



Improvement Of Ergonomic Cassava Removal Device Design With REBA (Rapid Entire Body Assessment) Approach In Tanjung Harap Village, Serbajadi District

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ABSTRACT

The goal to be achieved in this study is to improve the cassava fruit plucking device that applies to the harvesting process so that it becomes an ergonomic auxiliary tool by considering the safety, comfort, effectiveness of workers in doing work. This type of research is included in correlational type descriptive research with the method used in the form of the REBA (Rapid Entire Body Assessment) method is one method to analyze and provide observations of work postures quickly and easily. From the results of the study, the REBA score was obtained from the sum of the total grub A score and the total Grub B score and activity value, the effectiveness value obtained was 1 and the REBA score obtained was 10 where the number indicated high discomfort so that workers expended a lot of energy when doing work which resulted in many complaints of pain felt by workers thus it was necessary to redesign the tools used to Pulling out cassava fruit so that it can reduce the discomfort of workers and reduce complaints felt by workers.

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1. INTRODUCTION

The basis of designing work tools is ergonomics. Ergonomics is a systematic branch of science to utilize information about the nature, ability, of humans in designing a tool so that people can live and work in good working conditions. The achievement of the desired goal is that the work becomes effective, safe and comfortable. One that must be considered in designing tools is to recognize the nature, limitations and abilities possessed by humans. Humans play a central role in their activities, namely as executors in every work activity. Humans as a source of labor are still dominant through the design of better and efficient equipment to create results continuously. From these innovations, it is expected to be able to increase factory productivity and reduce complaints that occur to workers. The absence of cassava removal equipment for the cassava harvesting process causes cassava farmers to expend a lot of energy when pulling cassava when pulling out cassava stems that have large stem dimensions, it takes a long time to pull out cassava. The condition of cassava removal in this way has the potential to hurt the members of the worker baadan, therefore it is necessary to use tools that can help the cassava removal process for cassava workers in order to increase the effectiveness of the work carried out by cassava removal workers.

With the design of tools that pay attention to human factors, it is hoped that the designed tools can be operated comfortably and safely, so that from several human processes as the main segment for users, by paying attention to ergonomic aspects in the process of designing and developing products in an industry, in essence it is not just bringing humans to work in healthy, comfortable and safe conditions, But it is able to bring the industry towards productive, effective, and advanced work.

With an ergonomic approach, it is expected that human-product work interaction, equipment operated will be further improved.

2. METHOD

This type of research is included in the correlational type descriptive research. The purpose of descriptive research is to describe and explain aspects related to a problem that exists systematically and factually based on data from the object under study. This research starts from the process of collecting data, processing to problem analysis to suggest improvements to the problems studied. While correlational research aims to see the correlation or relationship between one factor and another based on the correlation coefficient. The relationship to be examined is the degree of work posture with the cassava extractor tool to be repaired. The research was conducted in Tanjung Harap, Serbajadi District, Serdang Bedagai Regency, North Sumatra The research was conducted in September 2023. The object of this research is workers and cassava removal equipment in Tanjung Harap, Serbajadi District, Serdang Bedagai Regency, North Sumatra.

Data Processing Method using REBA (Rapid Entire Body Assessment) Method is one method to analyze and provide observation of work posture quickly and easily.

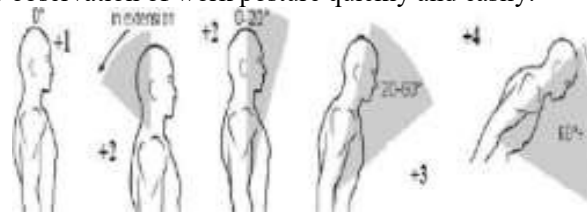


Figure 1. Back Movement

Table 1. Back Movement Score

Score	Position	Score Changes
1	Perpendicular body position	
2	Flexion body position between 0°-20° and extension between 0°-20°	+1 if rotated or tilted sideways
3	Flexion body position between 20°-60° and extension >20°	
4	Flexion body position > 60°	

3. RESULTS AND DISCUSSION

Data collection on work posture on cassava removal activities can be seen in table 2 below as follows:

Table 2 Recapitulation of Posture Degree Scores

NO	Grup A	Grup B	Grup C
1	The position of the neck forms an angle (20^0) with a score = 2	The position of the upper arm forms an angle (45^0) With score = 2	Skor Grup = Grup A + G + Skor Akt + 1
2	Back position forming angle (60^0) With score = 3	Forearm position forming angle (45^0) With score = 2	= 9 + 1 = 10
3	The position of the legs forms an angle (30^0) with a score = 3 The load is evenly distributed when lifting	Palm bend form angle (0^0) With score = 1 + 1 rotating grip Score = 2	
4	Skor Grup A = 6	Skor Grup B = 3	
5	Total Group A Score = (Group A score + load) = 6+2 = 8	Total Group B Score = (Group B Score + Hand) = 3+1 = 4	

From table 2 it is known that a total score of 6 in group A indicates a level of complaints with medium risk, a score of 3 in group B indicates a level of complaints with low risk.



Figure 2. Working posture with old cassava tool

Based on the posture above, there are cassava removal activities, cassava removal equipment will be repaired using the REBA (Rapid Entire Body Assessment) method as follows:

Before the Repair

Table 3. Reba Group A Score

Tabel A	Leher													
	1				2				3					
Kaki	1				2				3					
	1	2	3	4	1	2	3	4	1	2	3	4		
Punggung	1	1	2	3	4	1	2	3	4	4	1	2	3	4
	2	2	3	4	5	3	4	6	4	5	6	7		
	3	3	4	5	6	7	5	6	7	8	6	7	8	
	4	3	3	4	5	6	7	8	6	7	8	9		
	5	4	6	7	8	6	7	8	9	7	8	9		

Table 4 Loads Lifted

Burden	Score	Change Score
< 5 Kg	0	
5 – 10 Kg	1	+1 In case of sudden additional load or fast
> 10 Kg	2	

The score of group A is 6 plus the load score is 2 so the total score of group A is 8.

Table 5 Reba Group B Scores

Tabel B	Lengan Bagian Bawah (siku)												
	1				2				3				
Pergelangan Tangan	1				2				3				
	1	2	3	4	1	2	3	4	1	2	3	4	
Siku Lengan Bagian Atas	1	1	2	2	1	2	1	2	3	3	4	4	5
	2	2	3	4	3	4	3	4	5	6	5	6	7
	3	3	4	5	4	5	4	5	6	7	6	7	8
	4	4	5	6	5	6	5	6	7	8	7	8	9
	5	6	7	8	7	8	7	8	9	8	9	9	
	6	7	8	8	8	8	9	9	9	9	9	9	

Table 6. Handle

Handle	Score	Description
Good	0	It holds well and uses half the force to Grasping.
Not good	1	Handrails are still acceptable although not ideal.
Bad	2	Handrails are unacceptable although it is still possible.
Not Worth It	3	Very bad, The grip is not secure, there is no grip on body parts.

The score of group B is 3 plus the handle score of 1 so the total score of group B is 4

Table 7 Total Score of Reba Group C

SKOR data	Table C											
Table A+	SKOR B											
Skor Badan	(Ditotal skor Table B + Skor Postur)											
	1	2	3	4	5	6	7	8	9	10	11	12
1	1	1	1	1	2	2	2	3	3	4	4	5
2	1	2	2	2	3	3	4	4	5	6	6	7
3	2	3	3	3	4	4	5	5	6	7	7	8
4	3	4	4	4	5	5	6	6	7	8	8	9
5	4	4	4	4	5	5	6	6	7	8	8	9
6	6	6	6	6	7	7	8	8	9	10	10	10
7	7	7	7	7	8	8	9	9	10	10	11	11
8	8	8	8	8	9	9	10	10	10	10	11	11
9	9	9	9	9	10	10	10	10	10	10	11	11
10	10	10	10	10	10	10	10	10	10	10	11	11
11	11	11	11	11	11	11	11	11	11	11	11	11
12	12	12	12	12	12	12	12	12	12	12	12	12

Table 8 Activity Values

Activity	Score	Description
Static attitude	+1	One or more parts of the body are in a static state, such as holding for more than 1 minute.
Recurring	+1	Repeating a small portion of activity, such as stepping more than 4 times in 1 minute (in this case walking is excluded).
Unstable	+1	Activities that result in rapid changes in work attitudes or cause instability in work attitudes.

The score of group C is 9 plus the activity score is 1, so the total score of group C is 10. Cassava removal activities are carried out for 5 working hours so that there is an addition to the activity value. So the total REBA score for formation activities is 10.

The REBA method classifies the score as a high-risk job so that it is necessary to take corrective actions for ergonomic tool design.

The corrective action taken is the design of a cassava puller that is more ergonomic so that it can reduce complaints of pain in workers when carrying out work activities, namely when operating a skunk puller.

Table 9. Reba's Final Action

Skor REBA	Tingkat Resiko	Tindakan
1	Diabaikan	Tidak perlu
2 - 3	Rendah	Mungkin perlu
4 - 7	Sedang	Perlu
8 - 10	Tinggi	Perlu segera
11 - 15	Sangat Tinggi	Sekarang juga

After Repairs



Figure 3 Work posture with a new cassava tool

The material used is cylindrical iron (pipe iron) with a diameter of 2 inches and a thickness of 0.2 cm. Wheel diameter 15cm Tilt lever 10°C.

Table 10 Recapitulation of Degrees of Body Posture After Improvement

NO	Grup A	Grup B	Grup C
1.	The position of the neck forms an angle (0 - 20 ⁰) with a score = 1	Upper arm shaping position angle (0-20 ⁰) With score = 1	
2.	The position of the back forms an angle (0 ⁰) With score = 1	The position of the forearm forms an angle (20-45 ⁰) With score = 2	Group C score = Group A + Group B + Score, Activity = 4
3.	The position of the legs forms an angle (<20 ⁰) with a score = 1. The load is evenly distributed when pushing	The bend of the palm forms an angle (0 ⁰) With score= 1 + 1 rotating grip Score = 2	
4.	Total Group A Score = 1	Total Group B Score = 2	
5.	Total Group A Score (Group A Score + load) = 1+2 = 3	Total Group B Score = (Group B score + grip= 2+1 = 3	

A score of 1 in group A indicates a low risk complaint level, a score of 2 in group B indicates a moderate complaint level

Table 11 Reba Group A Scores

Tabel A	Latar															
	1				2				3				4			
Kaki	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
	2	3	4	5	2	3	4	5	2	3	4	5	2	3	4	5
	3	4	5	6	3	4	5	6	3	4	5	6	3	4	5	6
	4	5	6	7	4	5	6	7	4	5	6	7	4	5	6	7
Punggung	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
	2	3	4	5	2	3	4	5	2	3	4	5	2	3	4	5
	3	4	5	6	3	4	5	6	3	4	5	6	3	4	5	6
	4	5	6	7	4	5	6	7	4	5	6	7	4	5	6	7

Table 12. Lifted Load

Burden	Score	Change Score
< 5 Kg	0	+1 In case of sudden or rapid additional load
5 – 10 Kg	1	
> 10 Kg	2	

Table 13 Reba Group B Scores

Table 14 Handhandles

Handhandles	Score	Description
Good	0	It holds well and uses half the force to grasp.
Not good	1	Handrails are still acceptable although not ideal.
Bad	2	Handrails are unacceptable although it is still possible.
Not Worth It	3	Very bad, The grip is not secure, there is no grip on body parts.

The score of group B is 2 plus the handle score of 1, so the total score of group B is 3.

Table 15 Reba Group C Scores

Table 16 Activity Values

Activity	Score	Description
Static work attitude	+1	One or more parts of the body are in a static state, such as holding for more than 1 minute.
Recurring	+1	Repeating a small portion of activity, such as stepping more than 4 times in 1 minute (in this case walking is not included).
Unstable	+1	Activities that result in rapid changes in work attitudes or cause instability in work attitudes.

The score of group C is 3 plus the activity score is 1 so the total score of group C is 4, the number 4 signifies a moderate complaint level.

4. CONCLUSION

From the results of the research conducted, grub A gets a score of 6 and coupled with a load score of 2, so the total score of grub A is 8, where the greater the degree of work posture, the higher the score obtained. From the results of the research conducted, grub B gets a score of 3 and coupled with a grip score, which is 1, so the total score of grub B is 4, where the greater the degree of work posture, the higher the score obtained.

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