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## Design of Work Facilities to Reduce Complaints of Musculoskeletal Disorders (MSDS) with an Ergonomic Approach to Coffee Farmers

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### Abstract

*Complaints on the musculoskeletal system are complaints that are felt by a person in the muscles and skeleton with different levels of complaints, complaints to this damage are usually referred to as musculoskeletal disorders. The purpose of this study was to improve work facilities in the process of picking coffee cherries in Arul Item Village, Central Aceh. This measurement was carried out using the REBA (Rapid Entire Body Assessment) method and using the NBM (Nordic Body Map) questionnaire as the research instrument. The study was conducted using an analytical survey method which aims to see the relationship between work attitudes and musculoskeletal complaints with an ergonomic approach. From the results of the NBM questionnaire on 56 workers, it shows that the musculoskeletal complaints experienced by coffee berry pickers are in the category of pain, most of which are in the upper neck and left wrist as many as 39 (70%). In the very category of pain, the most pain was in the left shoulder 50 (89%) and the right wrist as much as 33 (59). Based on measurements using the REBA method, it is stated that there is an actual REBA score of 4-7 where the risk is at moderate risk for musculoskeletal disorders and on the proposed REBA score there is a score of 2 where the score is in a low risk area, so as to improve work attitudes and work posture which resulted in the emergence of musculoskeletal complaints, a modified work tool design, namely a bag, was proposed to reduce the high number of musculoskeletal complaints in coffee fruit pickers*

**Keywords:** *Musculoskeletal Disorders (MSDS), Rapid Entire Body Assessment (REBA), Nordic Body Map*

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### INTRODUCTION

Coffee is one of the agricultural products that is used as a raw material in the food and beverage industry. Processed coffee products are currently being widely used as raw materials for beverages. The existence of quality coffee beans is currently very valuable by the market, not only in the domestic market but also internationally. Coffee has become a drink with a high value and an expensive commodity. Indonesia is one of the largest coffee producing countries in the world which is ranked Indonesia's 4th world ranking in the international coffee market is of course supported at a fundamental level, namely in coffee care and post-harvest coffee processing. (Directorate General of National Export Development, Ministry of Trade, 2018).

In the post-harvest coffee picking process carried out by farmers, there are still many ways that are still very traditional and lacking in ergonomics to be applied in the current era so that it becomes a problem faced by farmers, namely, coffee pickers and coffee picks carried out. farmers, coffee is placed in a bag within 30-60 minutes so that the bag is fully loaded with a weight of 6-10 kilograms, the bag is carried on the side waist with a rope made of used sacks that rests on the shoulder the left according to their respective conditions.

Health considerations at work are still very poorly paid attention to, Farmers complain of aches in the neck, waist, shoulders, back and legs, due to the use of less ergonomic work methods and carried out for a long time almost every day. The work of picking coffee should be carried out more comfortably and safely by farmers, and also not cause long-term problems/disruptions that are felt by the farmer's body due to the implementation of work methods that are less ergonomic on a daily basis.

The fatigue experienced by coffee pickers is human interaction with work facilities that are not in accordance with human posture and work facilities that are not ergonomic, causing complaints,

musculoskeletal disorders. Complaints are known from Nordic Body Map analysis, a preliminary study based on Nordic Body Map of workers who experience complaints. Based on the problems that occur, this study was conducted to discuss the Design of Work Facilities to Reduce Musculoskeletal Disorders (MSDs) With an Ergonomic Approach to Coffee Farmers.

## RESEARCH METHODS

The type of research is descriptive research. In this study, identification was carried out namely to find out complaints MSDs to farmers to then design work facilities that is expected to reduce MSDs complaints and contribute in the comfort of the work of the farmers and in accordance with the needs of the farmers. Data processing in this study consists of:

1. Determination of Complaints of Musculoskeletal Disorders
2. Assessment of work posture using the REBA method
3. Anthropometric data

## RESULTS AND DISCUSSION

### Actual Work Posture Analysis

Analysis of actual work posture using the REBA method. The results of the REBA analysis obtained a final REBA score of 6 so that changes are needed. The thing that can be done is to design work facilities for the process of picking coffee cherries based on REBA analysis so that a smaller final score is obtained

### Antropometric Data

The data collected in the form of anthropometric data used in the design of work facilities in the form of bags are dimensional data from 56 workers, namely LB (shoulder width), TP (hip height), TBD (sitting shoulder height), TDB (standing chest thickness), TPB(thick abdomen standing), TSB(height of standing elbow), and LK(width of head).

### Data Test

Statistical tests carried out include Adequacy Test, Normality Test and Uniformity Test.

**Table 1. Adequacy Test, Normality Test and Uniformity Test**

Number	Dimension	Adequacy Test	Normality Test	Uniformity Test
1	LB	Adequacy	Normality	Uniformity
2	TP	Adequacy	Normality	Uniformity
3	TBD	Adequacy	Normality	Uniformity
4	TDB	Adequacy	Normality	Uniformity
5	TPB	Adequacy	Normality	Uniformity
6	TSB	Adequacy	Normality	Uniformity
7	LK	Adequacy	Normality	Uniformity

The results of the bag design as a container for the coffee fruit picking process can be seen in table 2.

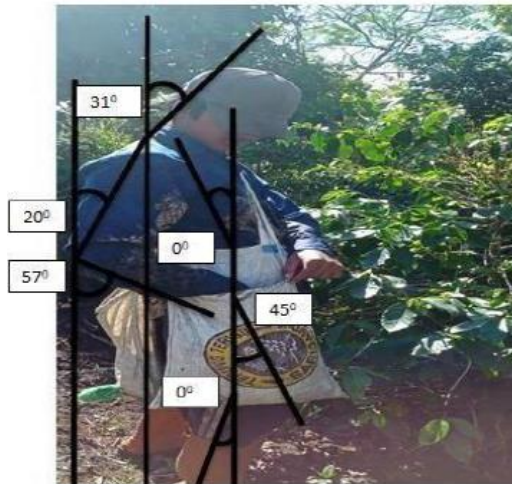
**Table 2. The Result of Bag Design**

Number	Bag Part	Size (cm)
1	Bag Width	50.28
2	Bag Height	13.2
3	Hand strap length	98.78
4	Main rope length	149.6

5	Main rope distance	17.6
6	Main rope width	7.54

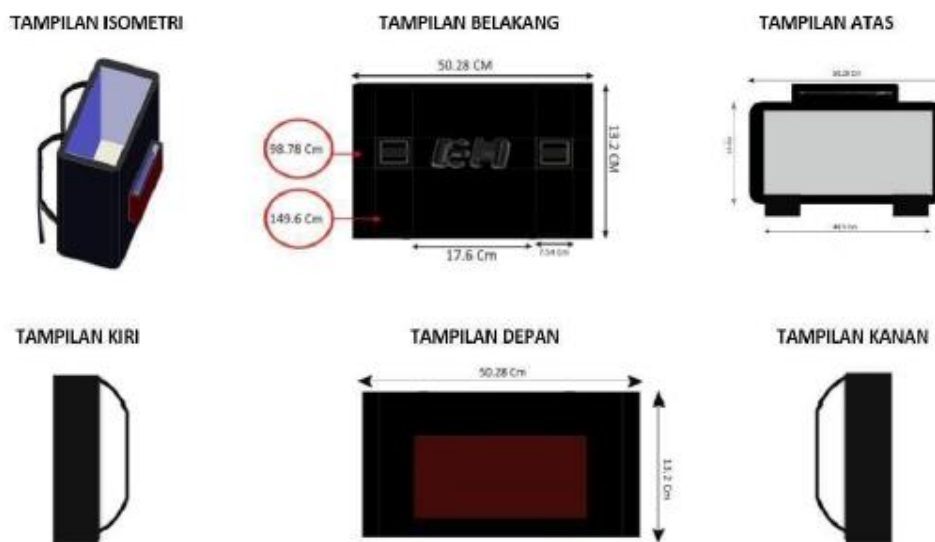
**Actual and Proposed Work Facility Design**

Actual work facility design



**Figure 1. Actual work facility design**

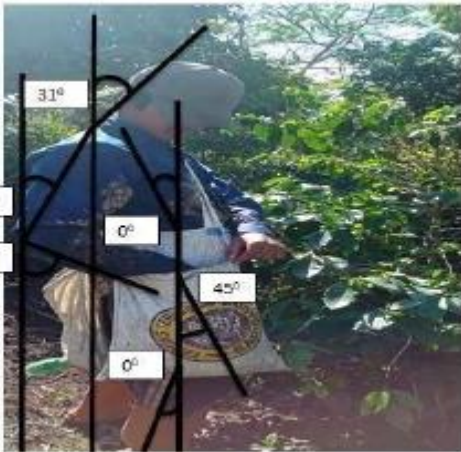
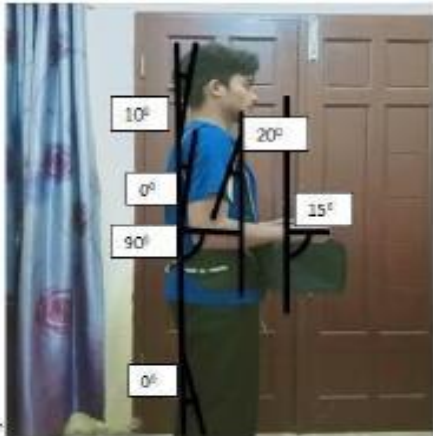
Proposed work facility design



**Figure 2. Proposed work facility design**

Comparison of Actual and Proposed Work Posture Analysis with REBA Method

**Table 3. Comparison of Actual and Proposed Work Posture Analysis with REBA Method**

Actual REBA Score	Suggested REBA Score
	
<p>Get a final REBA score of 6 with changes needed</p>	<p>Obtaining the final REBA 2 score with change action may be required.</p>

**CONCLUSION**

Based on the results of the research conducted, it can be concluded that the 56 coffee fruit pickers are as follows:

1. From the results of the NBM questionnaire (Nordic Body Map) on 56 workers, it shows that musculoskeletal complaints experienced by coffee berry pickers are the most painful in the upper neck and left wrist as many as 39 (70%). In the very category of pain, the most pain was in the left shoulder as much as 50 (89%) and right wrist as much as 33 (59%).
2. Based on the results of research conducted on the work attitude of picking coffee cherries using the REBA method, it was found that the work attitude of coffee picking workers was in the moderate risk category. This risk is known from the final result of the REBA score which shows that the work attitude of the coffee picking process is at a score of 6 and it is necessary to make improvements or changes in work attitudes.
3. Based on the results of the research conducted, the design results obtained with the size, bag width 50.28 cm, bag height 13.2 cm, middle strap length 98.78 cm, main rope length 149.6 cm, main rope distance 17.6 cm, main rope width 7.54 cm.
4. From the results of the proposed design, it is found that the REBA score is at a score of 2 which is a low risk category which may need to be done.

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