Management Support in Enhancing Participatory Ergonomic Interventions in Palm Oil Industry

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Abstract. This study is conducted in a palm oil industry in North Sumatera. The palm oil industry, which has great potential to end poverty, is usually performed by manual workers in such a way that it may cause musculoskeletal disorders. This is a challenge for future palm oil industry’s continuity. Participatory ergonomic intervention is one way to reduce this risk and needs management support for its success in implementation. A questionnaire is then spread to find the most influential type of management support that may promote active participation from workers. The recapitulation of the questionnaire shows that “being involved” as the highest score, followed by work authority and management commitment. Workers’ participation in ergonomic program implementation can only be realized if the management is committed.

1. Introduction
Indonesia, a country known as the world’s largest producer of palm oil, has roughly 19.5 million palm oil workers. Palm oil is a mainstay of Indonesia commodity and contributes toward 3.5% total of Gross Domestic Product (GDP) with income from palm export amounts to approximately USD 20.54 billion. Palm is the most productive oil type of crop, in which the value chain ranges from upstream plantation to downstream industry of processing. The increase of vegetable oil demand domestically and the big potential of palm oil export value (CPO) trigger the rapid growth of palm plantation nationally. In 1980, the total area of palm oil plantation is only about 295 thousand hectares and it soars to approximately 14.68 million hectares, an almost fifty-fold increase. The potential of the palm industry to end poverty but has an impact on the musculoskeletal risk that may happen to its workers. World Bank states that employers’ health and safety is the main concern of future palm oil industry continuity [1].

There are two types of activities in the palm industry, the first is in the palm plantation and the second is in the palm processing industry, which for the most part is performed manually [2,3]. The process of harvesting oil palms is done manually starting from cutting the fronds and fresh fruit bunches (FFB) with egret, inserting FFB into the sprouts with corners, pushing the sprouts containing FFB to the yield bin and loading the FFB into the transport trucks with the corner.

A study conducted in 3 palm industries in Malaysia shows that musculoskeletal disorders are more prevalent in seasoned employees (71.7%) than employees that have been working less than one (50.8%) [4]. When harvesting, the workers usually experience musculoskeletal pain around the neck area, lower back, right shoulder, right forearm, left forearm, and bottom. Factors related to musculoskeletal disorders are work posture, age, and overall work duration, thus corrective action is needed to prevent
the increase of increase the spreading of musculoskeletal disorders. Musculoskeletal disorders generally happen due to excessive muscle contraction; the muscle experiences excessive loading or contract for a long duration [5]. Epidemiological study shows that there exists a correlation between musculoskeletal disorders with lifting heavyweight, weird work posture, repetitive work, and whole-body vibration [6].

Musculoskeletal disorders can seriously affect workers and contribute to workers’ absence or workhour loss, which negatively affects economic activity [7]. Problems caused by work-related activity; especially musculoskeletal disorders greatly affect productivity. A study, *Global Burden of Disease, Injuries, dan Risk Factors 2016* (GBD 2016), states that musculoskeletal disorders contribute to the second-highest reason for physical disability. Meanwhile, musculoskeletal condition differs greatly across different generation and a study says that 20-30% of the world population lives with the painful musculoskeletal disorder [8]. To prevent the increase of musculoskeletal prevalence in the future, a corrective activity that can be taken care of the participative approach for prevention and searching the correct solution.

The effective participatory ergonomic program needs cooperative involvement from both management and workers [9]. How to involve both parties to actively participate in the ergonomic program remains a big question [10]. Prevention of musculoskeletal complaints should be taken from a management system approach, therefore all parties are involved and weighed in achieving maximal results [11]. Participatory ergonomics interventions must be directed at risk factors at the organizational level so that program success requires ongoing management commitment at all levels of the organization as well as the participation of workers and internal staff. Thus, the adoption of participatory ergonomics into the organization becomes an integrated organizational management system. It is predicted that management support will affect the effectiveness of participatory ergonomics intervention in reducing musculoskeletal disorders experienced by palm industry workers. Management support is management that is committed, actively participates, and has the authority to change the structure, so that planned progress can be carried out [12, 13].

2. Method

Observation is conducted in some palm industries in 9 districts in North Sumatera. Respondents in this study are 280 male workers that perform production activities at different stations, including loading ramp station, sterilizing station, threshing station, pressing station, clarification station, and kernel plant station. The study is conducted as follows, doing direct observation, giving interviews, spreading questionnaires regarding management support, which may affect work climate, which may improve participatory ergonomic intervention.

Management support is management’s willingness to facilitate and to allocate the time needed to review plans and get results. Indicators used to measure management support variables are management commitment, worker participation, and workers’ authority [14-16]. Management commitment consists of 4 statements, workers’ participation consists of 4 statements, and workers’ authority consists of 2 statements. The questionnaire is designed as structured questioned to be answered by each respondent. Validity and reliability test are conducted before the questionnaire is spread.

Respondents fill the questionnaire by giving a check sign (√) on the listed measured scale. The questionnaire consists of ten statements and uses a Likert scale (interval scale), where 1 means strongly disagree, 2 means disagree, 3 means neutral (neither disagree nor agree), 4 means agree, and 5 means strongly agree. Data analysis is performed using the method of Structural Equation Modeling (SEM) Partial Least Squares (SEM-PLS) with WarpPLS software. The contribution of statement items is calculated using a convergence validity test, consistency of statement items is calculated using the Composite Reliability (CR) test, and how good statement items are used to measure management support is evaluated using Cronbach’s Alpha (CA) test.
3. Results and Discussions

3.1. Respondents judgment regarding management support

Respondents judgment regarding management support show the respondents answer about the statements given. From these answers, average score and scoring criteria are then calculated. In determining the scoring interpretation from respondent answers, the Likert scale is used. The scale states that score of 1.00-1.70 means a very bad, score of 1.80-2.59 means bad, score 2.60-3.39 means neutral, 3.40-4.19 means good, and 4.20-5.00 means very good.

Respondent’s judgment regarding variables of management support in 10 statements mainly obtains good criteria (90%). The only indicator of participation1 that obtains an average score of 4.25 – a very good criterion. This means workers feel respected by management concerning active involvement in problem-solving, especially in the ergonomic intervention program. The next indicator, authority1 obtains an average score of 4.16 – a good criterion. Workers do feel management support existence – they obtain authority to perform work using their method. The lowest score of 3.99 is obtained by the commitment1 indicator concerning management support about ideas given by workers to improve ergonomic intervention effectivity. Respondent answer recapitulations concerning management support can be seen in table 1.

| Indicator | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree | Total | Average Score | Criteria |
|-----------|----------------|-------|---------|----------|-------------------|-------|--------------|----------|
| Commitment1 | 74 | 26 | 159 | 57 | 25 | 9 | 13 | 5 | 9 | 3 | 280 | 100 | 3.99 | Good |
| Commitment2 | 77 | 28 | 157 | 56 | 26 | 9 | 13 | 5 | 7 | 3 | 280 | 100 | 4.01 | Good |
| Commitment3 | 89 | 32 | 145 | 52 | 30 | 11 | 12 | 4 | 4 | 1 | 280 | 100 | 4.08 | Good |
| Commitment4 | 89 | 32 | 159 | 57 | 12 | 4 | 14 | 5 | 6 | 2 | 280 | 100 | 4.11 | Good |
| Participation1 | 103 | 37 | 153 | 55 | 16 | 6 | 6 | 2 | 2 | 1 | 280 | 100 | 4.25 | Very Good |
| Participation2 | 84 | 30 | 157 | 56 | 25 | 9 | 12 | 4 | 2 | 1 | 280 | 100 | 4.10 | Good |
| Participation3 | 87 | 31 | 160 | 57 | 22 | 8 | 7 | 3 | 4 | 1 | 280 | 100 | 4.14 | Good |
| Participation4 | 77 | 28 | 162 | 58 | 19 | 7 | 16 | 6 | 6 | 2 | 280 | 100 | 4.03 | Good |
| Authority1 | 95 | 34 | 150 | 54 | 23 | 8 | 9 | 3 | 3 | 3 | 280 | 100 | 4.16 | Good |
| Authority2 | 90 | 32 | 151 | 54 | 23 | 8 | 14 | 5 | 2 | 1 | 280 | 100 | 4.12 | Good |

Head management support is needed to prevent the severed management role in the implementation process. Management involvement and full commitment to support the project of participatory ergonomic intervention will reduce musculoskeletal disorders experienced by workers in the palm industry. However, previous studies conducted reveal that not all studies concerning management support will positively affect participatory ergonomic intervention effectivity. Many other factors need to consider, as only management support does not have a significant effect on participatory ergonomic intervention.

3.2. Convergency validity test

Convergency validity test is performed to calculate the contribution of ten indicators of management support, which consist of 4 management commitment indicators, 4 workers participation indicators, and 3 workers authority indicators with the criteria of loading factor above 0.7 and significant P-Values [17]. An indicator with a high loading factor has a high contribution and vice versa. All loading factors of management support is valid. The lowest score of 0.773 is obtained for participation4 indicator, a
statement stating that workers give input to solve the problem about participatory ergonomic intervention and the highest score of 0.872 is obtained for commitment3 indicator, a statement stating that management push workers to participate in developing the ergonomic program. From table 2, it can be seen that the highest contribution indicator toward management support is commitment3 indicator, followed by commitment1, authority1, participation2, etc.

| Indicator     | Loading Factor | P-Value   | Criteria |
|---------------|----------------|-----------|----------|
| Commitment1   | 0.835          | < 0.001   | Valid    |
| Commitment2   | 0.811          | < 0.001   | Valid    |
| Commitment3   | 0.872          | < 0.001   | Valid    |
| Commitment4   | 0.804          | < 0.001   | Valid    |
| Participation1| 0.801          | < 0.001   | Valid    |
| Participation2| 0.834          | < 0.001   | Valid    |
| Participation3| 0.819          | < 0.001   | Valid    |
| Participation4| 0.773          | < 0.001   | Valid    |
| Authority1    | 0.835          | < 0.001   | Valid    |
| Authority2    | 0.782          | < 0.001   | Valid    |

3.3. Reliability test
The reliability of the questionnaire is tested using Composite Reliability (CR) and Cronbach’s Alpha (CA) test with a critical value higher than 0.7 [18]. Composite Reliability (CR) depicts the statement consistency in every indicator in measuring management support and Cronbach’s Alpha (CA) is a value to evaluate how good the indicator used to measure management support. CR of 0.952 implies that the statement of every indicator is consistent and CA of 0.994 implies that all statements are reliable, as can be seen in table 3.

| Criteria                  | Value  | Critical Value | Criteria |
|---------------------------|--------|----------------|----------|
| Composite Reliability (CR)| 0.952  | 0.700          | Reliable |
| Cronbach’s Alpha (CA)     | 0.944  | 0.700          | Valid    |

4. Conclusions
The success of participatory ergonomic intervention needs continuity in management commitment at all levels, and also workers’ participation and authority involvement. Management commitment and support are important because the management party is a policymaker, making policy regarding every aspect of production and development activity. Workers’ participation in a participatory ergonomics program can only be realized if the management party is fully committed.

If a company wants to develop an effective participatory ergonomic intervention model, the factor of management support must be weighed first. This can be done by planning the necessary things. Analysis of problems faced by workers regarding ergonomic intervention programs is crucial, so that rejection due to changes does not happen. As widely known, ergonomics is a process of designing, modifying, arranging materials, tools, workroom, assignments, works, products, systems, and environments to meet human psychology, society, anatomy, biomechanics, and physiological ability, needs and limits. Some examples of support management parties can give are work controlling, work redesigning, autonomy in working, so that laborers can work within their capacity and health risk can be minimized. Giving what workers needs will improve their participation and in turn an increase in satisfaction and acceptance of ergonomic intervention program.
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