

Evaluation of Agricultural Work Environment with Ergonomic Checkpoints in Demangan, Siman, Ponorogo

Ratih Andhika Akbar Rahma^{1a♦}, Fahri Cahyo Satria^{1b}, Aisy Rahmania^{1c}, Rindang Diannita^{1d}

Abstract. *An ergonomic checkpoint is a method for evaluating the current work environment and implementing a more suitable work environment. When workers do work activities, the work environment is a critical component. Ergonomics is described as studying human factors in the workplace, including anatomy, physiology, psychology, engineering, management, and design. Based on preliminary observations, several activities allow potential hazards to arise, such as farmers' lack of understanding of Personal Protective Equipment (PPE) when spraying pesticides and farmers' use of t-shirts as a mask. Farmers repeated movements with a bent body position when planting rice seeds, which can cause potential health problems such as musculoskeletal. Using descriptive observational research, this study tries to objectively establish the conditions of the work environment concerning the circumstances. The Ergonomic Checkpoints method was used for data collecting. The results of the work environment assessment using the Ergonomic Checkpoints method in agriculture in Demangan Village revealed that five aspects that required corrective action, consisting of materials storage, and handling, had two points of incompatibility, machine safety had one moment of incompatibility, premises/workspace had one moment of incompatibility, and welfare facility had one moment of mismatch. Farmers in Demangan village should use Ergonomic Checkpoints to pay attention to the work environment in keeping with agricultural standards.*

Keywords: *agricultural, ergonomic checkpoints, work environment*

I. INTRODUCTION

Indonesia is well-known for the diversity of its natural resources, which include forests, fisheries, plantations, animal husbandry, and agriculture. Indonesia is said to as an agricultural country due to its vast natural resources. Agriculture is a critical industry for the economic viability of nations, both established and developing. Tropical climate conditions influence Indonesia's natural resources. Additionally, there is the issue of the potential hazard associated with health problems such as musculoskeletal ailments.

According to International Labor Organization (ILO) figures, the annual death toll

from workplace accidents or occupational diseases will exceed 2.78 million in 2021. Around 374 non-fatal injuries occur each year, resulting in more than four days of missed work. Each year, this harms the economy and workplace health and safety policies. According to World Health Organization (WHO), around 1 billion workers, or almost one-third of the worldwide workforce, lived in poverty in 2014. More than half of the workforce is working in the informal sector in certain countries without access to social protection or health care. Occupational health and safety norms are not rigorously enforced.

Demangan Siman Village is located in Ponorogo Regency, East Java, primarily populated by farmers. Rice and horticulture are the primary crops of Demangan village. Horticultural farmers are plantation crop growers whose activities include sowing, breeding, harvesting, packaging, and distribution. The potential dangers inherent in horticulture farmers' labor processes include the presence of hazards such as chemical hazards from pesticide liquids, biological risks from pest attacks, and physical hazards from tractor engine vibration.

According to initial observations, several activities contribute to the emergence of potential hazards, such as farmers' lack of

¹ Occupational Safety and Health Department, Faculty of Health Science, Universitas Darussalam Gontor, Jl. Raya Siman, Ponorogo, 63471

^a email: ratihandhika@unida.gontor.ac.id

^b email: fahricahyosatria@gmail.com

^c email: aisyrahmania@unida.gontor.ac.id

^d email: rindangdiannita@unida.gontor.ac.id

♦ corresponding author

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understanding regarding the proper use of PPE when spraying pesticides, farmers' use of t-shirts as a mask, and farmers repeated movements with a bent body position during the rice seed planting process, which can result in potential health problem such as musculoskeletal. Most farmers' jobs use their hands, which can cause tiredness; activities involving farmer-owned tractors are conducted twice a year and result in fatigue when operating tractors. Farmers utilize the shoulder of the road in rice fields for resting, eating, and already have a toilet; once the planting activity is through, the owner maintains it foto survive the last living creatures. Because an undesirable work environment can result in possible dangers, it is required to conduct an ergonomic checkpoint assessment (evaluation) of the work environment.

Based on the previous, the researcher wishes to undertake research in Demangan Village, Siman, Ponorogo on "Evaluating the Agricultural Work Environment Using the Ergonomic Checkpoints Method." Compared to past research, the novelty of this research is the subject of investigation, specifically the farmers of Demangan village. As evidenced by the primary analysis, the objects in this study are distinct from those in the prior research. They are using the Ergonomic Checkpoints method that is used explicitly for agriculture.

II. RESEARCH METHOD

This is a descriptive observational study conducted using a quantitative research design. This study aims to describe the working circumstances in a given situation objectively. This study took place in Demangan Village, Siman, Ponorogo, from Januari - March 2022. The agricultural work environment in Demangan Village, Siman, Ponorogo is the focus of this research. This study used Ergonomic Checkpoints to evaluate the current work environment and implement a more suitable work environment. instruments in this study using ergonomic checkpoints, cameras and research stationery. Ergonomic Checkpoints consist of material storage and handling, hand tools, machine safety,

workstation design, lighting, premises, hazardous substances and agents, welfare facilities, and work for organization. Univariate analysis is a technique for studying data on a single variable in isolation of each variable based on descriptive others. Researchers summarize the data collection process by showing the frequency, the highest frequency value, the minimum and maximum values of the research variable.

III. RESULT AND DISCUSSION

Demangan Siman Village is located in the Ponorogo district of East Java and is primarily populated by farmers. Each farmer participates in the Demang Jaya Farmers Group Association (Gapoktan), which comprises five farmer organizations. Demang Jaya Gapoktan has 145 members. Demangan Local possesses Natural Resources and Human Resources (HR), which are underutilized to improve the village community's welfare. The potential of natural resources is seen in the 122 hectares of farmland in Demangan Village, passed down from generation to generation. When yields are considered, soybeans produce the most at 1,433 tons every planting season, rice at 800 tons, corn at 726 tons, and potatoes at 249 tons. Additionally, farmers raise various horticultural crops, including vegetables and fruits. Because an undesirable work environment can result in possible hazards, conducting a work environment assessment (evaluation) is required.

Assessment Results in Agriculture in Demangan Village

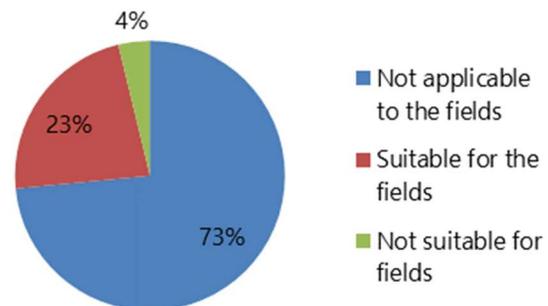


Figure 1. Percentage of Ergonomic Checkpoint

Table 1. Checkpoints for Ergonomic Recapitulation of Observation

No	Aspect	No (questions number)	YES (questions number)	PRIORITY (questions number)	Not Applicable (questions number)
1	Material Storage and Handling	1,2,3,6,14	4,11	4,11	5,7,9,10,12,13,15,16,17
2	Handtools	22,25,28,29	-	-	18,19,20,21,23,24,26,27,30,31
3	Machine Safety Aspect	41	43	43	32,33,34,35,36,37,38,39,40,42,44,45,46,47,48,49,50
4	Workstation Design Improvements	-	-	-	51,52,53,54,55,56,57,58,59,60,61,62,63
5	Lighting	64,67,68	-	-	65,66,69,70,71,72
6	Premises	-	83	83	73,74,75,76,77,78,79,80,81,82,84
7	Hazards of the Work Environment	85,91	-	-	86,87,88,89,90,92,93,94
8	Welfare Facilities	95,96,97,98,100,101,102,105	99	99	103,104
9	Work Organization	106,110,111,114,116,120,130	-	-	107,108,109,112,113,115,117,118,119,121,122,123,124,125,126,127,128,129,131,132

The results shown in Figure 1 show that 132 assessment points provided a summary of the results of the work environment assessment using the Ergonomic Checkpoints method in rural agriculture; 30 assessment points indicated "NO" because the work environment did not conform to the Ergonomic Checkpoints list, and five assessment points indicated "YES" because the work environment did not fit. With the Ergonomic Checkpoints list that might be improved, 97 sub-assessments do not apply to the Ergonomic Checkpoints list in agriculture.

According to Table 1, 97 of the 132 Ergonomic Checkpoints evaluation points cannot be applied in rice fields, 30 are suitable, and five need improvement.

In Table 1, it was discovered that specific points could not be applied to the agricultural work environment in Demangan Village. These aspects are inappropriate because field conditions are not identical to the Ergonomic Checkpoints assessment points, such as indoor work, heavy equipment such as conveyors and forklifts, and work that requires additional lighting such as lamps the use of electrically powered machines. These items are not present in agriculture when Ergonomic Checkpoints with the accompanying question number are used.

Aspects consistent with the Ergonomic Checkpoints evaluation include clear transit

routes, regular equipment inspection, and a preference for natural light sources. They isolate or conceal noisy machines or compondes machines and provide a rest area for farmers.

Furthermore, in Table 1, it is noted which areas of the agricultural work environment in Demangan Village require improvement through Ergonomic Checkpoints with an associated question number. The following areas need improvement:

1. Provide ramps with inclines rather than narrow stairwells or sudden height variations within the workplace.

Sub Aspect 4 in Figure 2 of the Ergonomic Checkpoint list indicates that ramps with tiny stairs of varying heights must be provided in the workplace. The current state of affairs falls short of these criteria. The height difference between the road, the agricultural areas, and the agricultural activities are highly evident, making it difficult for farmers to handle materials and materials. While the height difference is visible, there is no ramp with a ladder to support outdoor activities. Another issue is the lack of ramps with small stairs in the fields; in the image above, you can see the state of the slopes in the areas, which vary in height; the lack of small stairs as a walking aid between the roads and the sites can make it difficult for farmers to perform their daily



Figure 2. Sub Aspect 4 Field Ergonomic Checkpoints



Figure 3. Recommendation for Sub Aspect 4 Improvement

activities. Days in the areas become incompatible with evaluating the work environment, necessitating improvement. Sub-aspect 4 in figure 3 recommendations include providing stairs on the ground with a gradual decline and, if necessary, adding handrails to the stairs to enable field activities and minimize slipping or tripping due to terrible terrain conditions.

2. Manually Transporting Items without Separating Them into Two Halves Using Containers or Trays

The Ergonomic Checkpoint list recommends in Sub Aspect 11 in figure 4 that dividing the burden into lighter packages using containers or trays is required. The current state of affairs does not match these criteria. The load on farmers remains excessive, to the point of posing a risk to farmers. By breaking the weight into smaller packages using containers or trays, the likelihood of a possible hazard happening can be minimized. Another issue is

that the load has not been divided into lighter parcels through containers or trays in agricultural field activities. As seen in the image above, the bag is quite large and has not been divided into smaller parts, making it more difficult for farmers to carry out their daily activities. Days in the fields become incompatible with evaluating the work environment, necessitating improvement. Recommendations for improvement in sub-aspect 11 in figure 5 include developing a similar device large enough to carry two specific loads over a specified distance while maintaining balance and minimizing lifting or lowering work, thereby reducing the risk associated with lifting excessive loads and simplifying work activities.

3. Using Warning Signals that are Simply and Correctly Understood by Farmers

Sub Aspect 43 of the Ergonomic Checkpoints list must present warning indicators that workers quickly and accurately recognize. The current situation does not match these criteria. There are no warning flags or anything of the sort presently. Another issue is that they have



Figure 4. Sub Aspect 11 Field Ergonomic Checkpoints



Figure 5. Recommendation for Sub Aspect 11 Improvements

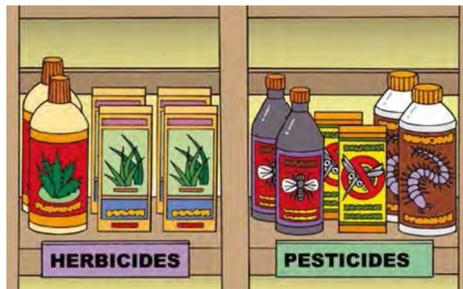


Figure 6. Recommendation for Sub Aspect 43 Improvements



Figure 7. Recommendations for Sub Aspect 83 Improvements



Figure 8. Recommendations for Sub Aspect 99 Improvements

not provided a warning sign of risk when spraying pesticides; this is contrary to the work environment assessment, which indicates that adjustments must be made.

Recommendations for improvement to sub-
aspect 43 in figure 6 include providing a
warning sign containing a brief message
indicating the nature and gravity of the hazard
and what to do or not to do.

4. Indicate Escape Routes and Keep them Clear of Impediments

Sub Aspect 83 of the Ergonomic Checkpoints list states that escape routes must be marked and clear of obstacles. The current state of affairs does not meet these criteria. There is no sign of an escape route in the village of

demangan's rice fields. Another issue is that they have not marked the evacuation route and gathering point in the areas; this is contrary to the work environment assessment and thus requires improvement.

Sub-aspect 83 in figure 7 can be improved by clearly marking the escape route and keeping it clear of obstacles in the demangan village rice fields.

5. Provide a Meeting and Training Facility for Workers

Sub Aspect 99 of the Ergonomic Checkpoints list states that a facility for worker meetings and training is required. The current state of affairs does not meet these criteria. There is no facility for meetings or training, and the workspace does not conform to the work environment assessment, indicating that improvements are necessary.

Sub-aspect 99 in figure 8 recommendations for improvement include providing a meeting and training space with sufficient space and furniture for employees to feel comfortable.

IV. CONCLUSION

The main conclusions from the research are:

1. The results indicated that the results of the work environment assessment using the Ergonomic Checkpoints method in Demangan Village agriculture were known from 132 assessment points; 30 assessment points indicated "NO" because they were by the Ergonomic Checkpoints list, and five assessment points indicated "YES" because they did not come according to Ergonomic Checkpoints list, There are 97 of the assessment's sub-aspects cannot be applied to the Ergonomic Checkpoints list in agriculture.
2. The results indicated five necessary improvements out of 132 assessment points. Materials storage and handling had two points of incompatibility (points 4 and 11), machine safety moment points of incompatibility (point 43), premises had one moment of incompatibility (point 83), and welfare facilities had one incompatible (Point number 99).

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