ORIGINAL ARTICLE

THE EFFECT OF HAND ARM VIBRATION SYMPTOMS AMONG PALM OIL HARVESTER WITH THE USAGE OF CANTAS MACHINE IN SELANGOR

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ABSTRACT

A cross sectional study was conducted to determine the effect of hand arm vibration symptoms on 'Cantas' machine among palm oil harvester in Selangor. Questionnaire survey is use as strategy of enquiry for achieving the objectives. A vibration analyser HVM 100 attached to a tri-accelerometer was used. The vibration level for working hours is 2.30 m/s^2 and is deemed safe as specified in ISO 5349-1. The prevalence of hand-arm vibration syndrome (HAVS) based on reported symptoms through questionnaires was 39.4%. None of them reported persistence in the symptoms. The ergonomics risk factor mean score was 2.93 out of 4. The issues on ergonomic design was weight, maintenance, portability, ease of usage and efficiency. In conclusion, regular screening for early signs of vibration-related damage is needed as an important part of preventing the aggravation of health problems. The workers also gained awareness regarding vibration exposure and safe working procedure on using Cantas machine.

Keywords: Cantas machine, HAVS, vibration, palm oil industry, ergonomic issue

1. INTRODUCTION

Occupational hazards have always been the major consideration for most of the industry in present. One of the industry that are important in our country is agriculture. Study had stated that the daily exposure to musculoskeletal injury are of great concern for this industry as most of the worker are still using manual tools in the operation (Deros, Ali, Mohamad, & Daruis, 2016). The fresh fruit bunch (FFB) production per each palm are between 8 to 15 FFB per year weighing approximately 15 to 25 kg each. The production per palm varies depending on the planting substance and age of the palm (Ismail, Ahmad, & Sharudin, 2015; Jelani et al., 2018). The work of lifting heavy FFB using manual tools could contribute to health problems towards the worker (Palmer, Haward, Griffin, Bendall, & Coggon, 2000). Mass of energy is required for the harvester during the cutting process to ensure that the work done is successful regardless in short or tall palms. On top of that, the worker should be fit enough to the work to get the job done successfully (Jelani et al., 2018)

A research had been conducted using Quick Exposure Check (QEC) system to assess the ergonomics risk factors for Work-related Musculoskeletal Disorders, WMDs. The author's findings show that a very high WMDs risk are affecting the harvesters. High exposure level for wrist especially in loading the fruits from ground to truck and loading from truck to lorry. The affected body regions are back and wrist / hand (Syazwani, Sukadarin, & Nordin, 2016). Fresh fruit bunches (FFB) harvester and loose fruit collectors were the groups that having highest body pain complaints and almost all of them are having low back health problems (Ng et al., 2015). Thus, the first step to tackle this issue is to do risk assessment which main aim of the effort should be to identify hazardous, ergonomics related problems and determine the body parts that are experiencing illness or injury faced by oil palm plantation workers (Djomo, Ibrahima, Saborowski, & Gravenhorst, 2010) . Figure 1 shows the harvester needs to generate a strong force for hand and shoulder that is why he is using his body weight also to generate a strong momentum.

Fig. 1 General Posture during FFB harvesting activities

The use of manual tools is still a norm and become a necessity for them. These oil palm workers prefer traditional tools than the current machinery technology. However, there is also a work unit assisted by the latest machinery technology which is FFB collector. Fresh Fruit Bunches (FFBs) collector is no longer using manual tools such as wheelbarrows due to the existence of the Mechanical Buffalo (Badang) and Mini Tractor Grabber (MTG) machines which help lighten their workload. Yet, the result of the study had also identified that; the technology has also led to body pain and injury. Body pain experienced is not much difference with the workers using fully manual tools. Thus, it becomes an issue why we need to use the technology if it gives more health and safety risks. This should not happen because the purpose of tools being developed is to help and take care of the health and safety of the workers (Syazwani et al., 2016). Since the first report of an association between the use of vibrating hand tools and Raynaud's phenomenon by Loriga (1911) and subsequently by Hamilton (1918). The health effects of Hand-Transmitted Vibration (HTV) exposure with the hand-arm vibration syndrome (HAVS) have been studied widely (Su, Hoe, Masilamani, & Mahmud, 2011).

The vast usage of the 'Cantas' machine (Fig. 2) nationwide along with the governance effort to help subsidies RM1000 from the actual price, this machine is no doubt the farmer's first choice. Jelani et al. (2018) states that Cantas is believed to have the following characteristics:

- Increasing productivity
- Reducing cost of production
- Reducing labour requirement
- Reducing the operator's efforts in executing the harvesting operation

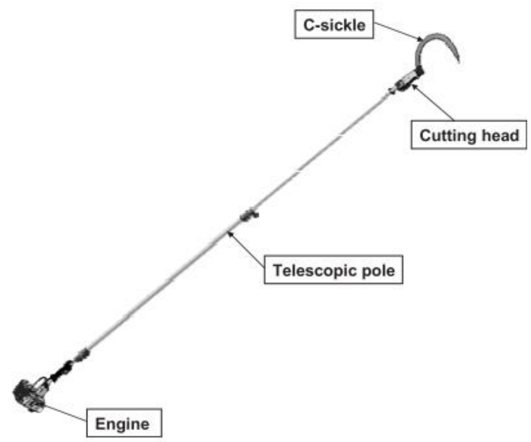


Fig. 2 Motorized cutter, Cantas machine

Questions arise whether this machine could contribute to hand-arm vibration as there no study being done to measure the vibration level and to determine the threshold level. Besides, to date still no complaint either positive or negative yet regarding the machine whether it is really beneficent or poses any defect to be improved to the harvesters who choose to use it in doubling their productivity. Based on the critical literature review, majority of the problems come from technical aspects or technology related, which includes; not user friendly, expensive, heavy, noise, vibration, difficult to access in the plantation and others. In order to overcome this problem, technologies need a solution from the ergonomic element (Kogi, Kawakami, Itani, & Batino, 2003).The existing technovation tools demonstrate a lot of weaknesses which depicts the primary cause of this issue especially in terms of their non-ergonomic designs. Further study of the aspects of human and environmental factors and physical designs is needed so that boast off ergonomic design characteristics.

2. MATERIAL AND METHOD

In the critical review of related literature, one of the most popular survey tools for detecting Hand Arms Vibration Syndrome (HAVS) is the Hand-Transmitted Vibration Health Surveillance – Initial Questionnaire and Clinical Assessment published by the Research Network on Detection and Prevention of Injuries due to Occupational Vibration Exposure (Vibration Injury Network) (Azmir, Ghazali, Yahya, Ali, & Song, 2015). The information obtained from the review of related literature assisted the researcher to have in-depth knowledge of the signs and symptoms of HAVS among the harvesters. The Hand-Transmitted Vibration Health Surveillance – Initial Questionnaire and Clinical Assessment was developed and organized to create a simple standardized questionnaire that could be used for the screening of Hand Arm Vibration Syndrome (HAVS) as a part of ergonomic programs and for epidemiological studies of Hand-Tool Vibration (HTV). The study received approval from the subjects themselves prior to their participation in the study. Information on HAVS symptoms was obtained from interviews and physical observations or explanations to determine the presence of a condition in which workers experience HAVS after working with vibrating equipment. In this process, the interviewee selected the proper answers based on their professional judgments and subjects' feedback in order to prevent misunderstandings. This will provide true information in answering the HAVS questionnaire. All information granted was confidential and used only for occupational health research activities.

For this study, experiments are to investigate the level of vibration and thus give guidance to users on how to use the machine properly. In this experiment the users will grip at point 1 and point 2 to operate the motorised cutter. The grip is at point 1 and point 2 to indicate the left (point 1) and the right hand (point 2) of the user. The measurement was carried out using HVM 100 attached with the tri-accelerometer attached to each grip point as shown in Figure 3. The HVM 100 (Fig. 5) is a useful vibration analyzer to measure vibration. (Ng et al, 2015). Total hand arm vibration, a_{hv} at each point calculated using square root the summation of $a_{hx}{}^2$, $a_{hy}{}^2$ and $a_{hz}{}^2$. Each of the user will be asked to perform a one complete cycle of harvesting one fresh fruit bunch. In order to measure, they will be instructed to harvest two fond (f1 & f2) and one fresh fruit bunch (b) to complete one work cycle. The time to complete the work cycle is measure in seconds. Total hand arm vibrations, a_{hv} were recorded and the daily exposure values (A)8 are calculated using Equation 1.

$$A(8) = \sqrt{\frac{1}{T_8}\sum a_{hv_{f1,f2,b}}{}^2 T_{f1,f2,b} + a_{min}{}^2 T_{min}}$$

Equation 1

$a_{hv,f1,f2,b}$ = The mean value of the vibration magnitude from the work done
(one complete cycle)

$T_{f1,f2,b}$ = Total tme taken to complete the cutting operation in one day

a_{min} = The mean arm vibration during idle throttle (from idle in second part)

T_{min} =The amount of time to solve the cutting operation

Fig. 3 Measurement of vibration using HVM 100 with tri-accelerometer attached to the Cantas machine

2.1 Data collection

The questionnaire survey method often has standardized answers that make it simple to compile data. For the purpose of this study, three elements for designing the questionnaire were adopted which include:

- Determine the questions to be asked.
- Select the question type for each question and specify the wording.
- Design the question sequence and overall questionnaire layout.

The issues and questions are determined through a combined process of exploring the literature and thinking creatively. A structured questionnaires design was used in the study. The questionnaires are design in six sections. The first section is about the background of the workers. The second section covers about the hand symptoms. The third section covers about the occupational history. The fourth section covers about social history. The fifth and sixth section covers about ergonomic risk factors and perception of ergonomics related issues. Figure 4. summaries the sampling flow that was conducted.

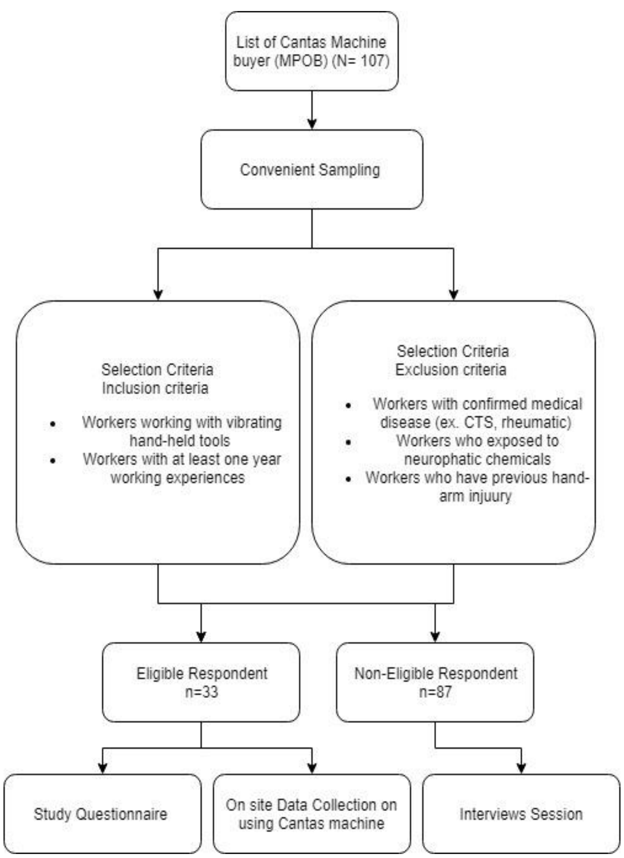


Fig. 4 Sampling Flow

List of instrumentation use:

a) Human Vibration Meter 100
b) Questionnaire

Fig. 5 HVM 100

2.2 Selection Criteria

The inclusion criteria of the study are workers working with vibrating hand-held tools in completing their task and workers with at least 2 years working experience using Cantas machine. The exclusion criteria of the study are workers with confirmed medical diseases (e.g.: diabetes, rheumatic disease, contact dermatitis, carpal tunnel syndrome) and workers who are exposed to neuropathic chemicals.

2.3 Pre-Test

A draft questionnaire is develop based on the symptoms of HAVS and the effect of developing HAVS from the usage of 'Cantas' machine. Before finalizing the questionnaire, a pre-test is done to check the reliability using Cronbach's alpha (0.829) and a pilot test is conducted with (50 % sample size) 15 respondents to ensure that the respondents for the main questionnaire understand the questions. This is to test the soundness of the data for the questionnaire.

2.4 Data analysis

Data analysis was carried out using SPSS version 19. The data were analysed in univariate stage of statistical analysis. Based on the questionnaire, respondents were categorized as having HAVS if they reported at least two of the symptoms in the questionnaire and were categorized as 1 in SPSS and 0 for one or no reported symptoms of HAVS. Basic statistical data on the normality was also used.

Descriptive statistics was to obtain frequency, standard deviation, mean and percentage of the data like Cantas machine working exposures, safety usage level of the machine, ergonomics risk factors and perception on ergonomic design issues of Cantas machine.

2.5 Validation of the entire study

The research is concluded with the validation of the entire finding of the study as the last part which was accomplished through the use of semi-structured interview conducted with experts. In this study, the researcher made use of interviews with industry experts to validate the findings using semi-structured interviews for the first phase. A questionnaire survey (phase 2) was used for the determination the main symptom of developing HAVS among the workers and recommendation on the safe work procedures using the 'Cantas' machine. The findings of the study are validated to ensure the quality of research and the interpretation of the data collected are precise and accurate

3. RESULTS AND DISCUSSION

A cross-sectional study was carried out from September 2018 to April 2019 across 9 district in Selangor. A total of 30 oil palm harvester, who had bought Cantas with at least two years of working experience using Cantas machine. Data were collected via interview session and questionnaire.

3.1 Response Rate

A list of total 107 Cantas machine buyers were called from the list of Cantas machine buyer provided by the Department of Research and Innovation of Malaysian Palm Oil Board of Malaysia (MPOB). However, only a total of 30 buyers who is eligible for this research based on the inclusive and exclusive criteria mentioned and give cooperation with the research data collection process. This represent the response rate of 28% of the Cantas machine buyer. The others who are not eligible are transferred to other state and not interested in the study (6), machine is not being used (20), machine is faulty (31), the contact number given is not in service (9), and the one who were already passed away (8).

3.2 Occupational Vibration Exposure from usage of Cantas for A(8)

In this study, the level of vibration exposure from usage of Cantas for A(8) working hour as shown in Table 1 is 2.30 m/s from the vibration magnitude perceived by the harvester hand which is 5.24m/s. The vibration level is deemed in the Green scale which is safe below the Estimated Action Value 2.5 m/s set by the internationally accepted limit values for hand transmitted vibration (HTV) as specified in the "ISO 5349-1, Mechanical vibration – measurement and evaluation of human exposure to hand-transmitted vibration – Part 1: General requirements" (ISO, 2001).

The total vibration (ahv) and daily vibration exposure A(8) obtained from this study were higher compared to the previous study done by Md Salleh et al. (2014) on skilled worker while lower compared to the unskilled worker on previous study done on usage of Cantas machine. The mean total vibration (ahv) from this study was (mean= 2.30 m/s, range= 2.4 – 7.40 m/s) compared to the study of Md Salleh et al. (2014) for (skilled worker, mean= 1.98 m/s, range= 10 - 14 m/s) and (unskilled worker, mean= 3.37 m/s, range= 10 - 22 m/s). Handling tool vibration can pose risk of development of HAVS such as tingling and numbness in the fingers, reduce grip force, less strength of hands and fingers going to blanch and become red and painful to the workers (Md Salleh et al., 2014).

From the observation in the workplace, cutting fronds and bunches using Cantas machine is difficult to analysed because of the differences in the height of the tree. The higher the height means the older the tree. This study focusses on the tree at approximately 8 – 10 ft height. The harvesters seem to be struggling when cutting fronds and bunches that are stiff. A stiff material needs more force to deform compared to a soft material (Jelani et al., 2018). Thus the harder the surface of contact between the cutter head of Cantas machine with the fronds and bunches, the higher the vibration produced from the increased throttle of the Cantas machine.

In contrast, there are study did by Azmir *et al.* (2016) on grass cutter worker which pose quiet similar few characteristics such as daily vibration exposure, A(8) (mean= 4.9 m/s, range= 2.1 – 20.7 m/s), net weight (weight= 7.8kg) and engine type (engine= 2 stroke) . The vibration magnitude is much or less the same as the vibration poses by Cantas machine among palm oil harvester. However, the big difference among the grass cutter with palm oil harvester is because on the mean duration in cutting duration per day which is 1.54 hours and 5.5 hours per day respectively. Thus the differences in daily vibration exposure A(8) of the grass cutter compare to palm oil harvester which has the higher potential to induce HAVS.

Table 1 Estimation on using Cantas Machine for harvesting for A(8) exposure

Vibration Magnitude m/s r.m.s	Min = 2.40	Max = 7.40	Mean = 5.24
Exposure Points per hour	12	110	55
Time to Reach EAV 2.5 m /s A(8) (hours)	8.68	0.92	1.82
Time to Reach ELV 5 m/s A(8) (hours)	>24	3.65	7.28
Partial Exposure m/s A(8)	0.688	4.2	2.3
Partial Exposure Points	8	283	87
Daily Exposure m/s A(8)	0.7	4.2	2.3
Total exposure Points	8	283	87
Scale	Green	Yellow	Green

3.3 Prevalence of Hand-Arm Vibration Syndrome

The second objective of this study was to determine the prevalence of hand-arm vibration syndrome among Cantas machine users. The early HAVS was determined using questionnaire method. The percentage obtained provided an indication of whether the respondents in this study were affected by the usage of vibrating tools by having a higher occurrence of symptoms.

Based on the reported symptoms from the respondents through questionnaires the reported HAVS which was determined by respondents who had experienced more than 2 hand arm vibration symptoms among the study population was 43.3%. The percentage of reported prevalence of HAVS obtained from this study was lower compared to previous studies done among hand-arm vibration exposed workers. The study by McGeoch and Gilmour (2000) among 165 workers in a heavy engineering company gave the prevalence of neurological symptoms as being 62%. A study done among 177 vibration exposed workers from multi industries by Cock, Piette, and Malchaire (2000) gave a prevalence of 40%. And a study among 344 ship yard by Jang et al. (2002) gave a higher prevalence of 78.2%. Another study done by Barregard, Ehrenström and Marcus (2003) among 308 car mechanics in Sweden showed a prevalence of 40% having neurological symptoms after 20 years of exposure (Su, Miyashita, Maeda, & Bulgiba, 2011).

The symptoms of HAVS obtained from this study was relatively lower compared to other studies, which could be due to several factors linked to exposure conditions, such as short working period with vibrating tools (means= 1.54 hours/day), relatively low daily vibration exposure (mean= 2.30 m/s) and the intermittency of tool used. The mean daily vibration exposure in this study was below the action level of 2.5 m/s as provided by EU Directive (2002), which was supported by comparing the vibration level in the above study (2.30 m/s). For example, the study by Barregard et al. (2003) reported that the workers were exposed to daily vibration exposure of 3.5 m/s, which was higher than this study (2.30 m/s), while Jang et al. (2002) reported the exposure in total vibration (ahv) of

6.6 m/s, which is also higher than this study (ahv= 5.24 m/s).

There has been intensive work done to investigate the dose-response relationship between the hand-transmitted m/sd vibration exposure and vibration white finger (Elms, Poole, & Mason, 2005). It was essential to gather a detailed history of the signs and symptoms for assessing or diagnosing HAVS and to estimate the possible staging. Many studies estimate the prevalence based on the answers to questionnaires. However, it has been shown that using both questionnaires and an objective test does not give the same result (Palmer et al., 2000)

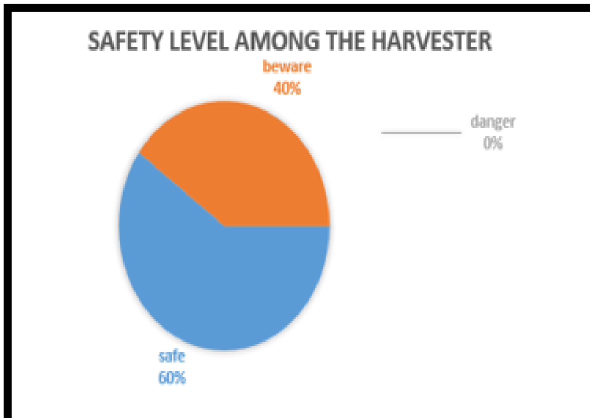
A study done on car mechanics in Sweden also showed a difference in the prevalence of HAVS, which was 24% reported cold induced white finger, 25% persistent numbness and 13% reduced grip force through the questionnaire (Nilsson, 2017). However, after clinical examination consisted of a detailed history of symptoms and other diseases, medication, use of alcohol as well as a timed Allen test, Tinel's and Phalen's test. This shown that the use of a questionnaire alone will give a higher prevalence compared to an objective test or enhancement of the assessment with clinical examination. The difference in prevalence between questionnaires and subjective tests could be due to overestimating by the respondent in answering the questionnaire concerning the symptoms experienced. Therefore, the accuracy of such research relies on the honesty and perception of the respondents in answering the questionnaires concerning the identification of HAVS and other information that was based on questionnaires without diagnosis by a physician. Data from the questionnaires could be subjected to respondent's recall bias. Respondents who are not satisfied with their workload and conditions or with a high tendency to report complaints might lead to overestimating or underestimating the effect of the risk factors (Palmer et al., 2000).

3.4 Safety Usage Level of Cantas for Harvesting

The third objective is to recommend and propose a safety level for using 'Cantas' machine. The safety usage level of the harvester to operate the Cantas machine is shown in Figure 2. There were no findings on the danger level (A (8) >5 m/s) as mostly were in the safe and beware level which is 60% (A (8) < 2.5 m/s and another 40% (A (8) >2.5 m/s) respectively on the occupational vibrational exposures as specified in the "ISO 5349-1, Mechanical vibration – measurement and evaluation of human exposure to hand-transmitted vibration – Part 1: General requirements" (ISO, 2001). On the other hand, the mean time to reach EAV 2.5 m/s A(8) hours is 1.82 hours and time to reach ELV 5.0 m/s A (8) hours is 7.28 while the mean time for daily cutting is deemed below both the EAV and ELV which is 1.54 hours.

Several studies have identified that agriculture industry workers are more vulnerable to occupational safety and health problem (Nawi, Deros, & Nordin, 2013). The exposure towards Hand Transmitted Vibration (HTV) from the previous studies done on both the agriculture and occupational industry can be compared. Su et al. (2011) reported the occupational vibrational exposures for Concrete Breaker (ahv =10.02 m/s, EAV= 30 min, ELV= 2 hrs), Impact Drill (ahv = 7.75 m/s, EAV=50 min , ELV= 3.33 hrs) and Grinder (ahv = 5.29 m/s, EAV= 1.78 hr , ELV= 7.15 hrs). Another study done reported that the occupational vibrational exposures for Rock Drill (ahv =26.0 – 36.4 m/s, EAV= 4 - 2 min, ELV= 18 - 9min) (Publication, 2012). These findings show that the higher the level of vibration produce by the vibrational machine, the lower the permissible time of daily exposure. The exposure time is a determining factor in the risk assessment of vibration and several studies have demonstrated that there is an increase in both the prevalence and the severity of vibration symptoms with increased hours of total tool use (Burström, Lundström, Hagberg, & Nilsson, 1998).

The level of HAV can be reduce through regularly maintenance on the machine, as well as the reduction on daily operation duration, safe working procedure and using an anti-vibration gloves as the initiatives to be taken by the individual and management part (Azmir et al., 2016). Besides, it is recommended to provide proper guidelines or training for any users before handling any vibrational machine so that less vibration transmission can be transferred to workers when using the machine (Md Salleh et al., 2014).



A(8), m/s	Safety Level
<2.5	WARNING: Exposure potentially above 2.5m/s EAV (100 points)
>2.5	WARNING: Exposure at or above 2.5m/s EAV (100 points)
>5	WARNING: Exposure above 5 m/s EAV (400 points)

Fig. 6 Safety level of the Harvester using Cantas

3.5 Ergonomic Risk Factors

The fourth objective is to determine ergonomics risk factors on the usage of Cantas machine. Table 5 shows that 25 (83.3%) respondents reported that there were more than 50 times of the occurrence of repetitive work, 26 (86.6%) related to forceful tasks and 13 (43.3%) related to awkward posture of the body especially the hand- arm. These ergonomics risk factors are believed to have a certain impact on the cause of musculoskeletal disorders in the hand-arm area since numbness does not always follow the vibration exposure profile as it is also associated with the upper extremity musculoskeletal disorders (Handford et al., 2017). A study done among forestry workers showed that although the prevalence of Vibration White Finger decreased, the numbness increased (Sutinen et. al., 2006). In that study, numbness was associated with upper extremity musculoskeletal disorders as metalworkers also performed repetitive and forceful movements that may explain both their neurological and musculoskeletal problems.

Another study reported that vibration- induced stresses, strains and power absorption on joint mechanical stability and muscle activities can affect the part of the hand arm system particularly at the palm, wrist, elbow, forearm and upper arm (Xu et al., 2017). Besides Xu et al. (2017) also stated that with the increasing applied hand force there will be increased in the peak frequency of the transmitted vibration frequency. This is because the contact stiffness and system stiffness generally increase with the increase in the applied force. Hand-transmitted vibration exposure may also indirectly affect the development of these Musculoskeletal disorders through increasing of the load, forces or overexertion under the vibration conditions.(Xu et al., 2017).

The response through questionnaire showed that the frequency of ergonomic risk factors performed by the harvesters was more than 77 times per hour. The score of the occurrence of the ergonomic risk factors in Table 2 also shows that the overall score was towards high risk as the mean score was 2.93 out of a maximum score of 4. It shows that the harvesters in this study had significantly high exposure to ergonomics risk factors in their job.

Table 2 Ergonomic Risk Factors

Ergonomic Risk Factors	Score				
	1	2	3	4	Mean (sd)
Repetitive	-	-	5 (15.1)	28 (84.8)	3.91 (0.29)
Forceful	-	-	4 (12.1)	29 (87.9)	3.88 (0.33)
Awkward	2 (6.1)	9 (27.3)	9 (27.3)	13 (39.4)	3.00 (0.97)
Overall score for ergonomic risk factors					3.60 (0.53)

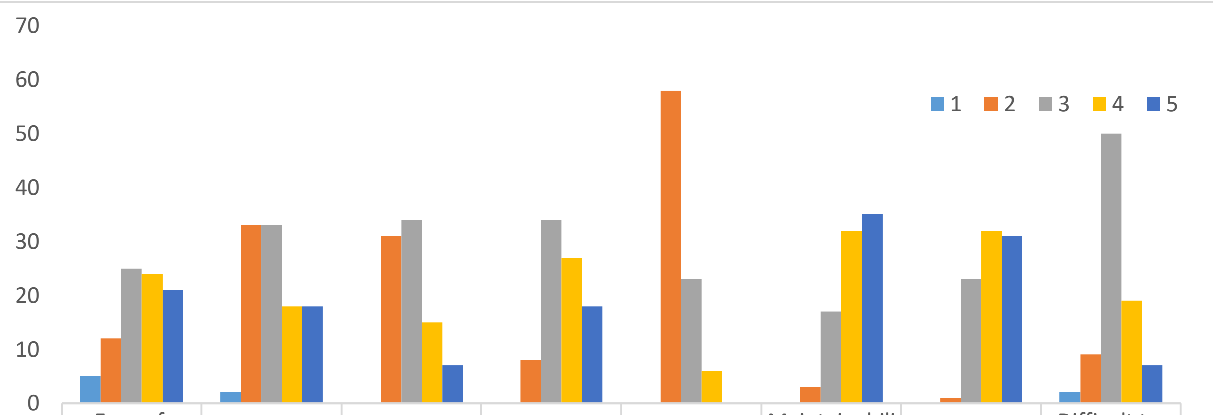
3.6 Perception on ergonomic design issues of Cantas machine among Harvester

The fifth objective is to determine the perception on ergonomics risk factors issues on the use of Cantas machine. Figure 7 shows the overall perception from the harvester who had been using Cantas machine. The most to the least concern issues on ergonomics design issue was address in the study which show that weight and maintenance was at high level, portability, ease of usage, efficiency and difficulty in learning how to operate Cantas machine was at medium level while durability and reachability was on the low level of concern.

Previous study on mechanized tools and technovation machinery in palm oil plantations by Hossain, (2013) that have been several arising issue on utilizing mechanized tools. The issues stated were on the feasibility using manual compare motorized, productivity is higher when using manual compare to motorized, time consuming to learn the new motorized machine, lack of proper training and also there have been reported cases of injury regarding the use of motorized machine, thus also affecting their health. Hossein (2013) also reported the arising issue stated by the management part as they stating that there was issues on decreasing productivity rate, high maintenance cost, health issues of workers and their preference to use manual tool compare to motorized.

Based on the general concept of ergonomics, utilizing technology is supposedly to make the machine fit to the human not the human fit to the machine. A study done in Brazil by Dias et al. (2011) strongly believe that with the adoption of technologies among companies in the agri-industry will surely become an indispensable tool for Brazilian agribusiness companies in the coming years. Study done by Deros et al. (2017) concludes that targeted fulfilment, assisting criteria and purpose to use affected the acceptance and use technovation tools decision of oil palm workers.

Based on the discussion above it is proved that the technovation in palm oil industry had produced several great potential inventions. These inventions were purposely designed in helping to enhance the overall work performance in industry but still there are arising issues that need to be tackle especially on the ergonomic design issue which is the most vital components in ensuring the use of technovation tools in industry (Deros et al., 2017)



	Ease of usage	Portability	Durability	Efficiency	Reachability	Maintainability	Weight	Difficult to learn
1	5	2						2
2	12	33	31	8	58	3	1	9
3	25	33	34	34	23	17	23	50
4	24	18	15	27	6	32	32	19
5	21	18	7	18		35	31	7

Note: score 1 indicate low level (poor), score 5 indicate high level (good)

Fig. 7 Perception on Ergonomics related issues of Cantas machine among Harveste

4. CONCLUSION

The study of the health effects of HTV exposure in a warm environment is very important to understand the situation and to ensure the appropriate protection of workers using vibrating tools in their daily work. Ergonomics and technology, if properly applied can reduce injuries and give benefit to company on lowering medical costs also will be able to reduce injuries and increase high productivity. Successful technology adoption should focus on three main elements which are human, process and technology. Therefore, this study should be continued and further study by expanding the number of respondent and the findings could be useful for the integration of inventing new technovation of better Cantas machine. In hope that it can help our palm oil industry will flourish.

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