The Analysis of Ergonomic Risk Factors Effecting Health Problem on Workers from Harvesting Activity in Oil Palm Plantation

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Abstract. Oil palm plantation consists of several activities such as harvesting, manuring, and spraying are exposed to ergonomic problems in their routine work. Although many technology advances have been developed, harvesting process is still using manual tools and need strength, energy, skill, and technique which exposed to the high postural risk. The environment and work nature also hazardous to the workers can cause accidents and ergonomic pain. This study aimed to determine ergonomic risk factor such as worker’s attitude, training, skill and management that influence to high pain experience, identify the common accidents faced by workers during harvesting activity and determine the relationship between risk factor toward pain and accident experienced. This study was conducted on 44 workers who involved in harvesting activity at Pembangunan Pertanian Melaka Sdn Bhd. The data were collected through survey method using structural distribution questionnaires and the data analysis involved were descriptive analysis, regression analysis and correlation analysis. The result showed that the common accident and pain experienced by the workers was neck, shoulder and lower back. Besides, the result showed that the training is the main factor that contribute to the high pain experienced and accident. Correlation analysis was found that there a positive correlation between training and ergonomic risk factor since the p-value is 0.02 less than 0.05. As a conclusion, this study gives an advantage in the oil palm plantation sector in terms of safety and health for future planning to reduce ergonomic pain and indirectly help in improve workers productivity.

Keywords: Ergonomic; Pain Experience; Accident; Workers; Training

1. Introduction

Oil palm (Elaeis guineensis) belongs to the family Arecaceae. It is originates from western Africa between Angola and Gambia and the oil palm tree were used to be an ornamental plant in Malaysia first when it was been introduced. After Indonesia, Malaysia is the second largest producer and exporter of oil palm in the world. Plantation sector require a large number of workers because different activity involves requires different skill and technique. By increasing the number of workers in this sector also will increase some problem such as risk and hazard. The Risk that normally occur in oil palm industries is an ergonomic risk because some of activity involve make the workers use the bad postures and feel discomforts during handling tools and equipment. In oil palm plantation, many field activities involve tend to be a risk and accident to the workers such as harvesting activity that can be considered as a core activity. For example, harvesting activity is potentially causing injuries to the workers and subsequently result in productivity loss.
Harvesting activity such as lifting the bunch, a collection of loose fruit, arrange the staking frond, and harvest shorter and tall palm tree can give impact to several aspects of an individual’s performance. Most of the posture adopted during harvesting activities is potentially injurious to the workers [2]. For example, risk to injuries on shoulder, neck, back, and other part of body. In additional, according to [8] the result from their study received the complaint from 86% of workers who experience in pain, disorder or discomforts at several body involved during harvesting activities. The most complain that reported by the workers such as shoulder and neck, lower back disorder, and knee. This part of body always effects and cause pain during harvesting activity compared to the rest parts of the body. Besides, the occupation of harvesting activities is a labour-intensive job because ergonomic hazards that presents are significantly different [9]. Risk that commonly occur in oil palm plantation are safety, health and ergonomic risk. The aims of this study are to determine ergonomic pain factor and pain experienced among the workers, to identify the effect of body part cause by harvesting activity and to determine the relationship between ergonomic pain factor with pain experience by workers.

2. Risk Factors Contribute to the Pain Experienced and Accident.

2.1. Worker’s attitude
Worker’s attitude become one of the factors that contribute to the risk and accident in harvesting activities of oil palm. Any accident that occur during performing the task cause by poor attitude of the workers such not followed the instruction given by the management. Not wear personal protective equipment (PPE) during work will lead to the accident because their certain body part is exposed to the hazard. Besides, the attitude of workers not practice the training that they had learnt also can lead to accident. Previous study also found that the attitude of workers such not follow the instruction or training given contribute to the factor that lead into high risk and accident and as the result that stated based on previous study found a high majority (82.9%) of workers did not use their knowledge from their training during perform harvesting task [2]. According to [2] the result showed a high majority (84.3%) of the workers did comply with the requirements and only and 15.7% of the respondents did not wear full personal protective equipment (PPE).

2.2. Training
Lack of training also become the major factor that contribute to the risk and accident. It because training is vitally important to the workers especially who involved in heavy work sector like plantation that needs the highly skilful workers. Training can change the workers from unskilled to skills workers by learning program during training and then they observed and practice what they had learnt during training. The problem normally occurs when the workers not implement the training given during performing their task. It happened because normally the standard of practice that prepared by management normally can make the workers feel discomfort to handling some tools and also can slower their work pace. According to [2] the majority of workers not practicing the correct manual handling and lifting technique was because it would slow down their work pace and they also felt uncomfortable in applying the suggested postures and techniques that they have learnt [2]. According to [7] provide sufficient training to the workers will decrease ergonomic risk among harvesters because their study said that worker’s skills is highly related to risk and accident that occur such as workload on neck, wrist, shoulder and back.

2.3. Worker’s skill
Skilled workers are important in an organization to make sure the better production and increase in profit. Skilled workers also can reduce the rate of accident in industries especially for plantation sector that need the workers use their strength and energy during performing the task. In addition, all the task can be complete at the right time and the target of production can be achieved by hired the skills person into the organization. The lack of skills workers makes certain organization hire the unskilled workers to their company and this will result the rate of accident and risk increase during performing the task because unskilled workers less experience and skill to manage some task given especially to handling tools and equipment. They also practice wrong posture during work that may led to the
ergonomic pain on their body. According to [7] most of body part that involved in ergonomic pain and accident during performing harvesting task is highly related to the worker’s skills. Previous study conducted by [13] state that unskilled workers more experience in pain and feel discomfort at their certain body part during perform harvesting work to compared with skills workers. Skill during handling harvesting pole is important because it not only reduce risk and accident during harvesting task, but only can increase the productivity of oil palm [13].

2.4. Management implementation
The management should play important role to make sure their workers always health and safe and also reduce the rate of accident among their workers. This role can be achieved by implement the training to the workers to increase skill of workers. The management also can set up work schedule properly to make sure all work can run smoothly without interrupt worker’s resting time. Company can provide a seminar on how to handle risk properly and make sure all the information especially about safety and health must deliver to the workers. Poor management will affect the organization because when the management ignore about the problem that face by workers especially that related to their health. When the workers were sick, their productivity will decrease and company’s income also decrease [16] said that too complicated procedure leads the workers underreporting the problem or accident that happen to the management. The management need to arrange work schedule properly to avoid production pressure and moral disengagement to the workers because these become one of the factors that push the workers not inform the accident that faced by them [16]. Poor designing tools from management will lead to injuries and high ergonomic risk among oil palm harvester because poorly design make them discomforts during working [17].

3. Materials and methods
The study was conducted at Pembangunan Pertanian Melaka Sdn Bhd Ladang Lembah Kesang who are located at Batu 19 Semujuk, Kampung Seri Mendapat, 77300 Merlimau, Melaka. Ladang Lembah Kesang is the company that focuses on oil palm production with the complete implementation of vehicle and machinery. 40 sample size was selected from 50 population based on Raosoft calculator. Quantitative research was used in this study through survey method and the data was collected by structural distribution of questionnaire. The questionnaire was divided into 3 sections which are section A, B, and C. Section A consist of demographic information, section B consist of worker’s attitude, training, skill and unskilled workers, and management implementation and section C about the pain experience during perform the jobs. SPSS was used to analyse the data such as reliability test, descriptive analysis, correlation analysis and regression analysis.

3.1. Theoretical Framework
The Theoretical framework is a logical structural representation of the concepts, variable of dependent and independent and relationship involved in this study. Their function is to identify what needs to be measured, examined, explored and described. The Theoretical framework is important to guide and ensure the study is managed well. So that the researcher will identify whether a dependent and independent variable is related or not at the end of the study. A dependent variable for this study is pain experience and accident while the independent variable are worker’s attitude, training, worker’s skill and management implementation.
4. Results and discussion

4.1. Pain experienced and accident faced by the workers

Based on figure 1 shows the pain experience from respondent during perform the job task. The common pain faced by the respondent are shoulder, neck, lower back and leg with frequency are 36, 33, 34 and 30 respectively. The pain experienced at those parts mostly because of harvesting the matured fresh fruit bunch with the weight around 25-30kg and loading the FFB into the lorry.

4.2. Types of accidents
Figure 2 above shows the result for types of accident that commonly occur during harvesting activity. The result shows the highest accident and injured is caused by a thorn from the bunch and frond with the frequency 37 from 40. The second highest is skin got scratched during handling tools and equipment with 33 frequencies of respondent. Meanwhile, lorry or tractor that overturn during transport the bunch are recorded the highest answer from the respondent that answered NO with 38 frequency.

4.3. Correlation analysis

Table 1 shows the result for correlations that consists of four independent variable that involved in this study. The correlation value (r-value) for training and management implementation is 0.496 and 0.474 which indicate that medium positive correlation. Meanwhile, the significance value (p-value) for training is 0.001 and management implementation is 0.002 which is less than 0.05. Based on the result below, it shows that only training and management implementation shows positive relationship with ergonomic pain and experience. This study was aligned with the previous study that the training was led to ergonomic pain and accident during harvesting activity of oil palm. According to [2] he stated that the 81% of respondent from their study was undergone the training for proper manual handling and lifting technique and as the result, the respondent more aware and concern about the use of correct technique and procedure during performing the task.

4.4 Regression analysis

Table 2. Regression Analysis R-square Result

| Correlations | ATTITUDE | TRAINING | SKILL | IBM | PAIN EXPERIENCE |
|--------------|----------|----------|-------|-----|-----------------|
| Correlation Coefficient | 1.000 | .496** | .322* | .474** | .024 |
| ATITUDE | Sig. (2-tailed) | . | .001 | .043 | .002 | .884 |
| N | 40 | 40 | 40 | 40 | 40 |
| Correlation Coefficient | .496** | 1.000 | .480** | .264 | .368* |
| TRAINING | Sig. (2-tailed) | .001 | . | .002 | .100 | .020 |
| N | 40 | 40 | 40 | 40 | 40 |
| Correlation Coefficient | .322* | .480** | 1.000 | -.039 | .037 |
| WORKER’S SKILL | Sig. (2-tailed) | .043 | .002 | . | .811 | .819 |
| N | 40 | 40 | 40 | 40 | 40 |
| Correlation Coefficient | .474** | .264 | -.039 | 1.000 | -.021 |
| IBM | Sig. (2-tailed) | .002 | .100 | .811 | . | .897 |

Table 1. Correlation analysis at different risk factor with pain experience

Note: **Correlation is significant at the 0.01 level (2-tailed)
*Correlation is significant at the 0.05 level (2-tailed)
Table 3. Coefficient table for Regression

| Model | Unstandardized Coefficients | Standardized Coefficients | t  | Sig. |
|-------|-----------------------------|----------------------------|----|------|
|       | B  | Std. Error | Beta |     |     |
| (Constant) | 1.761 | .736 |     | 2.394 | .022 |
| ATTITUDE | -.187 | .127 | -.288 | -1.474 | .149 |
| TRAINING | .367 | .130 | .561 | 2.830 | .008 |
| WORKER’S SKILL | -.121 | .195 | -.107 | -1.618 | .105 |
| IBM    | .053 | .125 | .075 | .421 | .677 |

5. Conclusion

In a nutshell, risk analysis is an important tool to access the risk that might be faced by the company. From this study was concluded that all variable can be a factor that contributes to the ergonomic pain and accident in the harvesting activity in oil palm plantation. It founded that only the training has positive relationship with ergonomic pain and accident toward workers who carried out the harvesting work in oil palm plantation. It shows that insufficient training can contribute to the high percentage the ergonomic pain and accident because the workers less technique and skill for handling tools and equipment. Besides, the management implementation is considered as a second factor that contribute to the ergonomic pain and accident but not the high impact like training. Next, the worker’s attitude and skill are indicated not give the impact and no relationship with ergonomic pain and accident.
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References
[1] Ahmad A and Baharudin R. 2019 The cost components of occupational accident in oil palm plantations in malaysia. Journal of oil palm research 19 17-28
[2] Deros B M, Ali M H, Mohamad D and Indah D D 2016 Ergonomic risk assessment on oil palm industry workers. Iranian journal of public helath 45 44-51
[3] Firdaus M, Aziz A, Firdaus M, and Aziz A 2018 Mechanization in oil palm harvesting. International journal of academic research in business and social sciences 8(5), 247–256
[4] Henry L J, Esfehani A J, Ramli A, and Ishak I 2015 Patterns of work-related musculoskeletal disorders among workers in palm plantation occupation. Asia Pacific journal of public health 27(2):NP1785-92
[5] Ismail A R, and Zakaria J 2016 Back Pain and the Observed Factor Among Oil Palm Workers. International journal of engineering technology and sciences 5(1) 70–78
[6] Mokhtar M M, Deros B M and Sukardin E H 2013 Evaluation of Musculoskeletal Disorders Prevalence during Oil Palm Fresh Fruit Bunches Harvesting Using RULA. Advanced engineering forum 10 110–115
[7] Nawi N S M, Deros B M and Nordin N 2013 Assessment of Oil Palm Fresh Fruit Bunches Harvesters Working Postures Using Reba. Advanced Engineering Forum 10 122–127
[8] Nawi N S M, Deros B M, Rahman M N A, Sukadarin E H, Nordin N, Tamrin S B M Bakar S A and Norzan, M L 2015 Conceptual design of semi-automatic wheelbarrow to overcome ergonomics problems among palm oil plantation workers. Materials science and engineering 100
[9] Ng Y G, Bahri S, Tamrin M, Syah I, Yusoff M and Hashim Z 2015 Risk factors of musculoskeletal disorders among oil palm fruit harvesters during early harvesting stage. Annals of agricultural and environmental medicine 22(2) 286–292
[10] Norzan M L, Shahriman A B, Shamsul B M T, and Deros B M 2015 Conceptual design for oil palm evacuation to improve ergonomics issues of collecting fresh fruit bunch. Applied mechanics and materials 786 281–286
[11] Parra L, Quintero M J, Maradei F, Industrial E D D, and Santander U I D 2018 Design of a cutting tool for oil-palm bunches 17(1) 59–67
[12] Parra L, Quintero L, and Maradei F 2018 Decreasing the load on the lower back with an ergonomic cutting tool for harvesting oil palm bunches 85(207) 214–220
[13] Preethi P, Singh. V, Ramajayam D and Prasad M V 2018 Pole harvesting - A skillful operation in oil palm fresh fruit bunch (FFB) harvest. Jounal of plantation crops 46(3) 204–209
[14] Sabrina N, Nasir M, Bahri S, Tamrin M, and Subra K 2016 Association of workplace stressors with salivary alpha-amyl-ase activity levels among fresh fruit bunch cutters in selangor. Iranian journal of public helath 45(1) 68–76
[15] Sukadarin E H, Ghani J A. Ismail A R. and Abdull N 2016 Original article validity test for simple ergonomic risk assessment ( SERA ). Malaysian journal of public health medicine 16 134–143

[16] Sulong A W, Hassan A and Hussin T M A R 2018 Workplace accidents and underreporting among the oil palm workers : a pilot study. Science international lahore 30(3) 479–483

[17] Syah I, Yusoff M, Bahri S, Tamrin M and Said A M A T 2014 oil palm workers : designing ergonomics harvesting tool using user centered design approach to reducing awkward body posture by catia simulation. Iranian journal of public helath 43(3) 72-80

[18] Syazwani N and Nawi M 2016 Malaysian oil palm workers are in pain : Hazards identification and ergonomics related problems. Malaysian journal of public health medicine 16 50-57

[19] Syuaib M F 2015 Ergonomic of the manual harvesting tasks of oil-palm plantation in Indonesia based on anthropometric , postures and work motions analyses. Agriculture engineering international: the CIGR e-journal 17(3) 248–262

[20] Yong H N A 2014 Safety culture in malaysian workplace : an analysis of occupational accidents. Health and the environment journal 5(3) 32–43