Job Demands and Performance Among Oil Palm Harvesters: Testing Work Stress Mediation

Mohammad Abiyyu Rendragraha[1*], Endang Parahyanti[2]
Fakultas Psikologi, Universitas Indonesia
Mohammad.abiyyu@ui.ac.id[1], endang.parahyanti@ui.ac.id[2]*

Abstract
This study examined whether job demands predict job performance among oil palm harvesters and whether work stress mediates this relationship from the job demands–resources (JD-R) perspective. A cross-sectional correlational survey was conducted with 215 oil palm harvesters at PT X, Central Kalimantan. Data were analyzed using structural equation modeling (SEM) with the maximum likelihood (ML) estimator in JASP, including an indirect-effect test for mediation. Job demands did not significantly predict work stress (β= 0.072; p= 0.350), and the indirect effect through work stress was not significant (β= −0.016; p= 0.363). Job demands positively predicted job performance (β= 0.650; p< 0.001), whereas work stress negatively predicted job performance (β= −0.514; p< 0.001). In this plantation context, job demands appear to function more as performance-relevant (challenge-like) requirements rather than stress-inducing burdens, whereas work stress, when present, remains detrimental to performance. The study is limited by cross-sectional self-report data from a single firm and an all-male sample, and job resources were not measured. Nevertheless, it clarifies a non-mediated pathway and points to strengthening resources and stress management as targeted levers for sustaining performance.

Keywords: *Job Demands–Resources (JD-R) Model, Job Demands, Job Performance, Oil Palm Harvest Workers, Work Stress Mediation Test*

1. INTRODUCTION

At PT X, oil palm harvesting requires workers to achieve daily targets for fresh fruit bunches (FFB) while contending with time constraints, physical exertion, and variable field conditions. Workers are required to cut bunches and fronds, transport loads, and uphold quality standards, all while adhering to safety and operational protocols (Carmenta et al., 2021; Dhandapani & Evers, 2020; Ng, Chen, Ng, Lin, & Kuar, 2017).

The conditions described pertain to job demands, which can influence both performance and stress levels. According to the Job Demands–Resources (JD-R) model, job demands may detrimentally affect well-being through a health impairment process. However, certain demands can also be perceived as challenges that enhance effort and performance contingent on the design and support of the work environment (Bakker & Demerouti, 2017; Bakker, Demerouti, & Sanz-Vergel, 2023; LePine, 2022; Podsakoff, Freiburger, Podsakoff, & Rosen, 2023; Scholze & Hecker, 2024).

In this study, we examined the demand–stress–performance mechanism because the available survey instrument assessed job demands, work stress, and job performance but did not encompass job resources (e.g., autonomy, supervisor support, and equipment adequacy). Consequently, resources were considered unobserved background conditions and are explicitly discussed as limitations and directions for future research.

Empirical evidence regarding the relationship between demand, stress, and performance is inconclusive, particularly in physically demanding occupations. While work-related stress is generally linked to diminished performance, high performance targets may also lead to increased output when workers perceive demands as attainable and meaningful. Consequently, it is crucial to investigate whether work stress serves as a mediating mechanism connecting demands to performance in the context of oil palm harvesting (Abdelmoteleb, 2019; Alsolais et al., 2021; Faeni, Puspitaningtyas, & Safitra, 2021; Garibaldi & Hayati, 2022; Putry & Hamsal, 2024; Shukla, Gajpal, Jha, & Mitra, 2020; Triatmaja, Nelwan, & Lengkong, 2022; Udodiugwu, 2024; Zaskia, Sukri, & Basir, 2025).

Therefore, this study examines the relationship between job demands, work stress, and job performance among oil palm harvesters at PT X, Central Kalimantan, using structural equation modeling. Specifically, it tests (1) whether job demands predict work stress, (2) whether job demands

predict job performance, (3) whether work stress predicts job performance, and (4) whether work stress mediates the relationship between job demands and job performance.

2. LITERATURE REVIEW

2.1 Job Demands–Resources (JD-R) Framework

The Job Demands–Resources (JD-R) framework provides a robust theoretical foundation for explaining how working conditions shape employee well-being and performance, particularly in high-intensity occupations such as nursing. The JD-R model posits that every job contains demands and resources, and that employee outcomes are determined by the balance between these two categories. Recent evidence in Indonesia also uses organizational practices and psychosocial safety climate to explain work engagement outcomes in ways that align with JD-R logic (Larasandi & Satrya, 2025). In this study, the JD-R framework was used primarily through its health impairment process, which explains how excessive job demands consume physical and psychological energy, create strain, and ultimately undermine work outcomes (Bakker & Demerouti, 2017; Bakker et al., 2023). This pathway is especially relevant in labor-intensive contexts, where workers face sustained physical exertion, time pressure, and operational uncertainty. Within this logic, job stress is positioned as the key psychological mechanism linking job demands to job performance because stress represents the strain response that emerges when demands exceed the worker's capacity and available support.

Critical synthesis in oil palm harvesting. In oil palm harvesting, the JD-R balance is shaped by the distinctive nature of plantation work: performance is assessed through tangible daily outputs and SOP compliance, while the work environment simultaneously exposes workers to physical load, time pressure, and environmental uncertainty. This context matters because job demands may operate simultaneously in two ways. First, they can activate the JD-R health impairment mechanism (demands → stress/strain → reduced performance) when demands exceed coping capacity and recovery times. Second, demands may also function as "performance-relevant requirements" that push output (e.g., quota completion and speed) when workers perceive the demands as manageable and aligned with their incentives and operational routines. Therefore, applying the JD-R model to oil palm workers requires explicitly testing both the direct pathway from job demands to performance and the indirect pathway through work stress, rather than assuming a single uniform effect of demands.

2.2 Job Demands

Job demands are generally characterized as elements of a job that necessitate sustained effort and are linked to physiological and psychological costs. In high-intensity work environments, these demands extend beyond the mere volume of work to encompass the challenges of completing tasks under time constraints, precision requirements, and environmental exposure (Hart, Gilstrap, & Bolino, 2016). Within the context of oil palm harvesting, demands manifest concurrently as a physical workload, time pressure, and task complexity (Narundana & Hendri, 2017). Physical workload involves continuous manual exertion, repetitive movements, and endurance requirements; time pressure involves strict harvesting windows and daily targets that must be achieved within a limited timeframe; and task complexity involves the necessity for accuracy, adherence to operational standards, and the ability to maintain performance in challenging terrain and weather conditions (Guan & Frenkel, 2019). These dimensions of demand align theoretically with the JD-R model, as they represent ongoing energy expenditures that can induce strain and diminish effectiveness when elevated (Bakker & Demerouti, 2017; Scholze & Hecker, 2024). In this study, job demands are conceptualized as a latent construct, reflected by indicators capturing perceived physical burden, time pressure, and task difficulty in plantation harvesting work. Based on this definition, we examined whether increased job demands elevate work stress (H_1) and directly predict performance (H_2).

Linking demands to stress and performance (synthesis). For oil palm harvesters, the same demand that improves measurable output can also accumulate fatigue and emotional stress. For example, quota pressure and speed requirements may increase daily productivity and procedural compliance in the short run; however, sustained exposure without sufficient recovery can elevate

strain and weaken attention, accuracy, and willingness to contribute to contextual performance. This means that job demands cannot be interpreted only as "bad" or only as "motivating" in plantation work; instead, their effect depends on whether the demands translate into stress responses that impair functioning, which is precisely why work stress must be modeled as a psychological mechanism within the JD-R logic.

2.3 Job Stress

Job stress is conceptualized as a negative psychological condition arising when employees perceive an inability to adequately manage work-related pressures. Stress emerges not merely from demanding work but from the persistence of such conditions, coupled with limited control, insufficient recovery, or inadequate resources to mitigate the strain. Within the JD-R framework, job stress is directly associated with the health impairment pathway: heightened demands deplete energy, increase fatigue, and induce psychological pressure, manifesting as stress responses (Bakker & Demerouti, 2017; Bakker et al., 2023). Operationally, job stress is typically assessed through perceptions of tension, worry, fatigue, emotional exhaustion, or feelings of being overwhelmed by job demands. In SEM, job stress can be specified as a reflective latent variable, indicated by workers' self-reports of psychological strain and their perceived inability to manage pressure (Mao, Fang, Jiang, & Wu, 2026). Consequently, the present study conceptualizes job stress as a construct reflected by indicators of perceived pressure, persistent fatigue, and difficulty in maintaining calmness and focus while performing work duties. Thus, work stress is anticipated to reduce performance (H_3) and mediate the demands–performance relationship (H_4).

Stress is a plausible mediator among palm oil workers**.** Oil palm harvesting requires sustained attention and physical coordination to maintain output quality and safety while working under time constraints and uncertain field conditions. When stress increases, workers may experience reduced concentration, faster fatigue, and lower emotional regulation, which are likely to harm not only core task execution (e.g., consistent target achievement) but also contextual performance (e.g., helping coworkers, maintaining paths, and responding effectively to operational disruptions such as fires). Therefore, stress is theoretically positioned not merely as an outcome of demands but as a mechanism through which demanding plantation work can translate into performance deterioration.

2.4 Job Performance

Job performance is a pivotal outcome variable in organizational research and is typically defined as the degree to which employees fulfill expected work outcomes and contribute to organizational effectiveness. It is conceptualized as a multidimensional construct encompassing both task and contextual performance. Task performance pertains to the effectiveness with which employees execute core job responsibilities, whereas contextual performance involves discretionary behaviors that support the organizational environment and facilitate efficient work completion (Çalışkan & Köroğlu, 2022; Scholze & Hecker, 2024). The harvesting context is particularly pertinent to this distinction, as workers must achieve quantitative outputs while engaging in behaviors that maintain workflow continuity and operational readiness (Yantri, Windayati, & Onoyi, 2023). From a measurement perspective in SEM, job performance can be modeled as a reflective construct indicated by the perceived achievement of targets, quality of output, timeliness, and consistency in completing assigned duties (Pramudita, 2025). When contextual behaviors are included, performance indicators may also encompass willingness to contribute beyond formal duties, cooperation, and proactive support, which enhances operational outcomes. In alignment with the applied focus of this study, job performance is treated as a latent construct reflected by indicators representing perceived effectiveness in completing work to standards, meeting work expectations, and sustaining reliable performance under demanding conditions (Çalışkan & Köroğlu, 2022; Pletzer & Abrahams, 2025). These considerations motivated the examination of the direct effect of demand (H_2) and the negative effect of stress (H_3) on performance.

In the oil palm industry, job performance is shaped by the tension between production-driven demands and human energy limits. Job demands may raise performance when workers mobilize efforts to meet quotas and maintain SOP compliance; however, stress can simultaneously act as a

performance inhibitor by reducing attention, endurance, and willingness to engage in contextual behaviors. This dual logic implies that (a) job demands may show a direct association with performance (particularly task performance), while (b) work stress is expected to show a negative association with performance and potentially transmit part of the effect of demands on performance. Testing both pathways is essential to avoid oversimplified conclusions such as "demands always reduce performance" or "demands always improve performance," especially in labor-intensive plantation settings.

2.5 Hypotheses Development

2.5.1 Job Demands and Job Stress

The JD-R model provides a clear theoretical explanation for why job demands increase stress. When job demands are high, workers must exert greater physical and mental efforts to meet the requirements. This sustained effort accelerates energy depletion and increases the likelihood of strain, particularly when workers have limited recovery time or insufficient support from their supervisors. The health impairment process explicitly predicts that high demands deplete resources and produce psychological fatigue and stress responses (Podsakoff et al., 2023; Rai & Chawla, 2022). In high-intensity work, this logic is amplified because demands tend to cluster, as physical fatigue is accompanied by time pressure, environmental risks, and performance accountability. Accordingly, the proposed model expects a positive relationship between job demands and job stress. Therefore:

H_1 states that job demands positively influence job stress (Bakker & Demerouti, 2017).

2.5.2 Job Demands and Job Performance

The relationship between job demands and job performance is theoretically complex because job demands may function differently depending on whether they are experienced as challenges that energize effort or hindrances that obstruct goal achievement. Under certain conditions, demands can motivate employees to focus, increase their efforts, and enhance their productivity, especially when resources are sufficient to support goal attainment, which aligns with the challenge–hindrance view of demands (LePine, 2022; Podsakoff et al., 2023). However, the JD-R framework emphasizes that demands become harmful when they exceed coping capacity and are not balanced by adequate job resources. In labor-intensive settings with limited technological support and persistent physical strain, demands are more likely to operate as hindrances that reduce performance and sustainability over time. Accordingly, this study tested the direct effect of job demands on employees' job performance. Therefore:

H_2: Job demands influence job performance (LePine, 2022; Podsakoff et al., 2023).

2.5.3 Job Stress and Job Performance

Job stress is expected to negatively affect job performance because stress impairs cognitive functioning, reduces attentional control, decreases motivation, and increases fatigue. When workers experience prolonged stress, they are more likely to struggle with concentration, decision quality, and the consistent execution of tasks, which reduces their effectiveness and increases the probability of errors. Stress-related strain can diminish the capacity to sustain effort and weaken both core task execution and supportive behaviors that facilitate organizational functioning. This logic aligns with the evidence that stress undermines individual functioning and reduces performance outcomes (Rai & Chawla, 2022). Therefore:

H_3: Job stress negatively influences job performance.

2.5.4 Mediation of Job Stress

The central theoretical contribution of this model is to specify job stress as a mediator in the relationship between job demands and job performance. Mediation is expected because job demands do not necessarily reduce performance directly in all contexts; rather, demands influence performance through psychological mechanisms that determine whether workers can sustain effective work functioning. When demands increase, workers experience higher strain, which impairs their performance. This is consistent with the JD-R health impairment pathway, in which demands

affect outcomes via negative psychological states (Bakker & Demerouti, 2017). Empirical work also supports this logic by showing that high demands contribute to stress, and stress, in turn, predicts poorer performance outcomes, implying that the indirect pathway can be stronger and more stable than the direct effect. Evidence that job stress transmits the influence of job demands on performance reinforces the relevance of the mediation model (Shukla et al., 2020). Therefore:

H4: Job stress mediates the relationship between job demands and job performance (Bakker et al., 2023; Shukla et al., 2020).

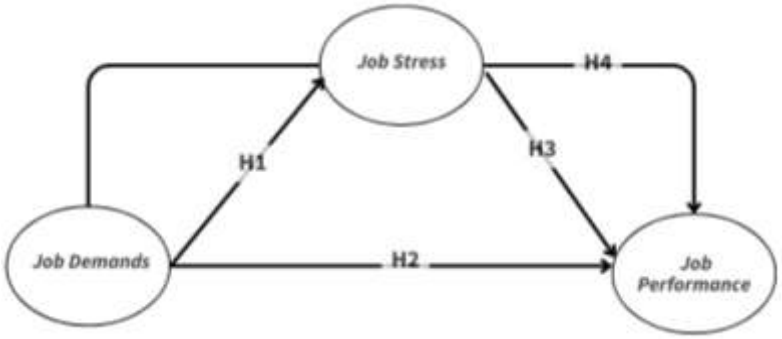

Figure 1. Conceptual framework

Figure 1 presents a JD-R-based conceptual model explaining how job demands shape job performance among oil palm harvesters through both direct and indirect strain pathways. In the JD-R health-impairment process, job demands, such as a heavy physical workload, time pressure, and emotion regulation during field challenges, require sustained effort and accelerate energy depletion. When demands remain high and recovery or resources are limited, workers are more likely to experience psychological strain and stress. Therefore, H_1 proposes that higher job demands increase work stress because persistent exertion and pressure in physically intensive plantation work elevate fatigue, tension, and perceived inability to cope (Bakker & Demerouti, 2017; Bakker et al., 2023; Podsakoff et al., 2023; Rai & Chawla, 2022; Shukla et al., 2020).

3. METHODOLOGY

This study employed a correlational quantitative design to examine the relationships among job demands, work stress, and job performance among oil palm harvesting workers, guided by the job demands–resources (JD-R) model. From an applied perspective, this study aims to generate practical recommendations for human resource management in plantation settings, particularly for managing work stress and sustaining employee performance.

The population comprised all harvest workers employed by PT X in Central Kalimantan, Indonesia (N = 750). The minimum sample size was estimated using G*Power for path analysis, with a medium effect size ($f^2 = 0.15$), $\alpha = 0.05$, and statistical power = 0.95, resulting in a minimum requirement of 138 respondents. To increase statistical robustness and reduce the risk of underpowered estimation, a larger final sample of 215 respondents was used. Respondents were selected using purposive (criterion-based) sampling because participation required specific job characteristics relevant to the research model. The inclusion criteria were as follows: (1) active employment as an oil palm harvest worker at PT X, (2) a minimum tenure of six months to ensure sufficient job exposure and adaptation to routine demands, and (3) active involvement in core harvesting duties (FFB cutting/collection) as well as field-related supporting tasks such as fruit transport to collection points and clearing harvesting paths. Workers who did not meet these criteria or who were not actively engaged in harvesting during the data collection period were excluded.

The research instrument was developed based on the JD-R framework and adapted to the context of oil palm harvesting. The questionnaire consisted of three constructs: job demands, work stress, and job performance, which were measured on a five-point Likert scale. Job demand items captured quantitative workload, time pressure, and emotional demands; work stress items reflected psychological pressure and emotional exhaustion; and job performance items covered task and

contextual performance. Prior to the main survey, content validity was strengthened through readability testing and expert judgment to ensure item clarity, relevance, and contextual appropriateness for harvest workers. A pilot test was conducted with 40 respondents to evaluate the initial internal consistency, producing Cronbach's alpha values above 0.80 for all constructs, indicating strong preliminary reliability.

Primary data were collected online via Google Forms following the acquisition of informed consent and the securing of ethical approval from the relevant institution. The survey link was disseminated through the company's field coordination channels, such as supervisors, foremen, and worker communication groups, to facilitate participation at various work sites. Owing to the absence of a comprehensive distribution log, the precise response rate could not be determined; this is acknowledged as a limitation of the study.

Data analysis was conducted using structural equation modeling (SEM) with the maximum likelihood (ML) estimator in the latest version of JASP. Prior to hypothesis testing, the measurement model was evaluated for validity and reliability. Convergent validity was assessed through standardized factor loadings, whereas internal consistency was evaluated using Cronbach's alpha and composite reliability. Discriminant validity was examined to ensure that each construct represented a distinct concept. Upon confirmation of measurement quality, the structural model was estimated to test direct effects and the proposed mediation mechanism. Mediation was assessed using bootstrapped indirect effects and confidence intervals to evaluate whether work stress mediated the effect of job demands on job performance within the job demands-resources (JD-R) framework.

4. RESULT AND DISCUSSION

4.1 Respondent Profile

This study involved 215 oil palm harvest workers employed by PT X, an oil palm plantation company in Central Kalimantan Province, Indonesia. The respondents were selected using purposive sampling based on two inclusion criteria: first, they had to be actively employed as harvest workers for at least the past six months; second, they had to be directly involved in field harvesting activities, including additional duties such as transporting fruit, clearing harvesting paths, and cleaning harvesting areas. A detailed overview of the frequency and percentage distribution of the respondents' characteristics is presented in Table 1.

Table 1. Respondent characteristics by frequency and percentage

Variables	Category	Frequency (n)	Percentage (%)
Gender	Male	215	100
Age	< 25 years	8	3.7
	25–34 years	34	15.8
	35–44 years	106	49.3
	> 45 years	67	31.2
Tenure	< 1 year	4	1.9
	1–3 years	14	6.5
	4–6 years	67	31.2
	> 6 years	130	60.5
Employment status	Contract/Daily worker	215	100
Education	Primary school	104	48.4
	Junior high school	55	25.6
	Senior high/vocational	56	26

As shown in Table 1, all respondents were male (100%), reflecting the typical workforce composition in oil palm harvesting, where work demands are highly physically intensive. Regarding age, most respondents were in the 35–44 age group (49.3%), followed by those aged over 45 years (31.2%), indicating that the sample largely consisted of mature workers. Regarding tenure, 60.5% had worked for more than six years, suggesting that most harvest workers had substantial experience

and were likely to be consistently exposed to field-based job demands over an extended period. All respondents (100%) were contract-based and worked on a daily basis. Regarding educational attainment, nearly half of the respondents had only completed primary school (48.4%), while the remainder had completed junior high school (25.6%) or senior high/vocational education (26.0%).

4.2 Descriptive Statistics of Job Demands

A descriptive statistical analysis was subsequently conducted to assess respondents' perceptions of various aspects of job demands encountered during daily harvesting activities. The indicators measured included quantitative workload, time pressure, and emotional demands that are inherent in fieldwork. Means, medians, standard deviations, and standard error values were used to evaluate the level and dispersion of respondents' perceptions for each questionnaire item (Table 2).

Table 2. Descriptive statistics of job demands

Item statement	Median	Mean	Std. Error of Mean	Std. Deviation
Harvesting a large amount of crops in one working day is required.	4	3.62	0.06	0.883
My daily workload volume was very high.	3	3.05	0.066	0.968
I often feel that I have too many tasks to complete within normal working hours.	3	2.61	0.063	0.921
I often feel that I do not have enough time to complete all my harvesting tasks.	2	2.32	0.058	0.855
My job requires speed in completing my tasks.	4	3.35	0.057	0.84
I rarely have free time during my working hours.	2	2.21	0.054	0.786
My job requires me to remain emotionally strong when I face field challenges.	4	3.59	0.062	0.912
Answer: I often feel emotionally overwhelmed while working.	2	2.31	0.061	0.891
I must hide my emotions to remain professional at work.	4	3.63	0.069	1.018

Three indicators reflected very high levels of job demands: *"I have to complete a very large harvesting output in one working day"* (M = 3.619; median = 4.000), *"My job requires me to remain emotionally strong when facing field challenges"* (M = 3.586; median = 4.000), and *"I have to hide my emotions to remain professional at work"* (M = 3.633; median = 4.000). These three items recorded the highest mean values, with medians in Category 4 (agree), indicating that respondents consistently experienced high work demands, both physically and emotionally. This pattern reflects simultaneous pressure from quantitative requirements (large harvesting targets) and affective demands (emotion regulation), which may deplete energy and become a source of job stress, as proposed by the JD-R model (Bakker & Demerouti, 2017). In comparison, the items *"My daily workload volume is very high"* (M = 3.051; median = 3.000) and *"My job requires speed in completing tasks"* (M = 3.349; median = 4.000) suggest that daily workload and time-related pressure were perceived as relatively high, although not as pronounced as the first group of indicators. The relatively low standard deviations (approximately 0.8–0.9) indicate a fairly homogeneous perception among the respondents regarding these demand indicators.

Several indicators were perceived at comparatively low levels. For example, *"I often feel that I run out of time to complete all my harvesting tasks"* (M = 2.316; median = 2.000), "*I rarely have free time during working hours"* (M = 2.214; median = 2.000), and *"I often feel emotionally overwhelmed while working"* (M = 2.307; median = 2.000). These findings suggest that although

harvesting work is intensive, not all respondents perceived their working time as consistently insufficient or experienced extreme emotional pressure. This may reflect the adaptive coping mechanisms developed through extensive work experience, given that most respondents had long tenures (60.5% had worked for more than six years). The item with the lowest mean was *"I often feel that I have too many tasks to finish within normal working hours"* (M = 2.605; median = 3.000), indicating that perceptions of imbalance between workload and available time were not uniformly experienced across respondents.

These descriptive results indicate that physical and emotional demands constitute the most salient dimensions of job demands among harvest workers at PT X. The high mean values observed for particular indicators indicate potential risks of psychological exhaustion and job stress, consistent with the JD-R assumption that high job demands increase the likelihood of impaired psychological well-being and reduced performance when not supported by adequate job resources (Bakker & Demerouti, 2017).

4.3 Descriptive Statistics of Job Stress

The descriptive analysis of job stress items aimed to assess the extent to which harvest workers at PT X experienced psychological pressure arising from high job demands within the oil palm plantation's work environment. The seven items analyzed capture multiple dimensions of stress, ranging from workload-related pressure and emotional exhaustion to potential effects on motivation and work–life balance (see Table 3).

Table 3. Descriptive statistics of job stress

Item statement	Median	Mean	Std. Error of Mean	Std. Deviation
I feel pressured because of my workload.	2	2.24	0.059	0.869
I often feel stressed because of the harvesting targets that must be achieved.	2	2.24	0.063	0.924
I find it difficult to separate work pressure from my personal life.	2	2.32	0.061	0.899
I feel that I am losing motivation to work because of continuous work pressure.	2	2.28	0.059	0.869
I feel emotionally exhausted after completing work on the plantation.	2	2.27	0.058	0.844
I feel drained of energy every time I finish my work.	2	2.41	0.066	0.972
I feel bored by my work routine.	2	2.12	0.065	0.954

All items showed a median value of 2.000, indicating that most respondents tended to select responses around the "disagree" or "neutral" range. This suggests that although harvest workers face substantial job demands, they do not consistently report high stress across the full set of indicators. The item with the highest mean was *"I feel drained of energy every time I finish work"* (M = 2.409; SD = 0.972), indicating that depleted energy and post-work fatigue were the most salient stress-related experiences among respondents. This was followed by *"I find it difficult to separate work pressure from my personal life"* (M = 2.321) and *"I feel emotionally exhausted after completing my work on the plantation"* (M = 2.270), reflecting the presence of emotional fatigue and work pressure that may spill over into personal life, although the intensity remained relatively low.

Several indicators reflect comparatively low stress levels. For example, *"I feel bored with my work routine"* had the lowest mean (M = 2.121; SD = 0.954), followed by *"I often feel stressed due to the harvesting targets that must be achieved"* (M = 2.237) and *"I feel pressured because of my workload"* (M = 2.242). These values indicate that while work pressure is present, not all respondents

interpret it as psychologically stressful in a way that produces negative impacts on their well-being. The variation across respondents was moderate, with standard deviations ranging from 0.844 to 0.972, suggesting heterogeneity in perceptions within a relatively controlled range. This pattern may be explained by factors such as long work experience, adaptively developed psychological resilience, and normalized expectations regarding physical and emotional strain during harvesting work.

The findings imply that harvest workers at PT X experience work-related pressure; however, their perceived job stress tends to be low to moderate rather than chronic or extreme. This phenomenon is consistent with the JD-R perspective, in which high job demands do not necessarily translate directly into high stress levels when coping mechanisms or supportive resources are present in the workplace.

4.4 Descriptive Statistics of Job Performance

Job performance was measured using seven items that reflected productivity, compliance with procedures, collective contribution, and proactive workplace behavior. Based on the descriptive statistics, the mean values across all indicators generally suggest a high level of performance, as indicated by the mean scores approaching the maximum value (4.000) and consistently high median values (Table 4).

Table 4. Descriptive statistics of job performance

Item statement	Median	Mean	Std. Error of Mean	Std. Deviation
We can meet the daily fresh fruit bunch (FFB) target set each day.	4	3.92	0.036	0.532
I complete harvesting tasks on time according to the predetermined schedule.	4	3.89	0.041	0.598
I comply with standard operating procedures when harvesting.	4	4	0.036	0.525
I help maintain clean harvesting paths.	4	3.72	0.045	0.662
I actively help my coworkers when they face difficulties in the field.	3	3.42	0.04	0.581
I participate in forest and land fire suppression efforts when needed.	4	3.79	0.048	0.704
I perform additional tasks not directly instructed to support smooth team operations.	3	3.43	0.046	0.672

The three items with the highest mean scores *were "I comply with standard operating procedures (SOP) when harvesting"* (M = 3.995; median = 4.000), *"I can meet the daily fresh fruit bunch (FFB) target set each day"* (M = 3.916; median = 4.000), and *"I complete harvesting tasks on time according to the prescribed schedule"* (M = 3.893; median = 4.000). These values indicate that most respondents reported high levels of compliance and work discipline, reflected in quantitative output (meeting targets), timeliness, and adherence to the formal procedures established by the company. This pattern suggests strong efficiency and technical competence in executing the core responsibilities of harvest workers.

Indicators related to teamwork and collective participation also appeared relatively strong, although their mean values were slightly lower than those for technical and compliance-oriented performances. For instance, *"I take part in forest and land fire suppression efforts when needed"* (M = 3.786) and *"I help keep harvesting paths clean and safe"* (M = 3.716) suggest that harvest workers did not focus solely on individual tasks but also demonstrated awareness of collective responsibilities and environmental emergencies. The lowest mean scores, while still within a relatively high range, were observed for *"I carry out additional tasks not directly instructed to support smooth team*

operations" (M = 3.433; median = 3.000) and *"I actively participate in helping coworkers when they face difficulties in the field"* (M = 3.419; median = 3.000). These values imply that proactive initiatives and voluntary contributions, although positive, were less pronounced than compliance and core task performance. This difference may reflect structural or cultural constraints in which extra-role initiatives are not consistently embedded in routine expectations or explicitly incentivized.

The standard deviations across items were relatively small (0.525–0.704), indicating that respondents' perceptions of their job performance were homogeneous and consistent. Overall, these descriptive results reinforce the conclusion that harvest workers at PT X demonstrate high performance across quantitative (productivity), qualitative (accuracy and compliance), and participatory (teamwork and collective awareness) aspects. The consistently high means and medians further suggest that the work pressures experienced by the respondents did not directly suppress their self-reported performance in day-to-day operations. Simultaneously, the SEM results indicate that job stress may operate as a negative mediating mechanism through which job demands exert indirect effects on performance.

4.5 Validity Testing

Based on the results of the CFA, not all indicators within the Job Demands, Work Stress, and Job Performance constructs satisfied the criteria for convergent validity. Accordingly, the measurement model was refined by retaining only indicators with factor loadings ≥ 0.50 and statistically significant loadings ($p < 0.05$). Indicators JD3, JD4, JD6, and JD8 (Job Demands) and JP2 and JP3 (Job Performance) were removed because they did not meet these thresholds, improving measurement clarity and reducing construct contamination.

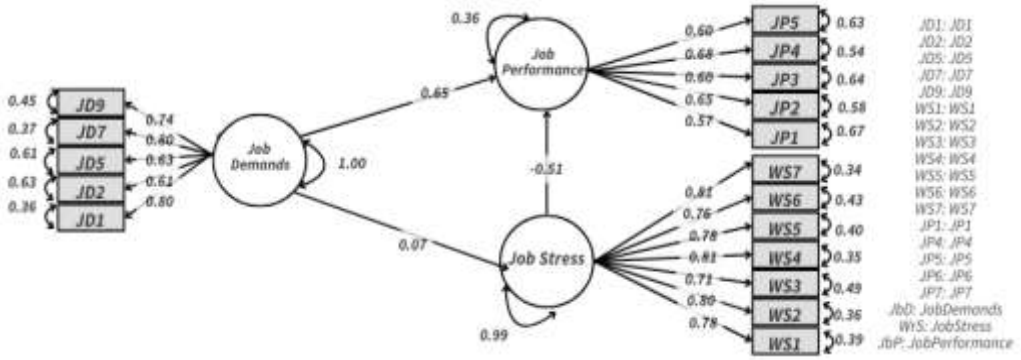

Figure 2. JD-R structural model

As shown in Figure 2, the measurement model evaluation indicates that for the Job Demands construct, only a subset of indicators met the convergent validity threshold and were therefore retained in the final model. Specifically, JD1, JD2, JD5, JD7, and JD9 demonstrated sufficiently strong standardized loadings to represent the dominant demand features in harvesting work, particularly perceived workload intensity, time pressure, and task difficulty. Indicators with weak loadings were removed to preserve measurement quality and ensure that the Job Demands construct was represented by empirically and theoretically defensible items (see Table 5).

All seven indicators (WS1–WS7) were retained, indicating that work stress was measured consistently and comprehensively using the full set of items developed in the questionnaire. These indicators jointly captured the psychological pressure, emotional exhaustion, and mental strain experienced by harvest workers, and their strong loadings suggested a coherent pattern of respondent interpretation and response to stress-related symptoms under demanding field conditions. For the Job Performance construct, five indicators satisfied the validity criteria and were retained in the final model: JP1, JP4, JP5, JP6, and JP7. These retained items were considered to reflect the core aspects of job performance, including the attainment of targets and procedural compliance, as well as contributions that support team operations and collective effectiveness. Indicators with low loadings were excluded to strengthen the overall fit and interpretability of the measurement model.

Table 5. Factor loadings

Latent Construct	Indicator	Std. Estimate	Std. Error	z-value	p
Job Demands	JD1	0.8	0.032	24.996	< .001
	JD2	0.59	0.05	11.945	< .001
	JD5	0.63	0.047	13.315	< .001
	JD7	0.79	0.033	24.278	< .001
	JD9	0.74	0.037	19.86	< .001
Job Performance	JP1	0.58	0.053	10.861	< .001
	JP4	0.66	0.047	14.045	< .001
	JP5	0.59	0.052	11.213	< .001
	JP6	0.68	0.045	15.042	< .001
	JP7	0.58	0.053	10.994	< .001
Work Stress	WS1	0.78	0.03	25.655	< .001
	WS2	0.8	0.028	28.646	< .001
	WS3	0.71	0.037	19.464	< .001
	WS4	0.81	0.028	29.16	< .001
	WS5	0.78	0.03	25.553	< .001
	WS6	0.76	0.033	23.298	< .001
	WS7	0.81	0.027	30.186	< .001

The refined measurement model is more parsimonious and, theoretically and empirically, more robust in representing each latent construct. For transparency, the indicators removed due to low or nonsignificant loadings were JD3, JD4, JD6, JD8, JP2, and JP3. This refinement was intended to improve reliability, convergent validity, and interpretability prior to estimating the structural relationships.

4.6 Reliability Testing

Reliability analysis was conducted to evaluate the internal consistency of each construct in the model. Two primary indices were used: Cronbach's alpha (α) and composite reliability (ω). In general, reliability is considered acceptable when α and ω exceed 0.70, as recommended by Hair, Risher, Sarstedt, and Ringle (2019) (Table 6).

Table 6. Reliability

Construct	Coefficient α	Coefficient ω
Job Demands	0.834	0.847
Work Stress	0.914	0.915
Job Performance	0.757	0.76
Total	0.783	0.882

The Job Demands construct yielded a Cronbach's alpha of 0.834 and a composite reliability of 0.847. These coefficients indicate strong internal consistency, suggesting that the retained indicators reliably measure job demands and adequately represent respondents' perceptions of the physical workload and psychological pressure associated with harvesting activities. The Work Stress construct demonstrated the highest reliability among the three constructs (α = 0.914; ω = 0.915), indicating that the items consistently captured the stress experience reported by respondents, including emotional strain, mental fatigue, and related psychological burdens. This high reliability is also in alignment with earlier validity results, in which all Work Stress indicators exhibited factor loadings above 0.70.

The Job Performance construct produced relatively lower reliability estimates (α = 0.757; ω = 0.760), although both values remained within an acceptable range and supported the conclusion that the construct was reliable. The comparatively lower coefficients may reflect the heterogeneity

inherent in performance measurement, as the retained indicators capture multiple facets of job performance, including SOP compliance, social contribution, and proactivity. At the instrument level, the overall reliability indices (α = 0.783; ω = 0.882) indicate that the questionnaire demonstrates strong reliability as a whole, supporting its use for the consistent measurement of the theoretical phenomena under investigation in the context of oil palm harvest workers.

4.7 Model Fit Analysis

Model 1 was assessed utilizing the Maximum Likelihood (ML) estimator. The analysis encompassed 215 observations, with 37 parameters estimated and 116 degrees of freedom. The model fit test yielded a chi-square value of 240.874 (df = 116, p < .001), signifying a significant deviation of the model from the observed data. However, in structural equation modeling (SEM), statistically significant chi-square results are frequently encountered because of the test's sensitivity to sample size, which can lead to the rejection of models that are substantively plausible. Consequently, the evaluation of model fit should not rely exclusively on the chi-square statistic but should also incorporate alternative fit indices and criteria related to parsimony.

The Akaike information criterion (AIC = 7328.136) and Bayesian information criterion (BIC = 7452.849) provide penalized measures that balance explanatory power and model complexity. Although AIC and BIC do not have universal cutoff values comparable to indices such as root mean square error of approximation (RMSEA) and comparative fit index (CFI), they are particularly useful for comparing competing models; smaller AIC/BIC values indicate a more efficient model in terms of data explanation relative to complexity. Although the current output does not report additional confirmatory fit indices, such as CFI, standardized Tucker–Lewis index (TLI), RMSEA, and standardized residual mean square (SRMR), the available results, together with satisfactory indicator validity and construct reliability, suggest that the model is adequate for structural interpretation. Nevertheless, a more comprehensive model fit assessment should ideally incorporate these additional indices to strengthen interpretive confidence and provide a fuller account of global fit.

4.8 Path Analysis

Table 7 summarizes the hypothesis testing based on standardized SEM estimates, p-values, and confidence intervals. Figure 3 presents the same information in a structural diagram to facilitate the interpretation of direct and indirect paths.

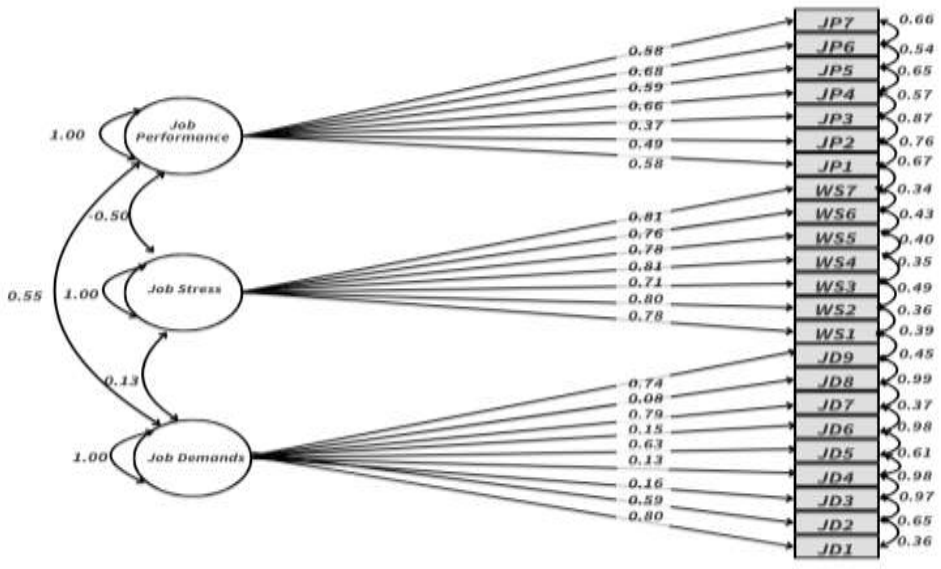

Figure 3. Structural model with standardized path coefficients and p-values

Figure 3 visualizes the standardized structural coefficients reported in Table 7, showing the tested direct and indirect (mediated) paths in the model. H_1 (Job Demands → Work Stress) was not

supported (β = 0.072; p = 0.350). H_2 (Job Demands → Job Performance) was supported, with a positive standardized effect (β = 0.650; p < 0.001) and a confidence interval that did not include zero (0.540–0.760). H_3 (work stress → job performance) was supported. Work stress showed a negative standardized effect on performance (β = −0.514; p < 0.001), indicating that higher stress is associated with lower job performance. H_4 (mediation) was not supported. The indirect effect of job demands on job performance through work stress was not significant (β = −0.016; p = 0.363), and its confidence interval crossed zero (−0.050 to 0.018).

Table 7. Path analysis results

Hypothesis	Relationship	Coefficient	p-value	Decision
H_1	Job Demands → Work Stress (a)	0.072	0.35	Not supported
H_2	Job Demands → Job Performance (b)	0.65	< .001	Supported
H_3	Work Stress → Job Performance (c)	−0.514	< .001	Supported
H_4	Job Demands → Work Stress → Job Performance (indirect)	−0.016	0.363	Not supported

The findings suggest a direct relationship. Job demands are positively associated with performance, whereas work stress is negatively associated with performance. The mediation pathway is not supported because job demands do not significantly predict stress. The results indicate that, in the context of oil palm harvest workers, job performance is shaped by both the direct level of job demands and the degree of work stress experienced; however, the data do not support a mediating role of work stress in the demands–performance relationship. This pattern underscores the importance of distinguishing between potentially motivating job demands and dysfunctional work stress, given their qualitatively different implications for employee performance. The findings also motivate further investigation by incorporating job resources as potential moderators, such as supervisory support, work flexibility, and perceived control over tasks, which may clarify when demands function as challenges that enhance performance versus when they contribute to strain and performance impairment.

Overall, the model supported two out of the four hypotheses (H_2 and H_3), whereas H_1 and H_4 were not supported. This pattern indicates that job demands operate mainly through a direct performance pathway, whereas work stress independently functions as a detrimental factor that lowers performance rather than transmitting the effect of demands.

4.9 Discussion

The structural model presented in this study reveals a direct-only pattern: job demands are positively associated with job performance, work stress is negatively associated with job performance, and work stress does not mediate the relationship between demands and performance, as job demands do not significantly predict stress. The primary contribution of this research is the finding that within the context of oil palm harvesting, job demands may function as performance-relevant (challenge-like) requirements rather than stress-inducing burdens, whereas stress, when present, detrimentally affects performance.

The insignificant Job Demands → Work Stress path indicates that perceived demands alone do not sufficiently account for stress variation within this sample. A plausible explanation, albeit untested, is the adaptation and routinization among workers who have developed coping mechanisms for recurring field demands. Another potential explanation is the buffering effect of unmeasured job resources (e.g., adequate tools, informal peer support, supervisor coordination, and recovery opportunities), which were not captured by the current instrument. This interpretation aligns with broader evidence suggesting that oil palm plantation work is labor-intensive and exposes workers to multiple occupational risks, making the presence or absence of protective conditions a significant determinant of strain (Myzabella et al., 2019).

The positive job demands → job performance relationship is consistent with the challenge–hindrance stressor perspective, which posits that certain demands can motivate effort and enhance performance when perceived as achievable and controllable (LePine, 2022; Podsakoff et al., 2023).

In this context, performance targets and time pressure may serve as organizing mechanisms that direct worker effort towards output, particularly when workers possess sufficient competence and task familiarity to meet demands without perceiving them as overwhelming.

Simultaneously, work stress was substantially associated with poor performance, indicating that unmanaged stress undermines sustained effectiveness. The lack of mediation suggests that interventions should not presume that reducing demands will automatically alleviate stress; stress may be driven by other factors, such as heat exposure, recovery constraints, safety climate, or resource inadequacy. Evidence from industrial agriculture indicates that regulated rest, shade, and hydration can mitigate physiological strain during strenuous outdoor work (Lucas et al., 2022). Future research should explicitly measure job resources and differentiate between challenge and hindrance demands to elucidate when demands translate into stress and when they enhance performance.

5. CONCLUSIONS

5.1 Conclusion

This study elucidates the interrelationships among job demands, work stress, and job performance in the context of oil palm harvesting at PT X, Central Kalimantan. The findings indicate that job demands are positively correlated with performance, whereas work stress is negatively correlated with performance. Notably, work stress does not mediate the relationship between job demands and performance because job demands do not significantly predict stress levels. This pattern suggests that, within this context, job demands may function more as challenge-like requirements linked to output, and stress, when present, continues to undermine performance.

For PT X, the implication is not merely to "reduce demands," but rather to manage how demands are established and supported. First, it is essential to calibrate daily targets and work pacing according to field conditions (e.g., extreme heat, heavy rainfall, challenging terrain) to ensure that targets remain achievable without imposing excessive strain. Second, it is crucial to enhance recovery and fatigue-control practices in the field, such as scheduled micro-breaks, accessible drinking water and shade, and clear guidelines for rest during high-heat exposure, approaches that have been demonstrated to reduce strain in strenuous outdoor work. Third, physical exhaustion should be mitigated through job resources that directly support task execution, including adequate and well-maintained tools, safer transport aids for bunches, and supervisor coordination to prevent unnecessary time pressure. Finally, implementing simple stress monitoring and response mechanisms (e.g., brief check-ins, early identification of overload) is recommended to address stress-related performance losses, even when the workload is substantial.

5.2 Research Limitations

This study has several limitations. First, the cross-sectional design precludes causal inferences from the observed associations, which may also be affected by unmeasured variables. Second, reliance on self-reported survey data may introduce response bias and common-method variance. Third, owing to the distribution of the survey link through field coordination channels without a comprehensive distribution log, the response rate remains indeterminable. Fourth, the sample was drawn from a single plantation (PT X) and consisted exclusively of male participants, thereby limiting the generalizability of the findings to other organizations, regions, or gender compositions. Fifth, job demands were conceptualized as a singular construct; however, different types of demands (challenge versus hindrance) may have distinct effects. Sixth, job resources were not assessed, despite the JD-R theory's proposition that resources mitigate demands and influence stress. Finally, the SEM output provided limited global fit information; future studies should report a more comprehensive set of fit indices to enhance interpretive confidence.

5.3 Suggestions and Directions for Future Research

Future research should address these limitations by employing longitudinal or multi-wave designs, expanding samples across various plantations and job roles, including female workers where applicable, and integrating self-reports with supervisor ratings or objective productivity indicators.

Researchers should also document the number of invitations and calculate response rates to enhance sampling transparency. Conceptually, future studies can explore job demands by differentiating between challenge and hindrance demands and examining whether key job resources, such as autonomy, supervisor support, training, equipment adequacy, and safety climate, mitigate demands or alleviate stress. Incorporating field conditions, such as heat exposure and rainfall, and mixed-method approaches, including interviews and on-site observations, would further clarify when high demands result in performance or strain and inform practical interventions to enhance well-being while maintaining output.

AUTHOR CONTRIBUTIONS

MARET contributed to the conceptualization of the study, development of the research methodology based on the JD-R framework, data collection, data curation, formal analysis using structural equation modeling (SEM), interpretation of results, and preparation of the original manuscript including writing of all main sections (introduction, literature review, methodology, results, discussion, and conclusion). EP contributed to the validation of the research design, supervision of the overall research process, critical review of the manuscript, and provided academic guidance and final approval of the manuscript for publication.

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