Hazard analysis in the process of transferring fresh fruit bunches to the collection point can be seen in the following table:

TABLE V

Analysis of Harvester Occupational Safety Hazards and Near Miss Events in the Process of Transferring FFB to TPH

Worker Activities	Actual Condition	Potentional Hazard		Near Miss Accident
		Yes	No	
Lifting the stroller	The worker lifts the stroller upwards	✓		Nearly got hit by a wheelbarrow
Pushing a stroller	The worker pushes the stroller forward		✓	Almost slipped/falled from potholes on the road
Take and swing buckle towards	Workers raise buckle upwards		✓	
on	the worker swings the buckle downward	✓		Almost got stabbed by a buckle
Plug in the TBS using buckle	workers stuck sticks into the FFB	✓		Almost got hit by FFB
Lifting FFB to TPH using buckle	Workers pick up FFB	✓		Almost got hit by FFB Almost got hit by a palm thorn
Put FFB in TPH using buckle	Workers unload FFB to TPH		✓	

When transporting fresh fruit bunches, workers can easily slip from their hands due to slippery hands. Workers are vulnerable to slipping/falling when pushing a wheelbarrow due to potholes in road conditions. After arriving at the collection point, the workers stopped, and then the workers took the buckle. The worker swings the buckle upwards, plugs the fresh fruit bunches using the buckle and then transports them. Workers are at risk of being stabbed by a buckle when hitting fresh fruit bunches using a buckle.

D. Analysis of Work Accidents In The Last 3 Months

TABLE VI

ANALYSIS OF WORK ACCIDENTS IN THE LAST 3 MONTHS

Juli s/d September							
No	**Initial**	**Location**	**Impact**	**Wound on**	**Wound Type**	**Source of Injury**	**Accident chronology**
1	EN	Sections 8	Minor Injury	Left eye	-	Palm dust	during harvesting the left eye got hit by palm dust
2	MS	Sections 9	Minor Injury	Right Stomach	Closed wound	Palm fruit	At the time of harvesting the stomach is crushed by the Palm Fruit
3	ABS	Sections 5	Minor Injury	Left Hand	Closed wound	Fertilizer	When lifting the fertilizer, the fertilizer fell and hit the left hand

Based on the table above it is known that in the last 3 months there were 3 cases of work accidents from June to August as many as 3 cases of work accidents that occurred in sections 5, 8 and 9. The work accidents caused minor injuries and injuries that left the left hand unable to move. The source of the wound was palm dust, palm fruit and crushed by fertilizer. The chronology of the accident included when the left eye was harvested by palm dust, during harvest the palm fruit was crushed in the stomach and when lifting the fertilizer, the fertilizer fell and hit the left hand.

CONCLUSIONS

The conclusions from this study are: SIRISKA (Occupational Risk Mapping System) is an application to measure and map work accidents and area-based accident risk factors.

At every working stage of the oil palm harvester, a near-miss hazard can occur, such as being cut by an sickle or an axe, falling by an sickle, or being crushed by a frond, exposed to fibre, punctured by a palm thorn.

Three work accidents in the last three months caused minor injuries and injuries that left the left hand unable to move.

The recommendations suggested by the author are optimizing the work accident reporting system using the SIRISKA application so that you can see risk factors and achieve zero accidents.

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REFERENCES

[1] Risma J, Koesyanto H. Penerapan near miss card sebagai upaya penurunan angka kecelakaan kerja. In: Higeia Jurnal of Public Health Research and Development. 2017. p. 119–30. Available from: http://journal.unnes.ac.id/sju/index.php/higeia

[2] Tian, S.C., Kou, M., Sun, Q.L., & Li, L. (2014). Analysis of near miss reporting will in China coal mines: An empirical study. *Advanced Materials Research*, (962-965), 1127-1131. https://doi.org/10.4028/www.scientific.net/AMR.962-965.1127

[3] East Cambridgeshire District Council. Accident/ Near Miss Reporting Policy. 2017. Nutholt Ln: East Cambridgeshire District Council

[4] University of Bristol. Near Miss Reporting Guide. 2016. Bristol

[5] National Safety Council, 2013. Near Miss Reporting Systems

[6] North American Spine Society Safety Campaign. 2013. Near miss Reporting a Missing Link in Safety Culture. North American

[7] Annazmi. 2017. Faktor-Faktor yang Mempengaruhi Pencapaian Nihil Kecelakaan (Zero Accident) di PT. PLN (Persero) Area Medan Tahun 2017. Fakultas Kesehatan Masyarakat Universitas Sumatera Utara, Medan. (http://repository.usu.ac.id/bitstream/handle/123456789/67752/Cover.pdf?se quence=7&isAllowed=y. diakses pada 26 Agustus 2018)

[8] Zhang, M., Cao, T., Zhao, X., 2019. Using Smartphones to Detect and Identify Construction Workers' Near miss Falls Based on ANN. J. Constr. Eng. Manage. 145 (1), 04018120. https://doi.org/10.1061/(ASCE)CO.1943-7862.0001582.

[9] Teizer, J., Cheng, T., 2015. Proximity hazard indicator for workers-on-foot near miss interactions with construction equipment and geo-referenced hazard areas. Autom. Constr. 60, 58–73. https://doi.org/10.1016/j.autcon.2015.09.003.

[10] RI, Undang Undang Nomor 13 Tahun 2003 Tentang Ketenagakerjaan

[11] Novitasari N, Panjaitan TWS. Upaya Pencapaian Zero Accident di PT . Sari Mas Permai. In: Jurnal Titra. 2015. p. 223–8. Available from: https://publication.petra.ac.id/index.php/teknik-industri/article/view/3479

[12] PP No. 50 Tahun 2012 tentang Penerapan Sistem Manajemen Keselamatan Dan Kesehatan Kerja