

Exploring the levels of work fatigue among rice farmers: A Cross-sectional study in an agricultural area

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Abstract:

The agriculture sector plays an important role in a country's economy, and one of the important sectors is food crops such as rice. Agricultural activities can put farm workers at risk of work-related accidents, and one of the factors that influences this is work fatigue. Work fatigue is the body's defense mechanism to reduce more severe damage when someone does excessive activity. This research analyzed work fatigue among farmers in Antirogo village, Sumbersari District, Jember Regency. This research was quantitative descriptive research using a sampling method on 290 respondents. This research was conducted using univariate analysis with frequency distribution. This research collected data using the Swedish Occupational Fatigue Inventory (SOFI) questionnaire. Data collection results showed that the highest result of assessment indicators in the medium category for lack of energy was 68.3%. Exertion of physical exertion was 62.4%, and physical discomfort was 46.6%; the lowest results were found in a mild category: motivation at 89.7% and sleepiness at 60%. The overall results of work fatigue among rice farmers in Antirogo Village are in the medium category of 60%. The bivariate analysis showed a meaningful relationship between the characteristics of the respondents, gender, and working period to the occurrence of work fatigue among rice farmers in Antirogo Village. This research showed that rice farmers experience fatigue influenced by the work environment and having good motivation can reduce fatigue.

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INTRODUCTION

Indonesia is an agrarian country, with most of the population making agriculture their main livelihood, as indicated by rural people whose livelihood is in the agricultural sector (Kühling et al., 2022). Agriculture is important in meeting the country's basic human needs, economic progress, and trade in the long term (Pawlak & Kołodziejczak, 2019). Jember Regency is a city where the agricultural sector is a significant economic contributor, producing food crops, namely rice. To produce good rice production, workers need to take care of them until they are ready for harvest, which is commonly called farm labor (Greco, 2019).

Rice farm workers carry out activities including preparing planting media, plowing rice fields and seedbeds, harvesting, and post-harvest (Paul et al., 2024). Reaching crops suitable for harvest requires technological assistance (Khan et al., 2020). Technology in the agricultural sector has progressed, especially in making the work of farm workers easier (Charania & Li, 2020). In contrast, developing countries like Indonesia still use traditional techniques and tools because they follow the local culture and affordable treatment costs (Sofiyuddin et al., 2021).

Agriculture in developing countries has kept up with developments in its use (De Janvry & Sadoulet, 2020). Some of the modern technologies used are rice field tractors with machines helpful in loosening the soil and threshers, commonly called rice dore, which help release rice from its stalks (Fu et al., 2022). Using these tools can speed up work but also cause health problems caused by vibration and noise in long-term use (Nag et al., 2020). Moreover, the bending position carried out by farm workers in planting or harvesting can cause health problems (Benos et al., 2019). Activities that are repeated in the long term can increase muscle load and provide a sense of fatigue (Boriboonsuksri et al., 2022).

Fatigue decreases physical and mental work capacity, which cannot be recovered by taking a break (Xing et al., 2020). Fatigue is a body protection mechanism that minimizes injuries and helps people recover after rest (Baumert et al., 2021). Fatigue due to work can decrease the welfare, efficiency, work performance, and physical health of the body to the point that it can pose a risk of injury to farm workers (Thorvaldsen et al., 2020). The risk of work fatigue in farmers is caused by several factors, such as slouched working positions, working hours, and lack of rest (Elliott et al., 2022).

Work accidents occur almost daily in Agricultural Indonesia (Maisyarah et al., 2022). Fatigue can cause work accidents (Bendak & Rashid, 2020). The application of occupational health and safety is focused on the formal and informal sectors because, just like in the formal sector, informal activities also include labor, tools, and interrelated work environments (Adei et al., 2021). These elements can cause occupational diseases and accidents if they do not function according to standards (Liu et al., 2019). Occupational accidents are unexpected events with underlying causes (Johnson et al., 2021). One of the causes of work accidents is work fatigue, which can be influenced by internal and external factors (Peng et al., 2020). If the risk factors that cause fatigue are neglected, it can impact worker health and productivity of work results (Magri et al., 2021).

METHOD

The design of this study uses quantitative description. The population in this study is rice farm workers managing rice fields in Antirogo Village, Summersari District. This research was conducted in August 2023. Sampling uses a non-probability sampling technique with the purposive sampling method. Then, the number of rice farm workers was included in the Slovin formula to obtain 290 rice farm workers, which would be the research sample. This study uses the following Inclusion criteria: a) Rice farm workers who actively manage rice fields until post-harvest in Antirogo Village, Summersari District, Jember Regency, b) Rice farm workers classified as productive age workers (15-64 years old). Also included are the following criteria: a) Rice farm workers who cannot read and write, and b) Rice farm workers who refuse to be respondents. The Faculty of Nursing Universitas Jember, Indonesia, ethically approved this study.

Data collection used the Swedish Occupational Fatigue Inventory questionnaire to measure the level of work fatigue in rice farmers. The questionnaire has been translated into Indonesian, and validation and reliability tests have been carried out by previous researchers with a result of 0.91 and a reliability of 0.9 so that it is declared reliable because the value of Cronbach's alpha is ≥ 0.8 (Zuraida, 2015). This study uses univariate data analysis techniques that will be displayed in the form of frequency and percentage, and each indicator on the questionnaire and the characteristics of the respondents will be described to produce a new set of informational data—and bivariate data analysis to determine if there is a significant relationship between respondent characteristics and work fatigue. With the data results, if the p-value < 0.05 , there is a significant relationship between the variables.

RESULT

Univariate Analysis

1. Characteristics of Respondents

Based on the study's results, it was found that the age of rice farmers who became the most respondents was 46 years to 55 years old, with a total of 125 people (43.1%). The frequency of farm

workers based on gender is primarily male, with a total of 185 people (63.8%), and rice farmers, with female gender as many as 105 people (36.2%). The characteristics of the number of hours of sleep show that rice farmers sleep the most for less than 8 hours every day, with a total of 261 people (90%). The length of the rice farm workers' work duration shows the same result, namely 50% work for ≥ 8 hours/day and ≤ 8 hours/day. Most farm workers have worked for > 10 years.

Table 1. Frequency Distribution of Respondent Characteristics

Variable	Frequency (n)	Percentage (%)
Sex		
Female	105	36.2
Male	185	63.8
Age		
17-25 years	1	0.3
26-35 years	15	5.2
36-45 years	65	22.4
46-55 years	125	43.1
56-65 years	65	22.4
> 65 years	19	6.6
Sleep hours		
< 8 hours/day	261	90.0
> 8 hours/day	29	10.0
Working duration		
≥ 8 hours/day	145	50.0
≤ 8 hours/day	145	50.0
Long Tenure		
< 10 years	18	6.2
6-10 years	58	20.0
> 10 years	214	73.8
Total	290	100

2. Fatigue Frequency by Indicator

The study's results show the distribution of the frequency of work fatigue among rice farmers in Antirogo Village, which is displayed according to each assessment indicator. The table shows that out of 290 people, 198 showed moderate energy strength (68%). The indicator of exerting physical energy showed a moderate score with 181 people (62.4%). Furthermore, the physical discomfort indicator gave a moderate result with 135 people (46.6%). Based on the indicator of decreased motivation, the highest measurement results were at a mild level of 260 people (89.7%). According to the sleepiness indicator, the measurements produced the highest score at the mild level of 174 people (60.0%).

Table 2. Frequency Distribution of Work Fatigue Based on Indicators

Indicators of Work Fatigue	Frequency (n)	Percentage (%)
Lack of Energy		
Low (0-10)	8	2.8
Medium (11-20)	198	68.3
High (21-30)	84	29.0
Physical Exertion		
Low (0-10)	71	24.5
Medium (11-20)	181	62.4
High (21-30)	38	13.1
Physical Discomfort		
Low (0-10)	129	44.5
Medium (11-20)	135	46.6
High (21-30)	26	9.0

Indicators of Work Fatigue	Frequency (n)	Percentage (%)
Lack of Motivation		
Low (0-10)	260	89.7
Medium (11-20)	21	7.2
High (21-30)	9	3.1
Sleepiness		
Low (0-10)	174	60.0
Medium (11-20)	104	35.9
High (21-30)	12	4.1
Total	290	100

3. The level of work fatigue of rice farm workers in Antirogo Village

The results of the level of work fatigue in rice farmers in Antirogo Village in 2023 in this study show that out of 290 people as respondents, it can be classified that farmers experience moderate fatigue with a frequency of 174 people (60%).

Table 3. Rice Farm Worker's Work Fatigue Rate

Work Fatigue Levels	Score	Frequency	Percentage
Low	1-50	103	35.5
Medium	51-100	174	60.0
High	101-150	13	4.5
Total		290	100

Bivariate Analysis

1. Relationship between Gender and Age with Rice Farmer Work Fatigue in Antirogo Village in 2023

Based on the results of the data analysis, it is known that the proportion of male rice farmers with the highest level of moderate fatigue is 105 people. Based on the Pearson chi-square statistical test, it was found that the gender of rice farmers had a relationship (p-value <0.05) with the work fatigue of rice farmers in Antirogo Village with p-value = 0.015.

The proportion of rice farmers with an age range of 46-55 years experienced moderate fatigue, which was the most out of the existing age range of rice farmers, which was 84 people. Based on the results of the Pearson chi-square statistical test, it is known that the age of rice farmers has no relationship (p-value >0.05) with work fatigue in rice farmers with p-value = 0.074.

Table 4. The Relationship between Gender and Age with Rice Farmers' Work Fatigue

	Work Fatigue Levels			Total	p-value
	Low	Medium	High		
Gender					
Female	36	69	0	105	0.015
Male	67	105	13	185	
Total	103	174	13	290	
Age (Years)					
17-25	1	0	0	1	0.074
26-35	5	10	0	15	
36-45	32	29	4	65	
46-55	38	84	3	125	
56-65	24	37	4	65	
>65	3	14	2	19	
Total	103	174	13	290	

2. Relationship between Sleep Hours, Work Duration, and Work Duration with Rice Farmer Work Fatigue in Antirogo Village in 2023

Based on the results of data analysis, it was found that the proportion of rice farmers with sleep hours < 8 hours/day more often experienced moderate category work fatigue. According to the

Pearson chi-square test results, sleep hours have no relationship ($p\text{-value} = >0.05$) with rice farmers' work fatigue with $p\text{-value} = 0.577$. The characteristics of the respondents of the working duration of rice farmers were obtained as a result that farmers with a working duration of <8 hours/day were more likely to experience moderate category work fatigue. Based on the analysis test results in this study, there was no significant relationship ($p\text{-value} = >0.05$) between work duration and work fatigue of rice farmers, with $p\text{-value} = 0.631$. The proportion of rice farmers who have worked for >10 years more often experience work fatigue in the medium category, which is 138 people. Based on the results of the chi-square test of working length, there was a significant relationship ($p\text{-value} <0.05$) with the work fatigue of rice farmers in Antirogo Village with a $p\text{-value} = 0.003$.

Table 5. Relationship between Sleep Hours, Work Duration, and Work Period with Rice Farmer Work Fatigue

	Work Fatigue Levels			Total	p-value
	Low	Medium	High		
Sleep Hours (hours/day)					
<8	91	159	11	261	0.577
>8	12	15	2	29	
Total	103	174	13	290	
Work Duration (hours/day)					
<8	48	91	6	145	0.631
>8	55	83	7	145	
Total	103	174	13	290	
Work Period (years)					
< 6	9	9	0	18	0.003
6-10	31	27	0	58	
>10	63	138	13	214	
Total	103	174	13	290	

DISCUSSION

Univariate Analysis

1. Characteristics of Respondents

Gender

The gender ratio of respondents shows that men mostly employ workers in agriculture. The reason was that physically, men have a more significant body, muscle mass, and energy than women, so in the agricultural sector, men do it (Daum & Birner, 2021). Researchers assume that workers in the agricultural sector are primarily male because they have greater physical strength than women.

Age

The age category of farmers in Antirogo Village, Jember Regency, is the most 46 to 55 years old. In this age phase, farmers are at a productive age where experience and work productivity are related to age. As workers get older, the experience they have in their field will increase. Still, older workers get lower productivity because their physical skills are weak and limited (Rigg et al., 2019). Based on this description, researchers can conclude that the age of rice farmers can affect their level of work experience. The older the farmer, the more experience in agriculture is obtained. Farmers also have experience using machine technology for agriculture, which can increase the productivity of farmers' work.

Number of Hours of Sleep

The characteristics of the number of hours of sleep in the study's results show that as many as 90% of farm workers sleep for less than 8 hours per day on average. Sleep is a physiological need by the body so that the body can recover the energy that has been used when working (Baranwal et al., 2023). In farm workers, the result of rest hours is less than 8 hours daily. The results of interviews with respondents found that not a few farmers have double jobs, so farmers have to divide their time every day. According to the statement, the researcher assumes that the delay in the

rest phase of rice farming can be caused by farmers having to complete work in the rice fields, which are adjusted by the land area. The more land area is worked on, the longer the farmers work in the rice fields.

Work Duration

Based on the data from the study, it is known that the duration of work in rice farmer respondents in Antirogo Village is that there are farmers with a working duration of less than 8 hours and more than 8 hours for one day. Workers work for a maximum of 8 hours every day. These hours include rest time (Foster & Rosenzweig, 2022). According to this description, the researcher thinks that rice farm workers in Antirogo Village have an equally divided work duration, which is less than 8 hours and more than 8 hours, and excessive work duration can reduce farmers' work productivity.

Length of Service

Rice farm workers in Antirogo Village show that 73.8% have worked as farmers for more than 10 years. Most farmers work for more than 10 years, and the longer a person works in agriculture, the more it can benefit the quality of the work. So, the longer the farmer's working period, the more agricultural knowledge and skills are obtained to facilitate work and increase productivity (Giller et al., 2021). However, the longer the working age is, the more accumulated energy used can cause health problems due to the decrease in energy used in the long term.

2. Analysis of Work Fatigue Levels in Rice Farmers

The results of the univariate analysis showed that farmers were categorized as having a moderate level of work fatigue in 174 respondents (60%). The level of fatigue is felt in the somewhat severe category, where the cause of fatigue is a high workload (Dolbec et al., 2023). The work management by rice farm workers in Antirogo Village is quite good, and the rest period is reasonable. The study results also show that factors affect the work fatigue level in farm workers in Antirogo Village.

Lack of energy

The study results showed that most % of the respondents in Antirogo Village on the lack of energy indicator were in the medium category, namely 68.3%. Farmers work outdoors, require energy to operate farm tools, and have a less ergonomic working position, so it can cause a feeling of fatigue quickly and can result in work injuries due to fatigue. Rice farmers have work activities carried out daily with less ergonomic working positions, and having short breaks can increase energy use while working (Benos et al., 2019).

Physical exertion

The study results show that rice farmers in Antirogo Village, in terms of the physical exertion indicator, are in the medium category, which is 62.4%. Production workers felt complaints due to work demands and the hot workplace temperature, which made them uncomfortable at work. Rice farm workers said they sweat daily, and their breath is short when the dry season arrives because farmers have to take water from the river for plant seed nutrition. So, the work environment, length of working time, and hot climate influence the onset of fatigue (Carter et al., 2019). The way to reduce fatigue risk in this dimension is to use personal protective equipment from the hot sun and immediately rest when tired.

Physical discomfort

The study results showed that rice farmers in the physical discomfort indicator were in the medium category (46.6%). This section assesses the symptoms felt in the form of stiff muscles, stiffness in the joints, cramps at several points, and body pain. According to the interview results, rice farm labor activities include planting rice seeds and cultivating the land so that it is ready to be planted for seedlings. In inland cultivation, farmers need tools such as rice field tractors to change the texture of the soil. Then, they irrigate the land, plant rice seeds, fertilize, and enter the harvest and post-harvest period. These activities can cause workers to feel tired because they work monotonously. Physical discomfort can be caused by work activities that are monotonous and repetitive for an extended period (Mekonnen et al., 2020). This study showed that most patients felt cramps at several points, and the body felt pain after work. Farmers have a good physical condition even with repeated agricultural activities. Because the body has become accustomed to physical activity in agriculture, in this assessment, muscle cramps rarely occur after work.

Lack of motivation

Based on research on rice farmers in Antirogo Village, Jember Regency, the lack of motivation indicator is in the mild category (89.7%). Rice farmers in Antirogo Village have an excellent work spirit and work motivation, where the role of the family is very influential in motivating farmers. When farmers have good enthusiasm and motivation, they can produce good work behavior, and work can be completed on time. Good farmer motivation is due to the encouragement to carry out planting activities to meet needs, which include basic needs, a sense of security, love, appreciation, and self-actualization to continue working as farmers (Meierová & Chvátalová, 2022). Rice farmers in Antirogo Village have an excellent work spirit and work motivation, so they have enthusiasm and motivation to produce good work behavior and complete their work on time.

Sleepiness

The research on rice farmers showed that the sleepiness indicator was in the mild category (60%). Fatigue is the body's response to the activities and exposures received; when the body does activities for 8 hours or more, the body is susceptible to fatigue.

Regarding the feeling of sleepiness, according to the research results, most rice farm workers in Antirogo Village said that drowsiness when working is rarely felt. Drowsiness and yawning often occur when farmers finish work, but not a few farmers feel the symptoms of fatigue that appear namely unfocused and glowing vision. Fatigue can occur due to various factors in the workplace and the main factors concerned, such as the length of work in a day and the presence of sleep or rest disturbances (Bauerle et al., 2022). For rice farmers in Antirogo Village, drowsiness is mild. Farmers who work have a good circadian rhythm so that they do not feel sleepy and are influenced by consuming coffee to stay awake.

Bivariate Analysis

Based on the analysis test results, it was found that in rice farmers in Antirogo Village, as many as 105 farmers of the male gender have a moderate level of fatigue. Still, some farmers have a high level of fatigue. According to the analysis, there is a relationship between genders affecting the level of work fatigue of rice farmers. If the level of work fatigue is compared with that of female farmers, the results are obtained that as many as 69 rice farmers experience work fatigue in the medium category. The study finding was in line with previous research, which shows a relationship between gender and the level of work fatigue in rice farmers (Lestari et al., 2021). The level of work fatigue in farmers of both male and female genders differs due to different workloads. Male farmers have a higher level of fatigue because the work they receive is quite heavy, such as plowing rice fields using modern tractors with vibrations that can cause fatigue, performing maintenance on rice plants, and lifting crops. In this case, it is hoped that rice farmers and health workers can carry out early detection to prevent work accidents in the informal sector.

The characteristics of age respondents are divided into five categories. The age division in the study stated that the more vulnerable a person's age is, the more likely it is to experience work fatigue. According to the results of the characteristics of the respondents by age, it was found that farmers at the age of 46-55 years experienced work fatigue in the moderate category the most than other age categories, with the results of the chi-square test obtained that there was no relationship between age and work fatigue.

Characteristics based on rest time with work fatigue showed that as many as 159 farmers experienced fatigue in the moderate category with a rest length of <8 hours/day. However, some farmers experience a high category of work fatigue when the rest period is <8 hours/day. Moreover, according to the test results of the analysis, there was no relationship between the length of stay and fatigue of rice farmers. Treatments that can reduce the accumulation of work fatigue are by ensuring the adequacy of sleep and rest time; the standard rest time needed by adults is not less than 8 hours per day, and the minimum adequate sleep time is not less than 6 hours per day (Steffey et al., 2023). The results of interviews with rice farmers in Antirogo Village showed that most farmers stated that they were used to the rhythm of working as rice field workers, so that when they rested, they did not need much time, and the fatigue felt was also not great because of the feeling of great responsibility to manage the rice fields until harvest. Based on this statement, rest time does not affect rice farmers' work fatigue in Antirogo Village.

Based on the results of the analysis, it was found that the length of work or duration of work in one day of rice farmers in Antiogo Village showed that farmers with a working duration of less than 8 hours per day experienced fatigue in the medium category, and through the relationship test, it was found that there was no relationship between the incidence of work fatigue and the length of work of farmers per day. In rice farmers in Antiogo Village, a few farmers also experience fatigue in the moderate category because they work >8 hours per day. According to the results of interviews with rice farmers, it was found that in addition to cultivating rice fields, some farmers also have other jobs. Farmers also said that in one working day, if not during harvest, they monitor the land in the morning and evening. So, the length of work of farmers is more in the medium category because the monitoring is carried out twice a day.

Based on the results of statistical tests, it is known that as many as 138 rice farmers have experienced work fatigue in the medium category for more than 10 years of work. Based on the results of the relationship analysis, it is known that there is a meaningful relationship between the incidence of work fatigue and the length of work or working period of rice farmers in managing the land. The incidence of work fatigue with long working hours in rice farmers is caused by rice farmers consistently doing their work, which causes the body to continue working for many years, which makes rice farmers effective in experiencing work fatigue. So, the more often and longer farmers work, the more it affects the work fatigue that accumulates in the body.

CONCLUSION

Rice farm workers in Antiogo Village have a moderate level of work fatigue. However, some factors affect work fatigue in farm workers. These factors can be assessed or observed through subjective assessment. These factors include the assessment of lack of energy, physical exertion, physical discomfort, lack of motivation, and sleepiness. It is hoped that farm workers will continue to maintain time management and rest and improve to maintain personal and family health.

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