




Checkpoint ergonomics as a health and safety effort at work among women farmers

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ARTICLE INFO	ABSTRACT
<p>Article history Received: 2023-05-16 Revised: 2023-07-24 Accepted: 2023-08-19 Published: 2023-10-20</p> <p>Keywords Ergonomics Farmers Musculoskeletal Posture Safety</p>	<p><i>PT X is a company that works in the plantation sector, one of which is an orange plantation. In the process of harvesting lime leaves, there are 3 workstations and 4 work activities. Most of the work is done manually with a high workload and repetitive movements, causing musculoskeletal complaints. Workers complain of musculoskeletal disorders while working. During initial observation, there were complaints of pain in the neck, shoulders, arms, waist, thighs, and knees. Based on these problems, this study aims to analyze the factors that cause musculoskeletal disorders in the orange harvesting process. The method used to solve problems with partners is by using an ergonomic checklist and the PATH method to analyze three physical risk factors in the workplace. Based on the results of data processing using the PATH method, it was found that the biggest risk factors for injury were 45.53% soil hoeing, 42.39% harvesting and 12.08% grass cutting. The proposed improvements given after being analyzed using ergonomic checkpoints are: (1) reducing bending or squatting postures; and (2) providing protectors and covers for lawn mowers and handcarts and handles for tools for harvesting oranges. This proposed improvement is in accordance with Sustainable Development Goals number 3, namely Good Health and Wellbeing for all.</i></p>
<p>Kata Kunci Ergonomi Keamanan Muskuloskeletal Petani Postur</p>	<p>Ergonomi checkpoint sebagai upaya kesehatan dan keselamatan kerja pada wanita petani. PT X merupakan perusahaan yang bekerja di bidang perkebunan, salah satunya adalah perkebunan jeruk. Pada perkebunan tersebut, proses pemanenan daun jeruk meliputi 4 kegiatan kerja dengan 3 stasiun kerja. Sebagian besar pekerjaan dilakukan secara manual dengan beban kerja yang tinggi dan gerakan yang berulang sehingga menimbulkan keluhan muskuloskeletal. Pekerja mengeluhkan gangguan muskuloskeletal saat bekerja. Saat observasi awal, ada keluhan nyeri di leher, bahu, lengan, pinggang, paha, dan lutut. Berdasarkan permasalahan tersebut, penelitian ini bertujuan untuk menganalisis faktor-faktor penyebab gangguan muskuloskeletal pada proses pemanenan jeruk. Metode yang digunakan untuk menyelesaikan permasalahan pada mitra yaitu dengan menggunakan <i>ergonomic checklist</i> dan metode PATH untuk menganalisis tiga faktor risiko fisik di tempat kerja. Berdasarkan hasil pengolahan data dengan metode PATH, faktor resiko terbesar untuk cedera terdapat pada kegiatan mencangkul tanah sejumlah 45,53%, pemanenan 42,39% dan pemotongan rumput sebesar 12,08%. Adapun usulan perbaikan yang diberikan setelah dianalisis menggunakan <i>ergonomic checkpoint</i> adalah: (1) mengurangi postur membungkuk atau jongkok, dan (2) memberikan pelindung dan penutup untuk mesin pemotong rumput dan gerobak tangan dan gagang perkakas untuk memanen jeruk. Usulan perbaikan ini sesuai dengan Sustainable Development Goals nomor 3, yaitu Good Health and Wellbeing untuk semua orang.</p>
<p style="text-align: right;">Copyright © 2023, Restuputri, et al This is an open access article under the CC-BY-SA license</p> <div style="text-align: center;">  </div> <p><i>How to cite:</i> Restuputri, D. P., Masudin, I., Wardhana, R. W., Baroto, T., & Arbiatul, A. (2023). Checkpoint ergonomics as a health and safety effort at work among women farmers. <i>Journal of Community Service and Empowerment</i>, 4(3), 581-588. https://doi.org/10.22219/jcse.v4i3.26464</p>	

INTRODUCTION

Work posture is one of the most important factors to be considered in any postural analysis. Awkward, extreme, and repetitive postures can increase the risk of musculoskeletal disorders (Charles et al., 2018). PT. X is a company engaged in the estate (hospitality and villas), annual plant cultivation, annual plant cultivation, industry, and tourism. Human power

plays an important role in the process of cultivating this plant to do several jobs such as tilling the land, sanitation or pest control, harvesting fruit, pruning leaves and wild plants (El-Shafie, 2019). In the industrial world, humans play an important role. If there are no workers, industrial activities will also not run as they should. The problem that occurs is where workers work with less ergonomic work postures. After observing workers in the orange cultivation division, there are 3 activities that are at risk of developing musculoskeletal disorders. Workers complain of musculoskeletal disorders while working. Complaints felt by workers are pain in the neck, shoulders, arms, waist, thighs, and knees. Therefore, it is necessary to improve the work system and identify problems with the posture of workers.

Previously, many researchers conducted research on work posture. For example analyzing the posture of workers using the OWAS (Ovako Work Posture Analysis System) (Kong et al., 2018) and RULA (Rapid Upper Limb Assessment) methods for ceramic process (Rahman, 2014). Besharati et al. (2020) assessed worker posture to evaluate the level of work risk for administrative bureau workers using the ROSA (Rapid Office Strain Assessment) method. Arifin et al. (2020) evaluated the posture of written batik craftsmen using the REBA (Rapid Entire Body Assessment) method for batik workers. Restuputri et al. (2021) analyzed the posture of paving operators using MFA (Muscle Fatigue Assessment) and NERPA (Novel Ergonomic Postural Assessment). The literature review conducted stated that several methods cannot assess the forearm while evidence from epidemiological studies indicates that it is important to assess the forearm in an effort to avoid exposure to musculoskeletal disorders (Pilgihan et al., 2000; Spielholz et al., 2001).

This study proposes several methods in assessing worker posture. As an initial stage of identification where to find out discomfort or pain in the body using a nordic body map. To find out the greatest musculoskeletal risk and assess the systematic relationship between tasks and workers using the PATH (Posture, Analysis, Tools, and Handling) method. PATH, a work sampling-based approach, was developed to characterize the ergonomic hazards of construction and other non-repetitive work (Buchholz et al., 1996). Some research uses PATH to solve and analyze posture problems, for example: Fulmer et al. (2004) analysis of apple harvest work in New York, Beheshti et al. (2016) using PATH for construction workers, and Kucera and Lipscomb (2010) used (PATH) method in small-scale commercial crab pot fishing. According to ergonomics checkpoints, material handling and storage are the worst in Indonesian agriculture, coupled with minimum safety information, toilet and washing facilities, and first aid. The high-risk activities are manual hoe for land clearing, manual plow, grass cutting for land clearing and threshing. The reported MSS mainly found in the shoulder and lower back (Widyanti, 2018). Ergonomic assessment checklist or ergonomic checkpoint is used to assess the risks of workplace injuries associated with ergonomic hazards (Niu, 2010). Some research that used ergonomic checkpoint for solve the problem, for example: Pérez et al. (2021) was improving working conditions using the ergonomic checkpoints tool in a Colombian meat processing plant, Abdollahpour and Helali (2022) implement practical ergonomics knowledge transfer using ergonomic checkpoints to support the participatory ergonomics process in an Industrially Developing Country, and Ahmadi et al. (2017) was using Ergonomic Checkpoints' measures in an assembly and packaging industry. Based on these problems, this study aims to analyze the factors that cause musculoskeletal disorders in the citrus harvesting process so that later suggestions are given according to the ergonomic checkpoint. This proposed improvement will later be in accordance with Sustainable Development Goals no 3, namely Good Health and Wellbeing for all.

METHOD

Ergonomic Checkpoint in agriculture is the result of a collaboration between the IEA (The International Ergonomic Association) and the ILO (The International Labor Organization) (Kawakami & Kogi, 2005). The preparation of these checkpoints is based on good ergonomic practices in agricultural and rural work in both developing and developed countries. These checkpoints are used to check the initial draft and make necessary improvements. The advice provided is based on training experience gained in both developing and developed countries. Corrective action at the workplace can be drawn from the benefits demonstrated by this checkpoint and is based on ergonomic principles that have been tested in the workplace. Ergonomic Checkpoints distributed by the ILO and IEA in 2012, there are 100 clear focus checkpoints, details that are practical, effective, and easy to change according to existing needs in agriculture to increase and reduce accident rates (Kogi et al., 2019). According to (Niu & Kogi, 2012), there are 4 ways to use this checkpoint, namely: (1) Apply the selected checkpoint to the workplace, (2) Design a locally adapted checklist, (3) Make ready-to-use information sheets, and (4) Organize training for planning and implementing workplace improvements.

A fully characterized method of ergonomic exposure in construction work has been developed, this method is named PATH (Posture, Analysis, Tools, and Handling) presented by incorporating the OWAS method into it to make a more comprehensive instrument (Paquet et al., 1999). The activity code includes manual material activities, and hand postures/activities. Lifting, lowering, carrying, moving/placing, and pushing/pulling are classifications of manual material activities in this method (Hajaghazadeh et al., 2012). Hand activity is categorized into rough grip, pinch grip, and empty hand (Torghabeh et al., 2020). The main assumptions underlying the PATH method are that ergonomic exposure is a function of the task and the relative frequency with which the task is required determines the exposure profile for an individual (Beheshti et al., 2016). In the PATH method, tasks are defined as the largest group of activities that are usually carried out together by a worker to achieve a common goal (Hajaghazadeh et al., 2012).

The data needed in this study are: documentation, body position, material handling manuals, weight, length of activity, activities, carrying position, and working altitude. The initial data will be analyzed later by identifying previous methods,

such as the Nordic Body Map (NBM) and PATH (Posture, Activity, Tools, and Handling). The processing stages to be carried out are as follows:

- 1) The first step is to carry out an initial identification by distributing the Nordic Body Map (NBM) questionnaire. Furthermore, the results of each worker's score will be classified according to the level of risk based on the NBM table.
- 2) Determine the stages and process operations of the ongoing work at the site.
- 3) A description of the tasks and activities carried out in each operation by each worker is obtained through worker interviews and direct observation as well as from photo or video documentation.
- 4) Then adjusted to code the tasks, activities, and tools used using the PATH code sheet provided.
- 5) To carry out data collection, observers select a number of workers who perform the same operation.
- 6) Workers are usually followed for 3 or 4 hours during each sampling period (from the start of the shift to the break or from the break to the end of the shift).
- 7) Observations are made at fixed intervals usually of 45 or 60 seconds, 45 seconds being the minimum interval used to maintain reliability.
- 8) After that, tasks involving workers are recorded, along with the data to be processed for each observation, while the calculation formula used for data processing on the PATH code observation sheet is:

$$\text{Data frequency} = \left(\frac{\text{Raw frequency}}{\text{Total number of frequencies}} \right) \times 100\%$$

- 9) Finally processing data using ergonomic checkpoints to provide improvement suggestions.

RESULTS AND DISCUSSION

There are several stages in processing fruit plants so that the plants become fertile and develop well, one of which is cultivating the soil using a hoe. Activities using hoes are used by workers to make partitions on dragon fruit plants so that the roots of the dragon fruit do not appear to the ground. Hoes are also used by workers to clear the land of weeds and when applying fertilizer to plants, in which a little soil is hoed and put on top to prevent the fertilizer from evaporating. These activities that use a hoe will certainly make the worker's posture bend continuously. The PATH assessment for soil digging activity is presented in **Table 1**.

Table 1. PATH assessment for soil digging activities

	Posture Code	Time (second)	Worker 1 (%)	Worker 2 (%)	Worker 3 (%)	Worker 4 (%)	Worker 5 (%)	Worker 6 (%)	Worker 7 (%)
Back	Neutral (< 20°)	60	8.70	20	15.79	10.71	20	16.67	22.73
	Bending 20° – 45°	60	30.43	32	26.32	17.86	30	38.89	31.82
	Bending (> 45°)	60	60.87	48	57.89	35.71	50	44.44	45.45
Arm	Elbows under shoulders/neutral	60	78.26	68	84.21	75	70	88.89	68.18
	Two elbows at/top shoulder level	60	21.74	32	15.79	25	30	11.11	31.82
Leg	Neutral with the bend of the knee < 35°	60	91.30	80	73.68	67.86	65	88.89	68.18
	One/two feet forming an indentation > 35°	60	-	8	-	10.71	-	-	18.18
	Walking/moving	60	8.70	12	26.32	21.43	35	11.11	13.64
MMH	Handling with two hands	-	100	100	100	100	100	100	100
Handling Position	Elbows close to the body	-	82.61	80	89.47	85.71	70	83.33	86.36
	Elbows away from the body	-	17.39	20	10.53	14.29	30	16.67	13.64
Weight	Light (< 4,5Kg)	-	100	100	100	100	100	100	100
Activity	Walking	60	13.04	12	26.32	21.43	20	11.11	9.09
	Neutral	60	82.61	80	52.63	39.29	65	72.22	86.36
	Standing/resting	60	4.35	8	21.05	3.57	15	16.67	4.55
Working height	Below the knee	60	100	100	100	100	100	100	100
	Between knee and waist	60	-	-	-	-	-	-	-
	Above waist height	60	-	-	-	-	-	-	-

Based on **Table 1**, it can be seen that the greatest frequency of back assessment is in the category of very bent posture (> 45°) in Worker 1, namely 60.87%. On average, workers have a greater frequency of very bent postures, which means that workers doing hoeing activities are more dominant in forming a posture > 45°. The greatest frequency in the assessment of the arm is in the category of the elbow being in a neutral position/under the shoulder. This means that workers do more hoeing activities with a neutral arm position. The greatest frequency in assessing the feet is in the category of knees with an indentation < 35°. This means that workers do more hoeing activities with a neutral foot position. All workers hold the load with two hands. The greatest frequency in the assessment of load-carrying positions is in the category

of elbows close to the body. This means that workers do more activities with their elbows close to the body. For the weight of the load used or carried by all workers < 4.5 kg. The greatest frequency in activity assessment is in the moving category. This means that workers carry out more activities in shifting positions. The working height in the work area is below the knee.

At the time the orange harvesting process was carried out by six workers. The harvesting process is done by picking citrus fruits that are ready to be harvested from one tree to another. Picked oranges are collected in small baskets that can hold 12 kg of oranges in one harvest. After that they are collected into bigger baskets with a load range of 38 kg. **Table 2** shows an assessment based on the PATH (Posture, Activity, Tools, and Handling) method for citrus fruit harvesting activities.

Table 2. PATH assessment for harvesting activities

	Posture Code	Time (second)	Worker 1 (%)	Worker 2 (%)	Worker 3 (%)	Worker 4 (%)	Worker 5 (%)	Worker 6 (%)	Worker 7 (%)
Back	Neutral (< 20°)	60	57.14	63	50.00	55.56	58	54.55	57.14
	Bending 20° – 45°	60	28.57	25	33.33	33.33	33	27.27	28.57
	Bending (> 45°)	60	14.29	13	16.67	11.11	8	18.18	14.29
Arm	Elbows under shoulders/ Neutral	60	50	64.29	46.67	43.75	60	50.00	50
	Two elbows at/top shoulder level	60	14.29	28.57	16.67	25.00	10	12.50	14.29
Leg	Neutral with the bend of the knee < 35°	60	33.33	44.44	36.36	40	33.33	30.77	33.33
	Walking / moving	60	66.67	55.56	63.64	60.00	66.67	69.23	66.67
MMH	Descending	-	30.77	31.25	33.33	66.67	14.29	33.33	30.77
	Holding - 1 hand	-	46.15	43.75	44.44	33.33	57.14	42.86	46.15
	Holding - 2 hand	-	23.08	25	22.22	11.11	28.57	23.81	23.08
Handling Position	Elbows close to the body	-	25	63.64	60	58.33	53.85	66.67	25
	Elbows away from the body	-	75.00	36.36	40.00	41.67	46.15	33.33	75.00
Weight	Medium (4.5 – 22.5 Kg)	-	100	100	100	100	100	100	100
Activity	Put the oranges in the basket	60	41.18	42.86	37.50	31.82	30.43	40.91	41.18
	Walking	60	23.53	23.81	29.17	27.27	43.48	31.82	23.53
	Harvesting	60	35.29	33.33	33.33	40.91	26.09	27.27	35.29
Working height	Below the knee	60	-	-	-	-	-	-	-
	Between knee and waist	60	-	-	-	-	-	-	-
	Above waist height	60	100	100	100	100	100	100	100

Based on **Table 2**, it can be seen that the greatest frequency of back assessment is in the category of neutral posture (< 20°) for all workers. The average worker has a greater frequency in neutral postures, which means that workers carry out harvesting activities more dominantly forming neutral. The greatest frequency of arm assessment is in the neutral posture category for all workers. On average, workers have a greater frequency of neutral arm postures, which means workers carry out harvesting activities with one arm above the shoulder. The greatest frequency of foot assessment is in the walking/moving category for all workers. On average, workers have a greater frequency of walking postures, which means workers carry out harvesting activities in a walking or moving position. The greatest frequency in the assessment of the use of manual material handling is in the category of holding with one hand for all workers. On average, workers have a greater frequency of holding with one hand, which means that workers carry out harvesting activities in a holding position with one hand. The greatest frequency in the assessment of the position of carrying the load is in the category of the elbow away from the body in Worker 1 and the other workers in the position of carrying it close to the body. This means that on average workers do more activities with their elbows close to the body. The weight of the load carried by all workers at harvest time is in the range of 4.5 kg – 22.5 kg. The greatest frequency in the activity assessment is in the moving category for Worker 5. This is because there are only a few trees or oranges that can be harvested by workers, so they do more activities in moving positions. The working height in the work area is above waist height.

In the lawn mowing activity, workers cut grass by carrying a lawn mower on their shoulders. The load of the lawn mower that is carried weighs 17.5 kg and the cutting machine handle is 5 kg. This work is carried out by one person and the load is carried during the weed cutting process until it is finished. The PATH assessment for lawn mowing activities is displayed in **Table 3**.

Table 3. PATH assessment for lawn mowing activities

	Posture Code	Time (second)	Worker 1 (%)
Back	Neutral (< 20°)	60	55.17
	Bending 20° – 45°	60	17.24
	Bending (> 45°)	60	27.59
Arm	Elbows under shoulders/neutral	60	100
	One elbow at/top shoulder level	60	-
	Two elbows at/top shoulder level	60	-
Leg	Neutral with the bend of the knee < 35°	60	44.44
	Walking / moving	60	55.56
MMH	Hold with two hands	-	100
Handling Position	Elbows close to the body	-	-
	Elbows away from the body	-	100
Weight	Light (< 4,5Kg)	-	-
	Medium (4.5 – 22.5 Kg)	-	100
	Heavy (> 22.5 Kg)	-	-
Activity	Walking	60	72.73
	Mounting the blade	60	9.09
	Resting / Standing	60	18.18
	Below the knee	60	100
Working height	Between knee and waist	60	-
	Above waist height	60	-

Based on **Table 3**, the greatest frequency of back assessment is in the category of neutral posture (< 20°) in workers. Workers have a greater frequency in neutral postures, which means that workers doing grass cutting activities are more dominant in neutral postures. The greatest frequency of arm assessment is in the category of neutral posture in workers. Workers have a greater frequency of neutral arm postures, which means that workers carry out grass cutting activities with their arms under their shoulders. The greatest frequency of foot assessment is in the walking/moving category of workers. Workers have a greater frequency of walking postures, which means workers carry out grass cutting activities in a walking or moving position. Assessment of the use of manual material handling is in the category of holding with two hands for workers who mow the grass. The greatest frequency in the assessment of the position of carrying the load is in the category of the elbow away from the body. This means that workers do more activities with their elbows far from the body. The weight of the load carried by workers when cutting grass is in the range of 4.5 kg – 22.5 kg. The greatest frequency in activity assessment is in the moving category. This is because when mowing the grass, the workers do it in shifting positions. The working height in the work area is below the knee.

Based on the results of data processing, the percentage of plowing the soil is 46%, the citrus harvesting is 42%, and the cutting of grass is 12%. It means that this activity has the longest time in the process. Based on the PATH method, the risk that has the potential to cause musculoskeletal disorders is the job with the greatest frequency (Beheshti et al., 2016). Therefore, it is necessary to propose improvements in order to minimize the risks that may occur.

Ergonomic Checkpoints distributed by the ILO and IEA in 2012, there are 100 clear focus checkpoints, details that are practical, effective, and easy to change according to existing needs in agriculture to increase and reduce accident rates. The ergonomic checkpoint consists of 10 assessment aspects (Helali, 2009), namely: (1) Material storage and handling with 14 check points; (2) Workstation and tools with 14 check points; (3) Machine safety with 12 check points; (4) Agricultural vehicle with 8 check points; (5) Physical environment with 13 check points; (6) Control of hazardous chemicals with 5 check points; (7) Environmental protection with 6 check points; (8) Welfare Facility with 8 check points; (9) Family and community cooperation with 9 check points; and (10) Work organization and work schedule with 12 check points (Caple, 2010).

There are five aspects of ergonomic checkpoints in this research to propose improvements, with a total of 56 points. There are 17 points that need improvement. Meanwhile, of the 17 points selected that needed to be prioritized, there were 5 points that were prioritized to propose improvements. The following is a proposed improvement based on an analysis using an ergonomic checkpoint checklist on priority points:

- 1) **Checkpoint 4:** Use handcarts, hand trucks and other wheeled devices when transporting materials, tools, and products. In the process of harvesting citrus fruits, workers use small baskets that can hold 12 kg of fruit. Once the contents in the small basket are full, they are transferred to a larger basket. This is of course not efficient. So it is necessary to have a suitable handcart (Kochańska et al., 2023).
Solution: Wheelbarrows and handcarts are particularly suitable when loads have to be moved over terrain and for short distances around farmland (Arabian et al., 2020). Handcarts with sturdy handles transport heavy or large quantities of material. And it's easier to move to the orange shelter.
- 2) **Checkpoint 18:** Change the farm settings in the field to avoid strenuous working postures as much as possible. Farming work in the field is very often done at ground level. This requires farmers to bend forward or squat. Because the work

usually takes a long time, farmers can easily experience back pain and leg muscle fatigue. This pain and fatigue can be prevented, or at least reduced, by introducing arrangements to avoid slouching or squatting postures.

Solution: Tools that are not ergonomically designed will make it difficult for workers to adapt (Gonzalez & Morer, 2016). In this case, it is necessary to replace agricultural tools with long shafts and easy-to-grip handles or hand grips that support high-strength work, namely all fingers gripping the handle, so that work on the ground can be done with a natural standing posture.

- 3) **Checkpoint 20:** *Eliminate work at height or provide a safe and stable platform.* In harvesting activities, workers often climb trees to collect fruit that is on the top branch. This is certainly a risk for workers.
Solution: To eliminate work at height by simple adjustments, such as long tool handles or limiting plant height. By designing ergonomically fit agricultural hand tools farmers could avoid their injuries (Parvez & Shahriar, 2018).
- 4) **Checkpoint 22:** *Choose a work method that alternates standing and sitting, and as much as possible avoid bending and squatting postures.* It is very important to avoid strenuous working postures such as bending and squatting. This posture places tension on the back and causes pain, leaving you prone to mistakes and accidents. Frequent changes in work posture can help prevent tension and pain.
Solution: Minimizing bent posture by using the appropriate tool, if digging or tilling the soil can use a long handle. This can be applied to workers with hoeing activities and with reference to previous research by Purwanto (2013), the use of an ergonomic hoe can enable workers to work in a natural position, thus minimizing the chances of hunchback.
- 5) **Checkpoint 29:** *Purchase a machine equipped with safety guards and necessary precautions.* During grass cutting activities, workers carry a machine weighing 17.5 kg.
Solution: Mowing the grass can use a tool like the picture above, where the mower is lighter, has a good grip, and has a guard around the blade. This will certainly reduce the risk of injury to workers (Nag & Gite, 2020).
- 6) **Checkpoint 30:** *Attach appropriate guards to dangerous moving parts of the machine.* Moving machine parts pose a risk of accidents to workers. As in lawn mowing activities when unprotected, dangerous objects such as sharp objects and hot metal can even fly out of moving parts. A simple, handmade shield can greatly reduce these risks.
Solution: (a) Make covers for the moving parts of the machine. Make covers for the moving parts of the machine. Use available materials such as wood or steel scrap. Choose materials that are strong and durable, and ensure the covers are difficult for children or careless people to remove (Ridley & Pearce, 2006). (b) Covers should be removed for repair and maintenance only by a qualified and experienced person. Follow safe maintenance procedures.

Based on the conclusions that have been described, the research implications are as follows: the results of this study can be used as a reference by the company when it will analyze the work done by farmers, because ergonomics has an important role in work attitude and reduces the level of risk of injury. The results of this study can be used as a reference by future researchers when designing a tool by taking into account ergonomic risks based on the ergonomics checklist. The limitations of this study are the small number of workers, and the data is only taken from one company. For future research, more data can be collected, and data can be classified based on several other categories, for example age, gender, etc.

CONCLUSION

Based on the results of the analysis using the Nordic Body Map questionnaire, it was found that the workers felt the most complaints in the neck, shoulders, arms, waist, thighs, and knees. This is due to work postures that are not ergonomic when working for a long duration. Based on the processing results of the PATH method, the biggest risk factor for injury was found in the activity of plowing the soil by 45.53%, harvesting by 42.39% and cutting grass by 12.08%. Proposed improvements using ergonomic checkpoints are as follows: for hoeing activities, workers should reduce bending or squatting postures. In addition, the equipment needed is equipment with a handle that is easy to grip. For the activity of harvesting oranges, a larger handcart with a long handle is needed so that the workers can pick up oranges easily. Lawn mowing activities require protection and cover for the machine so that workers are safer in mowing the grass. These three proposals are aligned with the goal of Sustainable Development Goals number 3, namely a Good Health and Wellbeing.

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