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Perceived Management Challenges Across Income Groups Among Independent Oil Palm Smallholders in Malaysia

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ABSTRACT

Independent oil palm smallholders play a vital role in Malaysia's palm oil sector but face numerous operational and market-related challenges. While financial capacity is often considered an important determinant of resilience, evidence on whether management challenges differ across income groups remains limited. This preliminary cross-sectional survey examined differences in perceived management challenges among independent oil palm smallholders in Peninsular Malaysia. Data were collected from 64 smallholders who were categorised into three income groups. Six challenge dimensions were assessed: replanting, labour shortage, sustainability compliance, productivity and tree age, production costs, and global competition. The Kruskal-Wallis H test was used to examine differences across income categories. Results showed limited variation in perceived challenges, with no statistically significant differences observed among the three income groups. These findings suggest that the challenges identified were experienced across different income levels and may be influenced more by broader structural and industry-wide conditions than by financial capacity alone. The results further indicate that income classification may not fully capture the range of challenges faced by smallholders, highlighting the importance of complementary policy approaches that address common sector-wide constraints. Given the relatively small sample size and cross-sectional design, the findings were interpreted as preliminary and that are not generalisable to the wider Malaysian smallholder population.

1. Introduction

Independent oil palm smallholders constitute an important component of Malaysia's agricultural landscape and contribute significantly to the global palm oil supply chain. In addition to their role in production, smallholders support rural livelihoods and local economic activity. At the same time, the sector faces a range of ongoing challenges, including rising input costs, labour constraints,

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compliance with sustainability standards, ageing tree stands, and exposure to global market fluctuations [12,17]. These pressures have implications for both productivity and long-term sectoral stability [13]. Policy responses to such challenges have commonly relied on income-based targeting. In this approach, smallholders are categorized according to income level, with the expectation that lower income groups face greater constraints and therefore require more extensive support. Conversely, higher income smallholders are often assumed to possess greater financial capacity to manage operational risks and investment requirements. This assumption underpins many subsidy schemes and development programmes in the agricultural sector [16].

However, the applicability of this logic within the oil palm smallholder context warrants further examination. Several key challenges, particularly those related to replanting, may not be easily addressed through income differences alone. Replanting requires substantial upfront capital, while the immature phase of oil palm cultivation results in a temporary absence of income. These features create a structural constraint that may affect smallholders across income categories. Similarly, compliance with certification standards and exposure to price volatility represent pressures that are not confined to specific income groups [17]. Despite the prevalence of income-based policy frameworks, empirical evidence assessing whether income level meaningfully differentiates smallholder experiences remains limited, particularly in Malaysia. Existing studies often emphasise financial capacity as a determinant of resilience, but fewer have examined how perceived management challenges vary across income groups in a systematic manner. This gap suggests a need for further investigation into whether income serves as an adequate proxy for vulnerability within the sector.

Accordingly, this study examines whether perceived management challenges differ across income groups among independent oil palm smallholders in Malaysia. The analysis focuses on six dimensions: replanting, labour shortage, sustainability compliance, productivity and tree age, production costs, and global competition. By comparing these dimensions across income categories, the study seeks to assess the extent to which challenges are differentiated or shared. The findings are intended to inform both academic discussion and policy design. If variation across income groups is limited, this would suggest that current income-based targeting approaches may not fully capture the nature of constraints faced by smallholders. In such a case, greater attention may be required for policy measures that address structural and sector-wide issues, rather than relying solely on income classification.

2. Literature Review

2.1 Key Challenge of Malaysia palm oil industry

The Malaysian palm oil industry faces a convergence of structural, operational, and market-driven challenges that threaten its long-term competitiveness. Insights from the Palm Oil Economic Review and Outlook Seminar 2025 (R&O 2025) indicate that these challenges arise from both domestic constraints and significant shifts in the global trade and regulatory environment. Structurally, production growth has become increasingly constrained by the saturation of planted areas and declining productivity associated with an aging plantation profile. This is summarized in Table 1. Since 2019, no significant expansion of oil palm cultivation has been recorded, with some regions experiencing net declines due to land conversion and delayed replanting. A substantial proportion of existing plantations now consist of old and old palms, while the share of young, high-yielding palms remains insufficient to support sustained productivity improvements. Replanting rates, estimated at between 1% and 2.5% annually, remain below the level required to offset yield decline, thereby limiting Malaysia's capacity to respond to global demand growth without

compromising environmental commitments. Operational pressures further compound these structural constraints. Labour shortages persist as a critical challenge, particularly in harvesting and field maintenance activities, with the industry remaining heavily dependent on migrant labour from Indonesia and other neighbouring countries [10]. This is supported by literature studies, where plantation work is widely perceived as dangerous, dirty, and difficult (3D), discouraging local workers and reinforcing reliance on migrant labour, particularly from Indonesia [14]. This dependence has become increasingly precarious due to inconsistent immigration policies, stricter border controls, and declining Indonesian migration as economic opportunities and educational attainment improve in sending countries [7].

Table 1
Instrument item

Cluster	Challenge	No of Item	Cluster Focus
Cluster A	Replanting	6	Evaluates the psychological, technical, and financial preparedness of smallholders to undergo the replanting cycle
Cluster B	Labour Shortage	5	Measure perceptions of labour availability and its impact on farm operations
Cluster C	Compliance with Sustainability Regulations	5	The administrative and operational burden of meeting sustainability standards.
Cluster D	Productivity and Age of Trees	5	The awareness of declining yields due to the aging biological profile of the palms.
Cluster E	Production Costs and Profits	5	The "Profit Squeeze" caused by rising input prices (fertilizers, tools, transportation).
Cluster F	Competition with Foreign Countries	5	Global market volatility and competition from other palm oil-producing nations.

Empirical studies indicate that migrant workers constitute approximately 70–80% of the plantation workforce in Malaysia, with labour shortages most acute in harvesting and fresh fruit bunch (FFB) collection due to the highly labour-intensive nature of these activities and low levels of mechanization [14]. Poor wages, substandard living conditions, and limited labour protections further exacerbate recruitment and retention challenges, contributing to high turnover and workforce instability [5,11]. Research on migrant labour regimes additionally reveals that undocumented Indonesian workers play a critical but under protected role in sustaining plantation operations, often under conditions of precarity and exploitation [2,11]. Beyond large plantations, labour shortages are also a major constraint for smallholders, where limited capital, aging landowners, and competition for foreign labour intensify workforce shortages and suppress productivity [4]. These labour constraints intersect with rising input costs and moderate yields, deepening economic vulnerability among small-scale producers. Rather than advocating wholesale replacement of foreign labour with local workers, the literature increasingly emphasizes structural and technological solutions. [14] argued that productivity challenges should be addressed through genetic innovation, diversification, and education-driven workforce upgrading, while repositioning foreign labour retention as a short- to medium-term necessity. Complementing this perspective, multiple studies identify mechanization, automation, and harvesting technologies that are supported by initiatives from the MPOB as key strategies to reduce labour dependency, lower costs, and improve productivity [3,9].

Recent reviews further highlight the emerging role of artificial intelligence, robotics, and digital systems in alleviating labour shortages, improving worker safety, and enhancing operational

efficiency [6]. At the policy and governance level, scholars stress that sustainable solutions to labour shortages require a combination of improved labour standards enforcement, better migrant worker protections, investment in local workforce development, and clearer, more consistent migration policies [5,11]. Collectively, the literature suggests that labour shortages in the Malaysian palm oil industry are not merely a manpower issue, but a systemic challenge rooted in labour governance, technological lag, and socio-economic transformation, requiring integrated policy, technological, and institutional responses rather than singular reliance on labour substitution. Besides, intensifying wage competition and increasingly similar remuneration structures across regional labour markets have made worker recruitment and retention more difficult. At the same time, input costs, particularly fertilizers such as DAP, phosphate rock, MOP, TSP, and urea, remain significantly higher than pre-2020 levels, exerting sustained pressure on operating margins. Elevated input prices, combined with labour constraints, have reduced operational efficiency across the sector, disproportionately affecting smallholders who often lack the financial buffers and institutional support necessary to absorb rising costs [15].

Beyond these domestic challenges, regulatory compliance pressures linked to international sustainability requirements have emerged as a major constraint on industry performance. The European Union Deforestation Regulation (EUDR) presents significant compliance challenges, particularly for smallholders and independent mills. Requirements for full supply chain traceability, geolocation data, and segregation between compliant and non-compliant supply chains entail substantial financial costs and operational restructuring [1]. Although implementation deadlines have been extended to 30 December 2025 for large and medium enterprises and to 30 June 2026 for micro and small enterprises, the industry faces immediate pressure to upgrade monitoring, mapping, and certification systems. Moreover, international buyers increasingly require compliance with sustainability standards that exceed national certification schemes such as the Malaysian Sustainable Palm Oil (MSPO), further intensifying the regulatory burden faced by producers and exporters [8].

At a broader level, the literature highlights that these compliance challenges are not solely a function of regulatory stringency, but are deeply shaped by governance design, enforcement capacity, and the interaction between public and private regulatory regimes. Studies on palm oil governance demonstrate a clear shift from voluntary, market-driven compliance mechanisms toward mandatory, legally binding regulations driven by importing countries. Mandatory frameworks impose rigorous due diligence and traceability requirements that restructure governance arrangements along the supply chain and heighten exclusion risks for actors with limited compliance capacity. In contrast, voluntary private standards, such as those implemented under the Roundtable on Sustainable Palm Oil (RSPO), have been shown to suffer from weak enforcement and limited sanctioning power, reducing their effectiveness in ensuring consistent compliance. These challenges are further exacerbated by regulatory complexity, where overlapping and sometimes conflicting public regulations and private standards create fragmented compliance pathways and reduce overall regulatory coherence. Importantly, evidence suggests that even mandatory national certification systems face implementation constraints when enforcement capacity, institutional coordination, and industry readiness are insufficient [8].

In parallel with regulatory pressures, the Malaysian palm oil industry continues to face heightened exposure to global market volatility. Palm oil prices are influenced by fluctuations in global production levels, biofuel mandates, exchange rate movements, and geopolitical developments. Recently, palm oil had at times traded at a premium relative to competing oils such as soybean, rapeseed, and sunflower oil—an atypical trend that increases the risk of demand substitution in price-sensitive markets. Expanding production of soft oils, along with Indonesia's growing domestic consumption of crude palm oil for biodiesel, has further reshaped global trade

flows. Weather variability and evolving policy frameworks in both producing and importing countries add additional layers of uncertainty, complicating long-term strategic planning for producers and exporters. Despite these challenges, the Malaysian palm oil industry remains a cornerstone of the national economy and continues to rank as the world's second-largest producer and exporter. This study therefore reviews the industry across three interrelated dimensions: (i) production and exports, (ii) challenges, and (iii) sustainability and diversification. While production and export volumes recorded a modest increase in 2022, persistent constraints related to land availability, labour shortages, regulatory compliance, and global price volatility underscore the need for strategic adaptation. In response, there is a growing emphasis on sustainability-driven transformation and diversification, particularly through downstream development and the expansion of value-added palm oil products.

3. Methodology

This study adopted a preliminary cross-sectional survey design to examine perceived management challenges among independent oil palm smallholders in Malaysia. Data were collected using a structured survey instrument from independent oil palm smallholders located in Selangor, Johor and Pahang. The study sample consisted of 64 independent oil palm smallholders. A purposive sampling strategy was employed to recruit active independent oil palm smallholders representing different income categories. Participants were selected based on their involvement in day-to-day farm management and willingness to participate in the study. While this approach enabled access to respondents with relevant experience, the sample may not be fully representative of the broader population of Malaysian oil palm smallholders. Eligible participants were required to be actively managing their own oil palm plots. Based on reported monthly income, respondents were categorized into three distinct groups to enable comparative analysis. Monthly income level was treated as the primary independent variable. The dependent variables comprised six clusters of management challenges, each derived from the aggregated mean scores of Likert scale items ranging from most acceptable (5) – least acceptable (1). These clusters represented key dimensions of the industry, including replanting, labour shortage, sustainability compliance, productivity and tree age, production costs, and global competition. The questionnaire was structured into two main sections, namely demographic information and perception-based items. Internal consistency of the instrument was assessed using Cronbach's alpha. The resulting values indicated acceptable reliability for the challenge dimensions included in the analysis, alpha = 0.82

First, descriptive statistics, including means and standard deviations, were calculated to summarise respondents' perceptions across challenge dimensions. The Shapiro-Wilk test indicated departures from normality ($p < 0.05$), supporting the use of non-parametric analysis. The Kruskal-Wallis H test was subsequently applied to examine whether perceptions differed across the three income groups Several limitations was acknowledged. First, the study was based on a relatively small sample of 64 respondents, which limits the generalisability of the findings. Second, the purposive sampling approach may introduce selection bias, as participants may not fully represent the diversity of independent oil palm smallholders in Malaysia. Third, the study relied on self-reported perceptions rather than objective performance indicators, which may be subject to response bias. Finally, the cross-sectional nature of the study captures perceptions at a single point in time and does not permit causal inference or assessment of changes over time. Consequently, the findings were interpreted as preliminary and indicative rather than representative of the wider smallholder population.

3. Results

3.1 Descriptive Analysis

Table 1 presents the mean scores and standard deviations for the six management challenge dimensions across the three income groups. Overall, respondents reported moderate to high levels of agreement across all challenge dimensions, indicating that these issues were generally perceived as important concerns among independent oil palm smallholders. Among the six dimensions, foreign competition recorded the highest overall mean score (M = 4.27, SD = 0.92), suggesting that respondents consistently perceived global market pressures as a major challenge. Sustainability compliance (M = 3.96, SD = 0.96), production costs and profits (M = 3.93, SD = 0.96), and productivity and tree age (M = 3.86, SD = 1.09) also recorded relatively high mean scores, indicating a substantial level of concern among respondents. Labour shortage recorded a moderate overall mean score (M = 3.55, SD = 1.10). Although the highest mean was observed among the high-income group (M = 4.13), concerns related to labour availability were reported across all income categories. Similarly, replanting recorded the lowest overall mean score among the six dimensions (M = 3.32, SD = 0.84), but respondents in all income groups nevertheless indicated moderate levels of concern regarding replanting-related issues. Across all dimensions, the mean scores showed only minor variation between income groups. For example, foreign competition recorded mean scores ranging from 4.25 to 4.40, while sustainability compliance ranged from 3.94 to 4.20. Similar patterns were observed for the remaining dimensions, suggesting a broadly consistent perception of management challenges among respondents regardless of income category. Overall, the descriptive findings indicate that management challenges were perceived across all income groups, with foreign competition, sustainability compliance, production costs, and productivity-related issues emerging as the most prominent concerns among the respondents surveyed.

Based on the finding, Figure 1 presents the distribution of challenge scores across the three income groups. The boxplots demonstrate substantial overlap in median values and interquartile ranges for all six challenge dimensions. While some variation was observed within individual groups, no clear separation between income categories was evident. The visual patterns therefore support the descriptive findings, suggesting that perceptions of management challenges were generally similar across income groups.

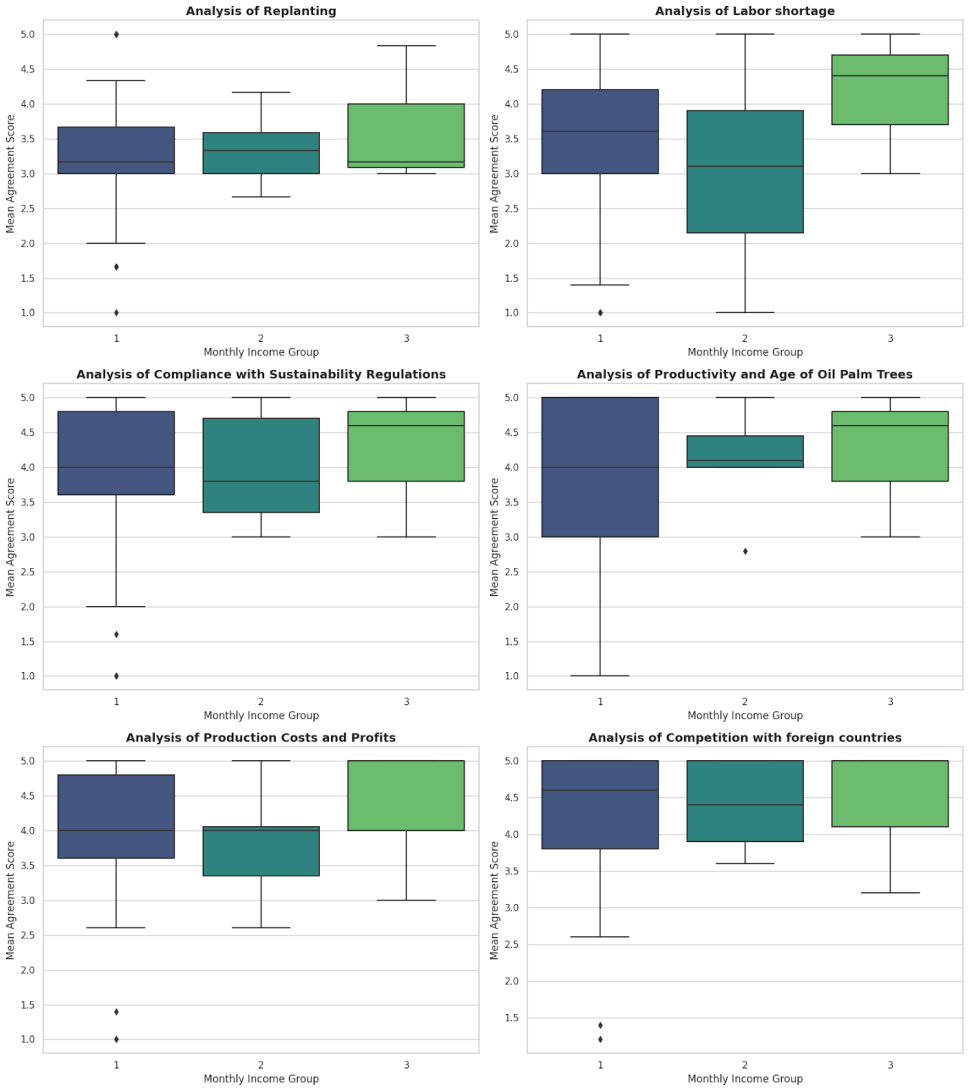

Fig. 1. Boxplot distribution

3.2. Inferential Analysis

The Kruskal-Wallis H test was conducted to examine whether perceptions of management challenges differed across the three income groups. As shown in Table 2, no statistically significant differences were observed for any of the six challenge dimensions ($p > 0.05$). Specifically, non-significant results were obtained for replanting ($H = 0.169$, $p = 0.919$), labour shortage ($H = 1.989$, $p = 0.370$), sustainability compliance ($H = 0.243$, $p = 0.885$), productivity and tree age ($H = 0.429$, $p = 0.807$), production costs and profits ($H = 1.398$, $p = 0.497$), and foreign competition ($H = 0.178$, $p = 0.915$).These findings suggest that respondents from different income categories reported broadly similar perceptions regarding the management challenges examined in this study. Within this sample, income level was not associated with statistically significant differences in any of the challenge dimensions investigated.

Table 2
Inferential Analysis

	H-Statistic	p-value
Replanting	0.169	0.919
Labour shortage	1.989	0.37
Sustainability Compliance	0.243	0.885
Productivity & Tree Age	0.429	0.807
Costs & Profits	1.398	0.497
Foreign Competition	0.178	0.915

4. Discussion

This study examined whether perceived management challenges differed across income groups among independent oil palm smallholders in Malaysia. The results showed no statistically significant differences across the six challenge dimensions examined, namely replanting, labour shortage, sustainability compliance, productivity and tree age, production costs, and global competition. These findings suggest that respondents across different income categories reported broadly similar perceptions of the challenges affecting their farming operations. The absence of significant differences across income groups indicates that income level alone does not adequately differentiate perceptions of management challenges among the respondents surveyed. Although income is often used as an indicator of financial capacity and vulnerability, the findings suggest that many challenges experienced by independent smallholders are shared across income categories. This observation supports the argument that several constraints affecting the palm oil sector operate beyond individual economic circumstances and are experienced throughout the smallholder community.

Among the six challenge dimensions, foreign competition recorded the highest mean score. This finding indicates that respondents perceived external market pressures as one of the most important challenges affecting their operations. The result is consistent with previous studies that highlight the increasing influence of global market dynamics, fluctuating commodity prices, changing consumer preferences, and competition from major producing countries on the palm oil industry. Since these factors operate at national and international levels, their effects are likely to be experienced across different groups of smallholders regardless of income category. Sustainability compliance also recorded consistently high mean scores across all income groups. This finding aligns with studies suggesting that certification requirements and sustainability standards impose administrative, technical, and operational demands on producers irrespective of their financial position. As sustainability requirements continue to expand within international supply chains, smallholders increasingly face the challenge of maintaining compliance while sustaining productivity and profitability. The relatively similar responses across income groups suggest that sustainability obligations are perceived as a common sector-wide concern rather than an issue confined to specific categories of producers.

Production costs and productivity-related issues similarly emerged as important concerns. Respondents reported high levels of concern regarding rising input costs, and the implications of ageing oil palm stands. Previous research has consistently identified fertiliser prices, labour expenses, and plantation maintenance costs as key challenges affecting profitability within the palm oil sector. Likewise, the relationship between ageing palms and declining productivity is well established in agronomic literature. The findings of the present study indicate that awareness of these challenges

is widespread among respondents and does not appear to vary substantially according to income level.

Labour shortage was also identified as an important challenge across all income groups. Although descriptive statistics showed some variation in mean scores, the differences were not statistically significant. This finding is broadly consistent with previous studies that identify labour availability as a persistent concern throughout the Malaysian palm oil industry. Labour constraints affect harvesting activities, plantation maintenance, and overall operational efficiency, particularly within a sector that continues to depend heavily on manual labour. The findings suggest that labour shortages are perceived as a common challenge among smallholders, regardless of income category. Taken together, the findings indicate that many management challenges faced by independent oil palm smallholders are perceived as shared concerns rather than issues that differ substantially according to income level. Consequently, income classification alone may not fully capture the complexity of challenges experienced within the sector. While income remains an important socio-economic indicator, the present findings suggest that broader industry conditions, including market competition, sustainability requirements, labour availability, production costs, and productivity concerns, are relevant considerations when developing support programmes for smallholders.

The findings also provide a foundation for future research. Since the challenges examined were reported consistently across income groups, future studies could investigate how these factors interact under different industry conditions using scenario-based approaches. For example, best-case scenarios could evaluate the effects of successful replanting programmes, improved labour availability, stable production costs, and stronger market demand. Conversely, worst-case scenarios could examine the combined effects of labour shortages, rising input costs, declining productivity from ageing palms, stricter sustainability requirements, and increased market competition. Such analyses would provide a deeper understanding of smallholder resilience and support the development of long-term strategies for strengthening the sustainability of the palm oil sector. Several limitations should be considered when interpreting the findings. First, the study involved a relatively small sample of independent oil palm smallholders, which limits the generalisability of the results. Second, purposive sampling may not fully represent the diversity of Malaysian smallholders. Third, the study relied on self-reported perceptions rather than objective performance indicators. Finally, the cross-sectional design captures perceptions at a single point in time and does not allow causal interpretation. Future research involving larger samples, broader geographical coverage, and additional socio-economic and farm-level variables would provide a more comprehensive understanding of the factors influencing management challenges among independent oil palm smallholders.

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