# Education to Improve the Working Posture With the Rula Method to Reduce Musculoskeletal (Case study: Grain takers in waluya village, karawang)

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## ABSTRACT

*The Farmers in the village of Waluya, Kutawaluya district, Karawang District, Farmers complain about musculoskeletal injuries because of the routine of cooking every day, where farmers work with the body posture bending so that they have some problems such as waist pain to the bump bending. Focus on the health of the posture of the farm worker, it is necessary to have a measurement of the body posture using the method of Rapid Upper Limb Assessment (RULA). After being analyzed with the method RULA. Posture of farm workers yields a score of 7 points, which means that the farm workers need to have an action and improvement such as feeding facilities such as Kitchenware or taking the remnants of the falling or untransported crop, so that farm workers feel comfortable.*

***Keywords***: *RULA, Farmwork, Working posture, Musculoskeletal, Rest harvest pickup*

## 1.  INTRODUCTION

Any kind of work and workplace, both formal and informal, has risks that can cause health problems for workers. Generally, informal sector workers lack awareness and knowledge of the dangers in their workplace, such as waist pain or lower back pain while working as a farmer **(Kementrian RI, 2016)**. Farmers have a high risk of work accidents because low use of sedentary K3 is a primary factor in the emergence of occupational diseases affecting farmers that affect the decline in farmers' performance that can cause losses for farmers using social and economic consequences. This is because the working posture of farmers is still bad basically, farmers suspect the socialization of the work posture is useless, wasteful of time, cumbersome, unpractical even tends to spoil the process of their agricultural activity. Employee health and safety care, similar to injuries, accidents, defects that may affect death **(Abdul, 2019).**
Therefore, ergonomics in the work environment are essential to improving the physical and mental well-being of workers through prevention. Injury due to wrong work and illness due

to work, with wrong work attitude performed over a long period of time, affect the health of the musculoskeletal system or lower back pain. Pain caused by non-static movements that injure the back muscles **(Andrian, 2013)**. The monotonous and continuous work of the farmer over long periods of time, coupled with the working environment that is directly exposed to the sun, makes farmers quickly fatigued at work, so it can be said that farmers are at high risk of work-related illnesses. (PAK). Research carried out in Indonesia showed that farmers are one of the jobs most frequently affected by low back pain (Khan, Bath, Boden, Adebayo, & Trask, 2019). Low Back Pain (LBP) is one of those disorders caused by poor physical activity **(Adha, Bahri, Mardhotila, & Artikel, 2020).**

The farmers in the village of Waluya, Kutawaluya district, Karawang district have a model of working with the way of cooking or picking up the remainder of the crop that has fallen or not transported by the landlord when harvesting padi with a long work time of 5-8 hours. The farmer's crop cuts the peas by machine, but the cutting by machine is not maximum, there are still uncut peas remains, so the farmer asks the farm workers to continue cutting the peach manually or by hand. The peasant worker suffered from pain in the back and waist due to most sitting, taken from the author's observations. These muscle complaints generally occur due to excessive muscle work due to the giving of too heavy workloads with long durations of loading time. According to research from **Briggs** (2019) Lower back pain has been the main cause of disability since it was first measured in 1990 and is the second cause of global disability in musculoskeletal problems is 20%-33% As far as the objective of this Abdimas activity is to introduce a padi cutter tool to reduce musculo-skeletal wounds and to make farm workers feel comfortable at work due to the presence of proposals for job posture improvement.

## 1.2 Partner Problems

The problems faced by our partners are as follows:
The farm workers complain about musculoskeletal injuries because of the daily cooking routine, where the farm workers work with the body posture bent so they have some problems.

## 1.3 Intention and Objectives

Working posture is an action taken by a worker in doing his job. Working Posture is closely related to the science of ergonomics, where the ergonomic science studies how to improve physical and mental well-being through efforts to prevent injuries from the wrong work posture and illness resulting from work as well as reducing the physical and psychological burden of work **(Baroroh & Ramadhan, 2018)**. The movements performed during the work include: flexion, extension, abduction, adduction, rotation, pronation, and supination. A flexion is a movement in which the angle between two bones is reduced. Abduction is a side movement away from the median plane of the body.

Rapid Upper Limb Assessment is a method developed in the field of ergonomics that investigates and evaluates the working position performed by the upper body. Diagrams of body postures and four assessment tables are provided to evaluate dangerous working postures in such work cycles **(McAtamney & Corlett, 1993)**. Using this method will obtain the maximum limit values and various postures of the worker, such limits range between values 1-7 **(Rivero, Rodríguez, Pérez, Mar, & Juárez, 2015).** This device does not require special instruments in providing a measurement of the posture of the neck, back, and upper body, in line with the function of the muscles and the external loads supported by the body. Assessment using the RULA takes a little time to complete and perform a general

scoring on the list of activities that indicate the need for a reduction in the risk resulting from the physical appointment by the operator. Based on the RULA analysis, it is possible to determine whether the posture of the employee needs to be improved to reduce the risk of work or not, so that improvements can be made in the design of the work system **(Rivero, Rodríguez, Pérez, Mar, & Juárez, 2015)**. The RULA is allocated to the ergonomic field with a wide range of coverage. The ergonomics assess the posture, strength and activity of the muscles that cause repetitive strain injuries. Ergonomics is used to evaluate the results of an approach that is a risk score between one and seven, where the highest score indicates the level of high risk to work. This does not mean that the lowest score will guarantee the researched work free of ergonomic hazards. That's why the RULA was developed to detect risky working postures and make improvements as soon as possible. The range for the back was developed by **Drury, Grandjean grandjean, et al** (Table 1).

**Table 1. Back Movement Scores (body strap)**

| Movement | Score |
|---|---|
| when sitting and supported with an elbow angle of 90° or more | 1 |
| 0°-20° flexion | 2 |
| 20°-60° flexion | 3 |
| >60° flexion | 4 |

And for the Range of Back Movement developed by **Drury, Grandjean GrandJean, et al**. can be seen in figure 1.
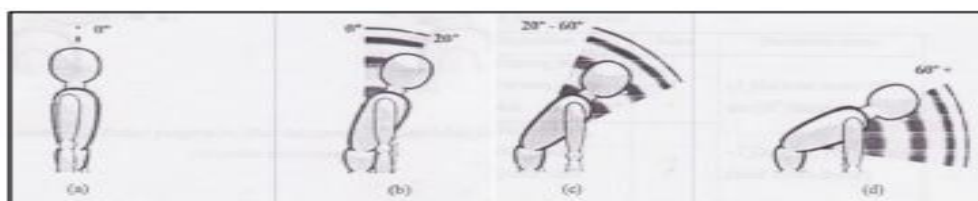


**Figure 1. Range of Back Movement**

The description of the above figure is: (a) natural posture, (b) 0-20o flexion postures, (c) 20-60o flexions, (d) 60o or more flexions postures. The back is rotated or curved with the description: +1, if the body is rotated and +1, when the body bends to the side (Pratama, 2021). The objectives are as follows:
  a. To increase farmers' understanding of the importance of a good working posture to prevent musculoskeletal injury.
  b. Teach farmers the techniques and methods of using the assistive pick-up tool for dropped or untransported Padi remnants, through interactive and easy-to-understand training methods.

Through the implementation of services focused on improving the effectiveness of application in using a simple and effective Padi harvest remnants assistive tool, hopefully can provide real benefits to farm workers in the village of Waluya, Kutawaluya district, Karawang district. It is hoped through this program, farmers can acquire the knowledge and skills necessary to increase agricultural productivity and can reduce the risk of musculoskeletal injuries.

## 2. IMPLEMENTATION METHOD

The location of our partners is in the village of Waluya, Kutawaluya district, Karawang. The method in this activity is the identification of needs and the problem that occurs in this farmer is about the posture of the farm worker while working. The method chosen is RULA.

### 2.1 Data collection and data processing

Data collection is carried out through observation of farm workers in the village of Waluya, the district of Kutawaluya. The data collection is obtained by taking photographs of the working postures of the farm workers when they are doing their work.



**Figure 3. Activities of PKM with Variable Responder**

Variables analyzed in this study are working postures and subjective musculoskeletal complaints. Variables characteristic of respondents such as age, gender, and working time were obtained through interviews with questionnaires as shown in figure 3. Instruments for taking work posture data by photographing work postures on work processes that include hugging, sowing, and harvesting. To analyze the working posture using the RULA method while to find out the subjective musculoskeletal complaints using the questionnaire.

### 2.2 Job Description

This study involves peat farm workers who are engaged in the activity of taking the peat on the remaining peat cutting by machine or taking a peat of the remainder of the crop that has fallen or not transported. The research was conducted to investigate and recommend improvements to the posture of peasant workers at risk of injury when removing grapes. When peasants took grapes from the remainder of the crop, the researchers took photos and videos from the left and right sides using cameras.

### 2.3 Equipment used

In this study there is a measuring instrument or tool used during the research of PKM activities.
1. This camera serves as a tool to take pictures/videos of farm workers while carrying out peat removal in the basement area.
2. Demographic Data Questionnaires Demographic

Data questionnaire taken from respondents or farmers include the name of the farmer, gender, age, height, weight, BMI, the experience of farmers, and also questions related to pain or disease experienced by respondents during the 1 week prior to the study. The Body Mass Index (BMI) is calculated by the equation

BMI = Weight (Kg) : Height(m) X Height (m).....................................................(1)

According to the BMI or IMT classification nationally classification of underweight or lean weight with a BMI of 18,5-25,0 and an obese weight classification with an BMI >25 **(Bachrodin, 2012).**

## 2.4 Worksheet RULA

Worksheet or RULA worksheet is used as a reference to determine whether the body posture of a farmer at risk of injury during planting in the Kelurahan area of Napal, Seluma district. The RULA worksheet has a level of values with the level of risk of injury and action to be taken. If the RULA final score is 1 then the risk level is ignored and no improvement is needed. If the 2 to 3 value is low and improving is possible, if the 4 to 5 value is moderate and requires improvement. Values 6 to 7 are high and improvement can be made as soon as possible.

## 3. RESULT AND DISCUSSION

## 3.1 Body Posture Analysis Before Improvement

### Table 2. Analysis of Posture Before Improvement

**Table A:**

| Upper Arm | Lower Arm | Wrist 1 Twist 1 | Wrist 1 Twist 2 | Wrist 2 Twist 1 | Wrist 2 Twist 2 | Wrist 3 Twist 1 | Wrist 3 Twist 2 | Wrist 4 Twist 1 | Wrist 4 Twist 2 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 1 | 2 | 2 | 2 | 2 | 3 | 3 | 3 |
| 1 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 3 |
| 1 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 4 | 4 |
| 2 | 1 | 2 | 3 | 3 | 3 | 3 | 4 | 4 | 4 |
| 2 | 2 | 3 | 3 | 3 | 3 | 3 | 4 | 4 | 4 |
| 2 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 5 | 5 |
| 3 | 1 | 3 | 3 | 4 | 4 | 4 | 4 | 5 | 5 |
| 3 | 2 | 3 | 4 | 4 | 4 | 4 | 4 | 5 | 5 |
| 3 | 3 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 5 |
| 4 | 1 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 5 |
| 4 | 2 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 5 |
| 4 | 3 | 4 | 4 | 4 | 5 | 5 | 5 | 6 | 6 |
| 5 | 1 | 5 | 5 | 5 | 5 | 6 | 6 | 7 | 7 |
| 5 | 2 | 5 | 6 | 6 | 6 | 6 | 7 | 7 | 7 |
| 5 | 3 | 6 | 6 | 6 | 7 | 7 | 7 | 7 | 8 |
| 6 | 1 | 7 | 7 | 7 | 7 | 7 | 8 | 8 | 9 |
| 6 | 2 | 8 | 8 | 8 | 8 | 9 | 9 | 9 | 9 |
| 6 | 3 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 |

**Table B: Trunk Posture Score**

| Neck Posture Score | Trunk 1 Legs 1 | Trunk 1 Legs 2 | Trunk 2 Legs 1 | Trunk 2 Legs 2 | Trunk 3 Legs 1 | Trunk 3 Legs 2 | Trunk 4 Legs 1 | Trunk 4 Legs 2 | Trunk 5 Legs 1 | Trunk 5 Legs 2 | Trunk 6 Legs 1 | Trunk 6 Legs 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 3 | 2 | 3 | 3 | 4 | 5 | 5 | 6 | 6 | 7 | 7 |
| 2 | 2 | 3 | 2 | 3 | 4 | 5 | 5 | 5 | 6 | 7 | 7 | 7 |
| 3 | 3 | 3 | 3 | 4 | 4 | 5 | 5 | 6 | 6 | 7 | 7 | 7 |
| 4 | 5 | 5 | 5 | 6 | 6 | 7 | 7 | 7 | 7 | 7 | 8 | 8 |
| 5 | 7 | 7 | 7 | 7 | 7 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| 6 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 9 | 9 | 9 | 9 | 9 |

**Table C: Neck, trunk and leg score**

| Wrist and Arm Score | 1 | 2 | 3 | 4 | 5 | 6 | 7+ |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 2 | 3 | 3 | 4 | 5 | 5 |
| 2 | 2 | 2 | 3 | 4 | 4 | 5 | 5 |
| 3 | 3 | 3 | 3 | 4 | 4 | 5 | 6 |
| 4 | 3 | 3 | 3 | 4 | 5 | 6 | 6 |
| 5 | 4 | 4 | 4 | 5 | 6 | 7 | 7 |
| 6 | 4 | 4 | 5 | 6 | 6 | 7 | 7 |
| 7 | 5 | 5 | 6 | 6 | 7 | 7 | 7 |
| 8+ | 5 | 5 | 6 | 7 | 7 | 7 | 7 |

This section contains the results of body posture measurements using the Rapid Upper Limb Assessment (RULA) method, table 2 shows the posture of the farm worker before making improvement. On the C table, score 7 is indicating that the posture is classified as high-risk and needs immediate correction.

Date taken: 11/16/2023, 09:18
a:57.4°
Upper Arm

Date taken: 11/16/2023, 09:18
a:147.7°
Lower Arm

Date taken: 11/16/2023, 09:18
a:7.8°
Wrist

Date taken: 11/16/2023, 09:18
a:20.3°
Neck

Date taken: 11/16/2023, 09:18
a:60.5°
Trunk

**Figure 4. Angle size determination**

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This angle size determination draws a line using paint software on specific parts such as the wrist, lower arm, arm, neck, and back. Then determines the angle size using ergofellow software based on the angle that has been drawn on that section as shown in figure 4.
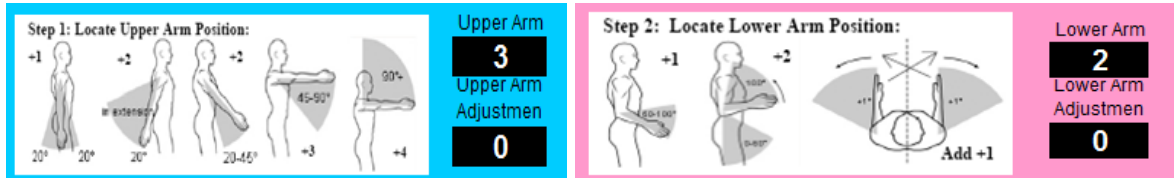


**Figure 5. Group A Step 1 and 2**

Figure 5 shows group A at step 1 and 2 which the score of the upper arm is 3 points, because the angle of position responders has a range of 45°-90°. The angle size on the lower arm of responders is 57.4° so the score is 2 points. Figure 6 shows score 2 points for the hand wrist, because the angle size of the wrist is 7.8°
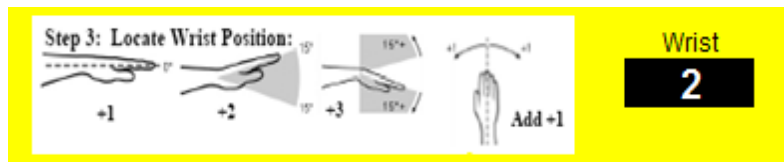


**Figure 6. Group A Step 3**
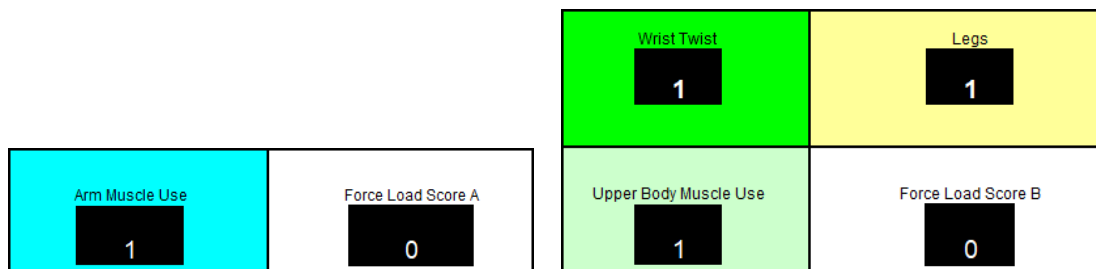


**Figure 7. Group A Step 4-8**

Scores at the rotation position of the wrist of 1 point as shown in figure 7, because the operator's wrist conditions are rotating at medium distance. This score is obtained from positioning on table A between upper arm and lower arm with wrist score and wrist twist. Then the score on step 5 is equal to 1 point. This score is based on the posture of the body when working statically for > 10 minutes and 4x/1 minute movements, then the score on step 6 is 1. This score looks from the load condition received by the operator according to its standard. Then the score in step 7 is 0 because the load conditions received by operator is < 4.4 lbs. This score was obtained from the accumulation of points obtained from step 5, step 6, and step 7. Then the point on step 8 is 3 points.
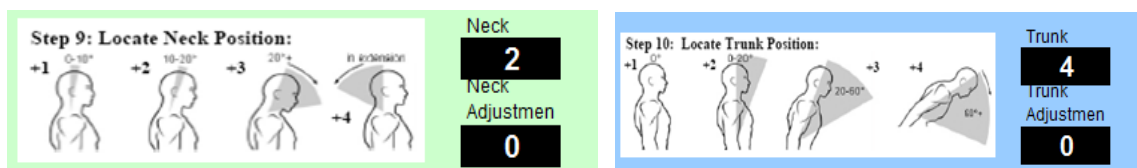


**Figure 8. Group B Step 9 and 10**

Figure 8 shows score on the neck part that is 2 points, because the angle of responder on the throat part is 20.3˚.  Scores on the back is 4 points, because the responder angle size on the trunk is 60.5º.
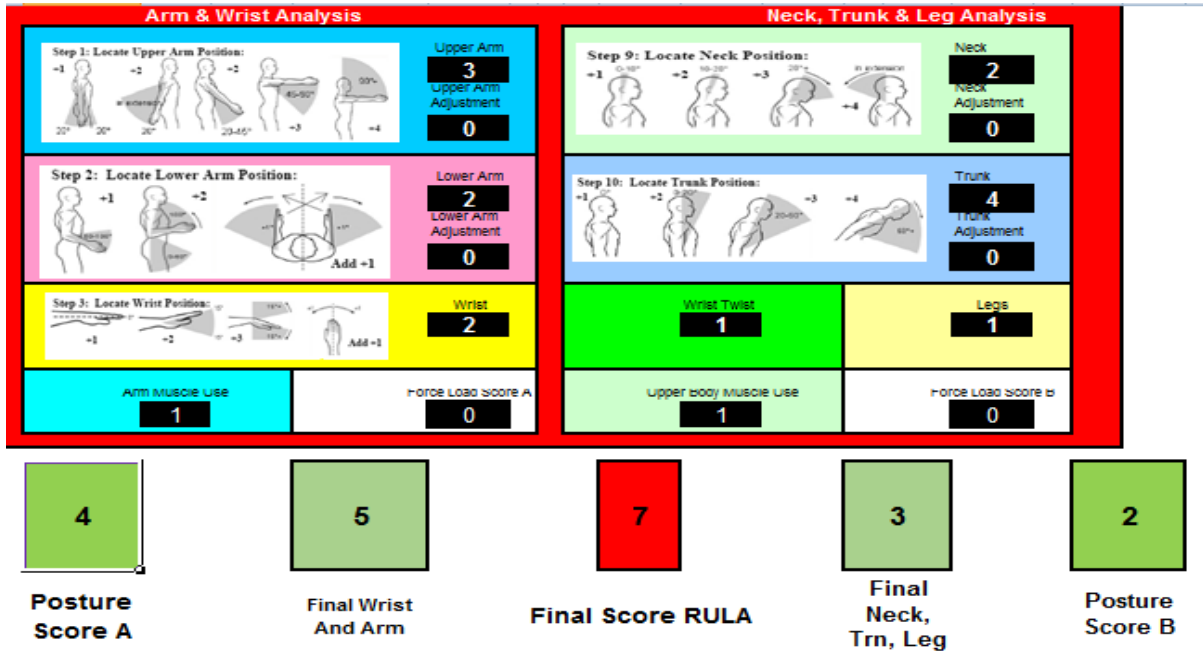


Figure 9. RULA Assessment Worksheet before making improvements

Figure 9 describes the scores obtained from the entire group A, and group B, thus resulting in the final score of RULA prior to improvement of 7 points.

## 3.2  Working Posture Improvement With the Application of Auxiliary Padi Cutting Tool
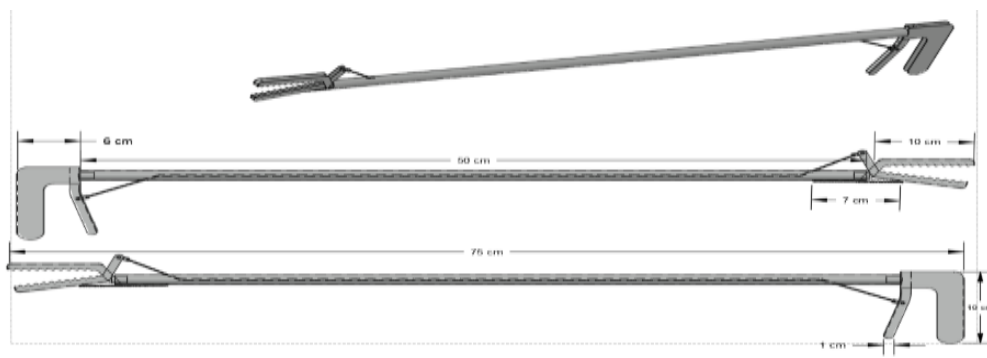


Figure 10. Tool for picking up the remnants of a falling or untransported Padi crop.

On the shoulder side, the shoulders are upright and the direction of vision towards the target object. A cooking assistant can be used by farm workers as a reference position on the back so as not to bend. Besides, there are also aids prepared for the peasant workers according to the height of the workers so that in doing his work the workers now feel comfortable. Figure 10 shows Tool for picking up the remnants of a falling or untransported Padi crop.

## 3.3 Results of Working Posture Improvement with Rapid Upper Limb Assessment Method (RULA)

This section is about measuring posture with the Rapid Upper Limb Assessment method. (RULA). Table 3 shows the posture of the peasant workers after repairs.

**Table 3. The Posture of The Peasant Workers After Improvement.**



On the C table the value is 3, indicating that the posture is included in the classification of low risk and allows for correction. Figure 11 shows angle size determination after position improvement.



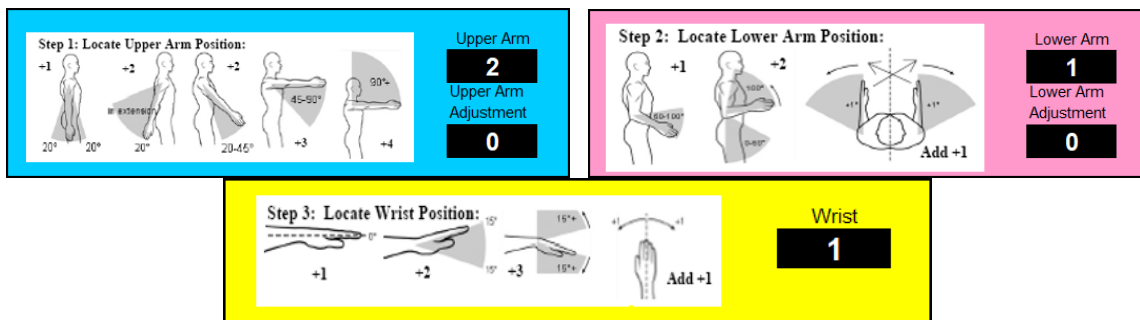**Figure 11. Angle size determination**



**Figure 12. Group A Step 1 until 3**

Scores of the upper arm is 3 points as shown in figure 12, because the angle has a range of 20˚-45˚, that is 27.6˚. Scores the lower arm improvement is 0 because the operator does not have too much up or down movement, but there is an addition of +1, because of the operator's condition there is a sliding movement, then the score on this step 2 is 1 point. Scores the hand wrestling part of 1 point, because the angle is 0˚.



**Figure 13. Group A Step 4-8**

Scores at the rotation position of the wrist of 1 point, because the operator's wrist conditions are rotating at medium distance. This score is obtained from positioning on table A between upper arm and lower arm with wrist score and wrist twist. Then the score on step 5 is equal to 1 point. This score is based on the posture of the body when working statically for > 10 minutes and 4x/1 minute movements, then the score on step 6 is 1. This score looks from the load condition received by the operator according to its standard. Then the score in step 7 is 0 because the load conditions received by operator is < 4.4 lbs. This score was obtained from the accumulation of points obtainé from step 5, step 6, and step 7. Then the point on step 8 is 2 points (figure 13).



**Figure 14. Group B Step 9 and 10**

The score on the neck is 2 points (figure 14), because the angle is 10ᵒ-20˚, that is 15.1˚. Score on the back of 2 points, because the angle on the  Figure 19 has a range of 20˚-60˚, that is 15.5ᵒ.



**Figure 15. RULA Assessment Worksheet after improvement**

Figure 15 describes the scores obtained from the entire group A, and group B, thus resulting in a final RULA score of 3 points included in the classification is low risk and allows improvement.

At harvest time, farmers carried out the cutting of peas by machine, but cutting by machine was not maximum, there were still the remains of the peas that were not cut and transported, so farmers asked the farm workers to continue cutting or picking the grass manually or by hand. The peasant worker suffered from pain in the back and waist due to most sitting, taken from the author's observations. After the analysis with the RULA obtained a score of 7 which means that the posture of the farm worker is at high risk and immediately to make improvements. The author proposes to make repairs with aids. The aids used by the peasant workers are made of aluminum, straight vertically equipped with a cutting knife and a pin, the posture of the body of peasants is upright, no longer bending, on the shoulder part, shoulders upright and the direction of vision towards the targeted object. A remnants pickup assistant can be used by farm workers as a body position reference. Once the tool is applied, there is a change and a correction of the posture. Furthermore, the tools prepared for the farm workers are according to the height of the farmers, so that in doing their work the farmer feels comfortable. The result of the improvement of the working posture of the peasant worker is analyzed with RULA, obtained Score 3 which means that the work posture is low-risk and allows for improvement and the posture has followed the principle of ergonomics.

## 5. CONCLUSION

The final scores obtained from both methods between the Worksheet RULA and Software Ergofellow obtain the same score of 3 points. This means that the scores are classified as low-risk and can be improved. This is due to the use of a suitable cutting tool. The tools used by the peasants are vertical, so there is a change in the working posture of the shoulder, shouldering and direction of vision towards the targeted object. The remaining crop pick-up assistant can be used by farm workers as a reference position on the back so as not to bend. Furthermore, the tools prepared for the farm workers are according to the height of the farmers, so that in doing their work the farmer feels comfortable.

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