Vol.9, No.1 : 30-06-2023
ISSN Print : 1411 – 951 X, ISSN Online : 2503-1716

Analysis of Work Posture on Gambier Farmers Using the Rapid Entire Body Assessment Method

Fea Firdani[1*], Azyyati Ridha Alfian[2], Aria Gusti[3] and Hendra Saputra[4]

[1,2,3)] Department of Occupational Safety and Environmental Health, Faculty of Public Health, Andalas University, Padang 25163, Indonesia
[4)] Department of Agricultural Science, Faculty of Agriculture, Andalas University, Padang 25163, Indonesia
[*)] e-mail correspondence: feafirdani@ph.unand.ac.id
doi: https://doi.org/10.24843/JEI.2023.v09.i01.p01
Article Received: 30 September 2022; Accepted: 24 Maret 2023; Published: 30 Juni 2023

Abstract

In processing gambier farmers work with various postures, namely standing, sitting, and some in a bent position. This study aims to determine the work posture to assess the ergonomic risk level in gambier processing farmers. This study is an observational study using the Rapid Entire Body Assessment (REBA) method. The survey was conducted in March – July 2022 on gambier processing farmers in Pesisir Selatan Regency, West Sumatra. Work postures were assessed starting from picking gambier leaves, preparing for boiling, boiling, pressing, settling, draining, and printing gambier. There are 11 work postures that were assessed. Data were collected using observations, documentation, and REBA worksheets. Then the data were analyzed based on the score from the REBA table, and the risk score was calculated. The results of the ergonomic risk assessment at each stage of the gambier processing process are it is known that in the process of picking gambier leaves the final score is 10, in the boiling preparation stage there are 4 different work positions with 2 final scores of 6, and 2 final scores 8, then the boiling stage the score final 9, tying gambier leaves for press preparation with a final score of 9, gambier leaf counting with a score of 9, gambier leaf press process with a final score of 9, gambier sap draining process with a final score of 10 and printing process with a final score of 8. Out of 11 postures at the gambier processing stage, nine poses have high risk with a score of 8 to 10, and two positions are of moderate risk. Efforts need to be made to improve equipment for processing gambier to prevent work-related injuries and reduce the physical workload on gambier processing farmers.

Keywords: ergonomics, farmer gambier, work posture

INTRODUCTION

Workers have the right to work safely and avoid dangers at work. For this reason, it is necessary to make occupational health and safety efforts for workers in formal and informal sectors. Occupational health efforts are aimed at protecting workers so that a healthy life is free from health problems and adverse influences caused by work, the work environment, both work situations and conditions, the layout of the workplace, or the materials used (Kementrian Kesehatan RI, 2009). Every job has risks that can cause health problems either caused by the work process, work area, or the attitude of the workers (Jauhari *et al*., 2017). The picture of occupational diseases in Indonesia is like the tip of the iceberg phenomenon, where known and reported occupational diseases are still minimal and partial based on research results, so it has

not illustrated the magnitude of the real problem of occupational safety and health in Indonesia (Kemenkes RI, 2016).

Occupational diseases are caused by many factors, one of which is ergonomics. Ergonomics, according to the ILO (International Labor Organization), is the application of human biological science with engineering knowledge to achieve several adjustments and reciprocity of workers in carrying out their work, and the benefits can be measured in terms of efficiency, health, and welfare. The primary purpose of ergonomics is to achieve the creation of a sound work system by increasing work effectiveness and efficiency, such as by increasing work comfort and improving the quality of the work environment (Kuswana and Wowo Sunary, 2016).

Ergonomics risks can be experienced by every worker, especially those who work in the informal sector, including farmers. The Health and Safety Executive (HSE) reported 2.410 non-fatal injuries per 100.000 workers in the agricultural industry in 2005. In 2009 in Romania, out of a total of 3.476 injured workers, 375 were from the farm sector. Data from a work-related disease survey in the UK shows that among an estimated 43.000 workers in the agricultural industry, there are ergonomic disorders with details of back pain injuries in 27.000 workers, upper limb injuries in 10.000 workers, and complaints of lower limb injuries in 11.000 workers (Ramona, 2010).

Various risk factors related to work can cause musculoskeletal disorders in farmers, such as work position, movements, and carrying loads at work. Farmers often complain about the prevalence of musculoskeletal conditions on the back, knees, shoulders, neck, wrists, hands, thighs, and feet (Agrawal *et al*., 2018). Awkward work postures are the leading cause of musculoskeletal disorders. Some awkward work postures include reaching back, twisting, working with a height above the head, wrist bending, kneeling, reclining, forward and backward bending, and squatting. (Lee and Han, 2013).

In West Sumatra Province, as much as 57% of the population is engaged in agriculture. One of West Sumatra's specific commodities is the gambier plant (Uncaria gambier). Gambier grows and develops well in the West Sumatra area. And is an essential livelihood that plays a critical role in receiving community income as well as regional and state payment, namely as an export commodity that can significantly contribute to the Regional Gross Domestic Product (GDP) of the region and foreign exchange for the country (Azmi Dhalimi, 2015).

Gambier processing is done traditionally and is done manually with simple tools. The processing of gambier is carried out in various postures such as standing, sitting, and some in a bent position. So it can cause ergonomic risks such as musculoskeletal disorders. Based on the initial survey conducted on gambier farmers in Pesisir Selatan Regency, gambier processing farmers experience complaints such as pain or pain in the back, waist, neck, shoulders, arms, hands, and legs. That can be caused by working with traditional and manual methods and doing work repeatedly.

One way to evaluate the physical factors in gambier processing to achieve safety and comfort at work is to identify and analyze the overall work posture. The method that can use to analyze work posture is the method of rapid entire body assessment (REBA). REBA is a method developed by Sue Hignett and Lynn McAtamney, effectively used to assess worker posture, the force used, and the type of worker movement. This method can define the movement of all body parts in workers. It can improve overall body movement so that it can provide a sense of comfort and safety when carrying out work activities (Stanton *et al*., 2005). This study aimed to determine the level of risk caused by work postures when carrying out gambier processing activities using the REBA method on gambier processing farmers in Batang Kapas sub-district, Pesisir Selatan district, West Sumatra.

Vol.9, No.1 : 30-06-2023
ISSN Print : 1411 – 951 X, ISSN Online : 2503-1716

METHOD

This research is an observational study. The method used to assess ergonomic risk is the REBA worksheet (Hignett and McAtamney, 2000). The study was conducted from March to July 2022 on gambier processing farmers in Pesisir Selatan Regency, West Sumatra. This study's population was workers involved in the gambier processing process stage. Ergonomics risk assessment of each worker for each step starting from the set of picking gambier leaves, preparation for boiling, boiling, pressing, settling, draining, and printing gambier. Eleven work postures are assessed at all work stages. Data were collected by observation, documentation, and REBA worksheets. Data analysis was carried out by calculating scores based on the table on the REBA worksheet.

RESULTS AND DISCUSSION

The gambier processing process begins with picking the gambier leaves. The gambier leaves and twigs are put into a knitting rope installed in a large cylindrical bamboo basket with the top and bottom not closed and made of woven bamboo. The leaves and twigs of gambier are then compacted and boiled in a container in the form of a large iron cauldron using a concrete furnace. Furthermore, the boiling results are tied or wrapped with a twisted rope to form a round and solid. The next stage is the pressing process, the deposition process, the printing, and the last one is dried in the sun.

Ergonomics risk level assessment by assessing work posture using the REBA worksheet. The results of work posture assessment observations are carried out at each stage of the gambier processing process. Based on Figure 1, the working posture during the process of picking gambier leaves. The results of observations using the REBA sheet are the position of the neck bending down the value = 2 and the neck turning to the right then the value is added by 1 with an angle of 20°, the position of the right leg is straight (value = 1), and the left leg is bent (value = +2) with an angle of 81,5°, the position of the body is straight (value = 1). The body rotates to the right, and the value is added by 1. In this process the load is < 5 kg, and the score = 0. Final total score A=6. The position of the worker's upper arm value = 2, the position of the worker's forearm value = 2 with an angle > 100°, the position of the worker's wrist (score = 2), the worker's hand rotates to the right and left (flexion) then the value = +1, the final score from matrix B REBA = 4. This score is added to a score of poor grip with a value of = 2 so the total final score of group B = 6. Because there are static body parts held for more than 1 minute, then the value is +1, and if there is the repetition of movements > 4 times per minute, then the value = +1, and the total score of activity = 2. Then the total score of Table C REBA is = 10, which is the high-risk level.

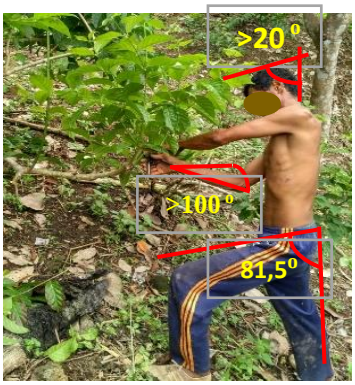

Figure 1. Working Posture of Picking Gambier Leaves

Vol.9, No.1 : 30-06-2023
ISSN Print : 1411 – 951 X, ISSN Online : 2503-1716

In Figure 2, the working posture during the process of attaching the knitting rope to the bamboo basket, the position of the worker's neck is bent down the value = 2, the position of the right and left legs is straight = 1, the body position is bent down the value = 4 with an angle of 87,3°. Then the total score is entered in Table A with a score = 5, then the score is added to the load score because in this process the load is < 5 kg the score = 0. Total final score A = 5. Position of the worker's upper arm = 2, Arm position under the worker score = 1 with an angle of 85,3°, the position of the worker's wrist (score = 2), in the picture above, the worker's hand bends to the right (score = + 1), the final score of the REBA matrix B = 3, the gripping score is good then the value = 0, so the total final score of group B = 3. Because there are static body parts held for more than 1 minute, then the value is +1, and there are repetitions of movements > 4 times per minute, then the value = +1, total activity score = 2. Then the total score of Table C REBA is = 6, which is a moderate level of risk.

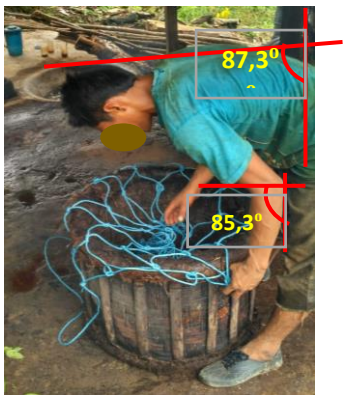

Figure 2. Working Posture Installing Knitting Rope
on a Bamboo Basket

Figure 3 the working posture when inserting gambier leaves and twigs into a bamboo basket. Position the worker's neck is bent down at a value of = 2, the position of the right and left legs is straight = 1, and the position of the body is bent down at a value of 4 with an angle of 112,8°. Furthermore, the total score is entered in Table A with a score = 5, then the score is added to the load score, because in this process the load is < 5 kg, and the score = 0. Total final score A= 5. Position of worker's upper arm value=2, position of the forearm of worker value=1, the position of worker's wrist (score=2), in the picture above, the worker's hand bends to the left (score=+1), final score from the matrix B REBA = 3, the gripping score is good then the value = 0, so the total final score for group B = 3.

Figure 3. Working Posture of the Process of Putting Gambier Leaves
into the Bamboo Basket

Because there are static body parts held for more than 1 minute, the value is +1, and there is the repetition of movements > 4 times per minute, then the value = +1, and the total

Vol.9, No.1 : 30-06-2023
ISSN Print : 1411 – 951 X, ISSN Online : 2503-1716

activity score = 2. Then the total score of Table C REBA is = 6, which is a moderate level of risk.

In Figure 4 the working posture during the process of compacting the gambier leaves into a bamboo basket by stepping on it, the position of the worker's neck is bent down the value = 2 and the neck moves to the left flexion (value = +1), the right leg position is straight = 1, and the left leg bends the value = 2, the body position is bent and bends to the left side the value = +1. Furthermore, the total score is entered in Table A with a score = 5, then the score is added to the load score, because in this process the load is < 5 kg, and the score = 0. The final total score is A= 5. The position of the worker's upper arm value = 1, the position of the worker's forearm value = 1, the position of the worker's wrist = 2, and the final score of the matrix B REBA = 4, then this score is added to the score of poor grip with value = 2, so the total final score of group B = 4. Because there are static body parts held for more than 1 minute, then the value is +1, and there is the repetition of movement > 4 times per minute. The value = +1, and the movement also causes changes in posture, then the value is +1, total activity score = 3. So the total Table C REBA score = 8 is a high-risk level.

Figure 4. Working Postures Compressing Gambier Leaves into a Bamboo Basket

In Figure 5, working posture during the process of installing the plastic cover of the bamboo basket, which has been filled with gambier leaves, the position of the worker's neck is bent down with an angle of 54,3°, the value = 2, and the neck moves to the left in flexion (value = +1), the position of the legs is straight = 1, the position of the body is bent at an angle of 53° with a value of 3 and bent to the right side value = +1. Then the total score is entered in table A with a score = 6. Then the score is added to the load score because in this process the load is < 5 kg, and the score = 0.

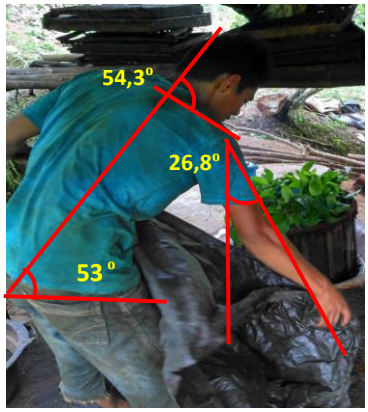

Figure 5. Working Posture Closing a Bamboo Basket

Vol.9, No.1 : 30-06-2023
ISSN Print : 1411 – 951 X, ISSN Online : 2503-1716

The final total score A = 6. The position of the worker's upper arm with an angle of 26,8° value = 2, the position of the worker's forearm value = 2, the position of the worker's wrist = 2, the final score from the REBA matrix B = 3, the gripping score is good then the score = 0, the total final score of group B=3. Because there are static body parts held for more than 1 minute then the value is +1, and there is the repetition of movement > 4 times per minute, then the value = +1, and the movement also causes changes in posture then the value is +1, total activity score = 3. So the total Table C REBA score = 8, which is a high-risk level.

In Figure 6, the working posture during the process of boiling gambier leaves, the position of the worker's neck is bent down with an angle of 54,9°, the value = 2, the position of the left leg is straight and the right leg is raised the value = 2, the body position is bent at an angle of 65,8° with a value of 3 and bend to the left value = +1. Then the total score is entered in Table A with a score = 6, then the score is added to the load score, because in this process the load is < 5 kg, and the score = 0. Total final score A= 6. Position of worker's upper arm value=2, the position of the forearm of worker value=1, position of worker's wrist value=2, turning left or right value +1, the final score of matrix B REBA = 4, good grip score than the value = 0, the total final score of group B = 4. Because there are static body parts, held for more than 1 minute, then the value is +1, and there is the repetition of movement > 4 times per minute. The value = +1, and the movement also causes changes in posture then the value is +1, total activity score = 3. So the total Table C REBA score = 9, a high-risk level.

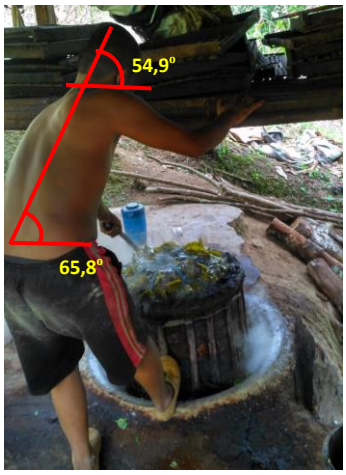

Figure 6. Working Posture of the Gambier Boiling Process

In figure 7 the working posture during the process of tying the boiled gambier leaves, the position of the worker's neck is bent at an angle of 96,7° value = 2, the position of the legs is bent at an angle of 115,9° the value = 2, the body position is bent at an angle of 90° with a value of 4. The total score is entered in table A with a score of = 6, in this process the load is < 5 kg, the score = 0. The final total score A= 6. The position of the worker's upper arm value = 1, the position of the worker's forearm value = 2, the position of the worker's wrist = 2, and moving flexion then the value is added 1, the final score of the REBA matrix B = 3, the gripping score is less good then the value = 1, the total final score of group B = 4. Because there are static body parts, held for more than 1 minute then the value is +1, and there is the repetition of movement > 4 times per minute then the value = +1, and the movement also causes changes

Vol.9, No.1 : 30-06-2023
ISSN Print : 1411 – 951 X, ISSN Online : 2503-1716

in posture then the value is +1, total activity score = 3. So the total Table C REBA score = 9, a high-risk level.

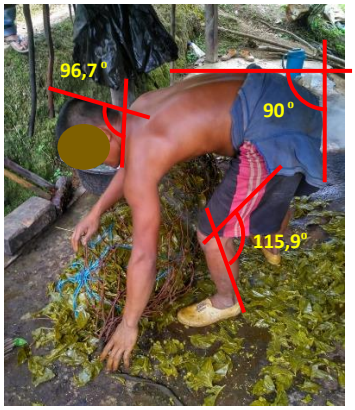

Figure 7. Working Posture for Tying Boiled Gambier Leaves

In figure 8, the working posture during the process of chopping gambier leaves by hitting with a hammer, the position of the worker's neck is straight = 1, the position of the legs is straight then the value = +1, the body position is bent the value is 2, and moving to the right or to the left, the value is added by 1. The total score is entered in table A with a score of = 2. In this process the load is 5-10 kg, and the score = 1. The final total score A = 3. The position of the worker's upper arm with an angle of 119,6° value = 4, the position of the worker's forearm value = 2, the position of the worker's wrist = 2 and moves in flexion then the value is added 1, the final score of the REBA matrix B = 7, good grip score then value = 0, the total final score of group B = 7. Because there is the repetition of movement > 4 times per minute, the value is +1, and the movement also causes changes in posture. The value is +1, and the total activity score = 2. Then the total score of Table C REBA is = 9, which is a high-risk level.

Figure 8. Working Posture when Chopping Gambier Leaves

In Figure 9 the working posture during the process of pressing or pressing gambier leaves, the position of the worker's neck is straight, the value = 1, the position of the legs is bent at an angle of 90°, the value = 2, the body position is upright, the value is 1. The total score in table A with a score of = 2, in this process the load < 5 kg then the score = 0. The final total score is A = 3. The position of the worker's upper arm with an angle of 119° the value = 4, the position of the worker's forearm value = 2, the position of the worker's wrist = 2 and moves in flexion then the value is added 1, the final score of the matrix B REBA = 7, good grip

Vol.9, No.1 : 30-06-2023
ISSN Print : 1411 – 951 X, ISSN Online : 2503-1716

score than the value = 0, the total final score of group B = 7. Because there is the repetition of movements > 4 times per minute, the value of +1 total activity score = 1. Then the total score of Table C REBA is = 8, which is a high-risk level.

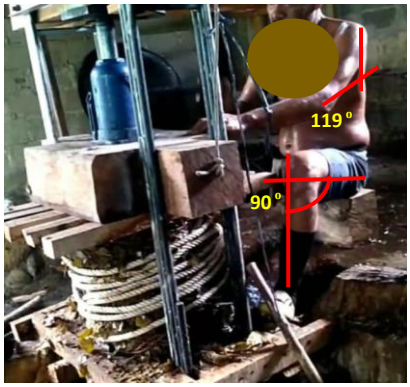

Figure 9. Working Posture of the Gambier Leaf Press Process

In Figure 10, the working posture during the draining process of gambier sap deposits, the position of the worker's neck is straight = 1, the position of the legs is straight then the value = +1, the body position is slightly bent then the value is 2. The total score in table A with a score of = 2. In the process this load > 10 kg then the score = 2. The final total score A= 4. The position of the worker's upper arm with an angle of 84,8° value = 3, the position of the worker's forearm value = 2, the position of the worker's wrist = 2 and moves in flexion then the value is added 1, the final score of the REBA matrix B = 5, unsafe grip score then value = 3, the total final score for group B = 8. Because movement causes changes in posture, the value is +1, total activity score = 1. Then the total score of Table C REBA is = 10, which is a high-risk level.

Figure 10. Working Posture during the Draining Process
of Gambier Latex Deposits

In Figure 11, the working posture during the printing process, the position of the worker's neck is straight, the value = 1, the position of the legs is bent at an angle of 37 o, the value = +1, and the body position is somewhat upright, the value is 1. The total score in table A with a score of = 1. In the process this load < 5 kg, then the score = 0. Total final score A = 1. The position of the worker's upper arm with an angle of 96,5° value = 4, the position of the worker's forearm value = 2, the position of the worker's wrist = 2, and moving in flexion then the value is added 1, the final score of the matrix B REBA = 7, good grip score than the value = 0, the total final score of group B = 7. Because there are repetitions of movements > 4 times

Vol.9, No.1 : 30-06-2023
ISSN Print : 1411 – 951 X, ISSN Online : 2503-1716

per minute, the value is +1, and the total activity score = 1. Then the total score of Table C REBA is = 8, which is a high-risk level.

Figure 11. Working Posture of the Printing Process

After obtaining the final score of the ergonomic risk level assessment, the next step is to determine the improvement efforts as described in Table 1. Based on Table 1 shows that from each stage of the process assessed, there are nine stages of the process with high risk and two stages of the process with moderate risk. Generally, the working position at each step of the gambier processing process is awkward. The awkward postures are bending, looking down, bending legs, and doing repetitive movements during the work process. This condition is also caused by non-ergonomic work equipment. Namely, the equipment used is still simple and traditional, and sitting in chairs that are not ergonomic.

Table 1
Final Score Result of Ergonomic Risk Level and Corrective Action on Work Posture of Gambier Farmers

Process Stage	Final Score	Risk Level	Corrective action
Picking gambier leaves	10	high risk	Improve your working position according to ergonomic standards and keep your neck straight
Attaching knitting ropes to bamboo baskets	6	moderate risk	Improve your working position by bending your knees so that your waist is not tilted down too much
Putting the leaves and twigs of gambier into the bamboo basket	6	moderate risk	Improve your working position by bending your knees so that your waist is not tilted down too much
Putting gambier leaves and twigs into the bamboo basket	8	high risk	Arrange work positions and provide work tools
Installing a plastic cover for a bamboo basket filled with gambier leaves	8	high risk	Arrange work positions
Gambier leaf boiling	9	high risk	Design a seat according to worker anthropometry
Tie the boiled gambier leaves	9	high risk	Arrange work positions
Chopping gambier leaves	9	high risk	Adjust work position and provide equipment according to worker

			ergonomics and anthropometric standards
Gambier leaf press	9	high risk	Adjust work position, provide equipment according to work ergonomics and design a seat according to worker anthropometry
Gambier latex deposit drain	10	high risk	Adjust work position and provide equipment according to worker ergonomics and anthropometric standards
Printing	8	high risk	Design a seat according to worker anthropometry

Working in an awkward position increases the amount of energy required to work. An uncomfortable position causes a condition in which energy transfer from the muscles to the skeletal tissue is inefficient, resulting in fatigue. In awkward postures are wrinkling or prolonged periods of reaching, twisting, tilting, sifting, squatting, holding in a static condition, and clamping with hands. This posture involves several areas of the body, such as the shoulders, back, and knees, because these are the parts that are most often injured (Straker, 2000).

In processing gambier, many workers have awkward postures, such as a diagonal neck position and a slight bow when picking gambier leaves, closing gambier leaves before boiling and boiling gambier leaves, and chopping gambier ones leave. The bending work is done when installing the knitted rope and inserting the gambier leaves into the bamboo basket. When bending, the spine moves to the front of the body. The abdominal muscles and the front side are stressed. On the back side, experiencing stretching or bending. This condition will cause pain in the lower back. In addition, the position of the legs resting on both bent legs does not provide stability to the body at work, so the workers' bodies easily slip. The position of the feet can cause workers to have work accidents (Lestari *et al*., 2017).

The position of reaching and hanging when compressing gambier leaves into the basket causes an awkward position on the arms and hands. Movement of the arm position away from the body can cause pressure on the neck and shoulder muscles. The more significant the angle formed by the arm, the greater the risk of musculoskeletal disorders. Elevated shoulder positions or extended arm positions (abduction) can cause neck pain (Pheasant and Haslegrave, 2018).

Lift a load of stone as a tool in draining gambier sap deposits. When lifting a weight by bending over, the force of the weight lifted is ten times greater on the spine. Bending activities carried out by lifting heavy weights can cause a slipped disc, which is damage to the invertebrate disc due to excessive lifting load (Astuti and Suhardi, 2018; Carayon and Friesdorf, 2006).

Ergonomic sitting position occurs during the pressing process and gambier printing. Working attitude and sitting position for a long time, using a chair that is not according to ergonomic standards, causes subjective complaints to workers. This condition is due to muscle contractions becoming static. Static working position conditions, irregular working hours, and traditional tools can cause workers to experience aches, muscle pains, and tingling in the neck, waist, arms, buttocks, and thighs. (Maksuk, Shobur and Habibi, 2021).

All types of work can pose an ergonomic risk to workers caused by work attitude, work position of equipment used at work, and working environment conditions.

CONCLUSION

Ergonomics risk assessment in the gambier processing process in 11 postures which are considered to be awkward, work equipment is still very traditional. The ergonomic risk level category for gambier processing workers has medium and high-risk levels. Gambir farmers can be expected to pay attention to posture when working so that the muscles are not held back or stretched for a long time and get used to doing light exercises and stretching so that the muscles can relax after a long load. Efforts should be made to improve work posture and replace or modify equipment or machines for gambier processing and work facilities according to ergonomic standards to prevent work-related injuries and reduce the physical workload on gambier processing farmers. For holders of occupational health efforts to provide education about occupational diseases, especially those related to musculoskeletal complaints, and monitoring the health of gambier processing farmers to prevent occupational diseases for workers in the agricultural sector.

ACKNOWLEDGEMENT

Thank you to LPPM Andalas University which has funded this research activity. The chair of the farmer's group and all gambier farmers in Batang Kapas District, Pesisir Selatan Regency, West Sumatra for participation in this research.

REFERENCES

Agrawal, S., Ghosh, J., and Ghosh, P. 2018. Prevalence of Musculoskeletal Disorders Among Vegetable Cultivators-a Review. *European Journal of Pharmaceutical and Medical Research*, *January*, 144–147.

Astuti, R.D., and Suhardi, B. 2018. Analisis Postur Kerja Manual Material Handling Menggunakan Metode Owas (Ovako Work Postur Analysis System). *Jurnal Rekavasi*, Vol. 6(1):44–50.

Azmi Dhalimi. 2015. Permasalahan Gambir (Uncaria gambier L.) di Sumatera Barat dan Alternatif Pemecahannya. *Perspektif: Review Penelitian Tanaman Industri*, Vol. 5(1):46–59. https://doi.org/10.21082/p.v5n1.2006.

Carayon, P., and Friesdorf, W. 2006. *Human factors and ergonomics in medicine*.

Hignett, S., anf McAtamney, L. 2000. Rapid Entire Body Assessment (REBA). *Applied Ergonomics*, Vol. 31(2):201–205.

Jauhari, L., Prabowo, K., Fridianti, A., Sarjana, P., and Kesehatan, T. (2017). Analisis Distribusi Tingkat Keparahan Keluhan Subjektif Musculoskeletal Diseases (MSDs) dan Karakteristik Faktor Tingkat Risiko Ergonomi pada Pekerja Kantor Asuransi. *Jurnal Info Kesehatan*, *15*(1), 20–28.

Kemenkes RI. 2016. Peraturan Menteri Kesehatan Republik Indonesia Nomor 56 Tahun 2016 Tentang Penyelenggaraan Pelayanan Penyakit Akibat Kerja. *Menteri Kesehatan*, 1–35.

Kementrian Kesehatan RI. 2009. *Undang-Undang Republik Indonesia Nomor 36 Tahun 2009 tentang Kesehatan*.

Kuswana, and Wowo Sunary. 2016. *Ergonomi dan K3: Kesehatan Keselamatan Kerja*. PT Remaja Rosdakarya.

Lee, T. H., and Han, C. S. (2013). Analysis of working postures at a construction site using the OWAS method. *International Journal of Occupational Safety and Ergonomics*, *19*(2), 245–250. https://doi.org/10.1080/10803548.2013.11076983

Lestari, R., Nur. F., and Mustaniroh, S. A. 2017. Analisis Postur Kerja pada Stasiun Pemanenan Tebu dengan Metode OWAS dan REBA, Studi Kasus di PG Kebon Agung, Malang Working Posture Analysis on Sugar Cane Harvesting Station Using OWAS and REBA,

a Case Study in PG Kebon Agung, Malang. *Jurnal Teknologi Dan Manajemen Agroindustri*, Vol. 5(1):39–45.

Maksuk, Maksuk, Shobur, S., and Habibi, U. (2021). Penilaian Risiko Ergonomi Pada Pekerja Tenun Tradisional di Sentra Industri Tenun. *Jurnal Ergonomi Indonesia (The Indonesian Journal of Ergonomic)*, *7*(2), 95–105. https://doi.org/10.24843/JEI.2021.v07.i02.p02.

Pheasant, S., and Haslegrave, C. 2018. *Bodyspace: Anthropometry, ergonomics and the design of work*. CRC Press.

Ramona, G. 2010. Musculoskeletal Disorders in Agriculture. *Jurnal of Occupational Medicine*, VOL. 2:*235–46*.

Stanton, N., Hedge, A., Brookhuis, K., Salas, E., and Hendrick, H. 2005. *Handbook of Human Factors and Ergonomics Methods*. Prentice Hall of International Series.

Straker, L.M. 2000. *An Overview of Manual Handling Injury Statistic in Ergonomic Methods*. CRC Press.