Journal of Sustainability Science and Management
Volume 20 Number 10, October 2025: 2127-2141
eISSN: 2672-7226

EXPLORING VALIDITY AND RELIABILITY IN SOCIAL LIFE CYCLE ASSESSMENT: A STUDY ON PINEAPPLE SUB-SECTOR

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http://doi.org/10.46754/jssm.2025.10.008
Submitted: 20 October 2024 Revised: 23 February 2025 Accepted: 25 March 2025 Published: 15 October 2025

Abstract: The Malaysian government's policy towards empowering the agricultural sector aimed to strengthen the social structure to achieve long-term food security. However, the development of social studies in the agricultural sector, particularly the pineapple subsector is relatively new in Malaysia. Therefore, the primary objectives of this study were: (1) to evaluate the content validity of the questionnaires for Social Life Cycle Assessment (S-LCA) in the pineapple subsector and (2) to assess the reliability of the questionnaires to determine their suitability for the actual field study. The study employed a total of nine expert panels to conduct a content validity study to determine the validity of the questionnaires prepared for the workers and local communities. Meanwhile, the reliability study employed the Cronbach's Alpha analysis method with a 5-point Likert scale. The Scale-level Content Validity Index (S-CVI/Ave) results were above 0.9, indicating the questionnaires were in good agreement among the experts while the results for Cronbach's Alpha analysis also achieved final values of more than 0.9, suggesting the questionnaire's good reliability. Overall, this article outlined the essential steps for developing the instruments required for Social Life Cycle Assessment (S-LCA) in the pineapple subsector and these steps can also apply to other crops.

Keywords: Agriculture, pineapple production, content validity study, reliability study, Social Life Cycle Assessment (S-LCA).

Introduction

Agriculture is one of the important sectors in the economic model's hierarchy. This sector serves as the primary production sector, playing a crucial role in the production of raw materials used in the secondary sector, which includes the manufacturing sector (Cooke *et al*., 2018). Recently, there has been an interest in sustainable agriculture practices, partly due to the increased awareness of global issues such as food security and climate change (Marzuki & Jais, 2020; Wijerathna-Yapa & Pathirana, 2022). Furthermore, there are growing public concerns about the need for environmentally safe agricultural produce. The excessive use of agricultural inputs has raised public concerns about food safety and health issues.

In addition to the environmental concerns, several social issues require immediate attention. These include problems with working conditions such as workers' ergonomic inefficiencies (Jirapongsuwan *et al*., 2023), as well as the potential health hazards from improper handling of agricultural inputs (Dhankhar & Kumar, 2023). Impacts on the local communities regarding the social interaction of workers are also a matter of concern, in particular for public safety. In Malaysia's agricultural and agro-commodities landscape, pineapple is one of

the food crops that generates profitable income for farmers, alongside the highly popular oil palm cultivation. The demographic structure of pineapple farm workers consists of mixed nationalities, comprising both local and foreign nationals. Therefore, it is imperative to address persistent variable issues.

The Social Life Cycle Assessment (S-LCA) is among the methods developed to study the social impacts of a specific sector or product (Tragnone *et al*., 2022). Essentially, the United Nations Environment Programme/ Society of Environmental Toxicology and Chemistry (UNEP/SETAC) first introduced this methodology in their 2009 guidelines (Norris *et al*., 2011). The five important stakeholder categories within the framework of S-LCA are workers, value chain actors, consumers, the local community, and society (Benoît *et al*., 2010). Within the pineapple subsector in Malaysia, overarching social issues focus on workers and local communities (Shaffril *et al*., 2010; Mohamad Salleh & Sukadarin, 2018). Meanwhile, previous S-LCAs related to the Malaysian region such as the oil palm sector and tea plantations have also clarified the social assessments of the workers and local communities (Muhammad *et al*., 2019; Sharaai *et al*., 2019).

Several positive and negative indicators have contributed to the social well-being of both workers and local communities (Di Cesare *et al*., 2018). Therefore, the S-LCA guidelines can serve as an important framework to develop the questionnaire instrument for evaluating the social well-being of both stakeholders (Benoît Norris *et al*., 2013; Traverso *et al*., 2021). It is imperative that a well-designed and validated instrument be prepared to ensure an accurate assessment of the social impacts on stakeholders' perceptions. Such findings will eventually lead to better-informed decision-making and policymaking, as well as socially responsible practices in the pineapple industry. Thus, it is crucial to establish the validity and reliability of both questionnaires' content. Content validity ensures that all questions represent relevancy, comprehensiveness, simplicity, clarity, and ambiguity (Abu Sabra, 2023). The experts selected for the content validity study should represent their knowledge and expertise in a particular field. These include backgrounds in social studies, agriculture, and pineapple supply chains.

Meanwhile, the reliability study is an important step after the content validity study. The purpose of this study is to identify potential challenges that may arise during the actual survey. There are several types of reliability studies, including test-retest reliability, internal consistency reliability, and alternate form reliability (Md. Ghazali, 2016). The test-retest reliability method necessitates two study administrations for assessment while the internal reliability method evaluates multiple items or variables for correlation over the same construct (McCrae *et al*., 2011). Assessing this procedure using Cronbach's Alpha analysis entails administering the test with a singular dataset (Green *et al*., 2016).

The purpose of this study is to evaluate the appropriateness and suitability of the questionnaires developed for the Social Life Cycle Assessment (S-LCA) of pineapple production in Johor, Malaysia. The two primary objectives are (1) to evaluate the content validity of the questionnaires using appointed expert panels and (2) to conduct reliability assessments to determine the appropriateness and suitability of the questionnaires for an eventual field study.

Materials and Methods

Development of Questionnaires

The instrument or questionnaire development was based on the UNEP/SETAC stakeholder categories with reference to the important methodologies from ISO standards for life cycle assessment (ISO 14040, 2006; ISO 14044, 2006; Benoît Norris *et al*., 2013; Traverso *et al*., 2021). The present study employed two sets of questionnaires to address the respondents' perceptions among workers and local communities.

The methodological sheets of UNEP/SETAC provided guidelines for developing potential subcategories and questions (Benoît Norris *et al*., 2013; Traverso *et al*., 2021). Within both of the guidelines, there are a total of 11 subcategories related to the workers and 9 subcategories associated with the local communities. However, based on the observations of the main issues related to the pineapple subsector in Malaysia as well as the current state of Malaysian economic development, which stands as an upper-middle-income country, there are five subcategories related to the workers and four subcategories associated with the local communities that are relevant to the studies. Table 1 describes the categories and subcategories selected for questionnaire development.

The questionnaire developed for the workers includes a total of 49 Likert-scale questions, with five subcategories related to work discrimination, fair salary/wages, working hours, social benefits/security, and health/safety. Meanwhile, the local communities' questionnaire comprises a total of 38 Likert-scale questions. The questions focus on the four subcategories of safety and healthy living conditions, local employment, community engagement, and cultural heritage. Specifically, the developed content structure of the questionnaires for both the workers and local communities addresses varying local issues related to both respondents, drawing on previous local studies by Muhammad *et al*. (2019) and Omran *et al*. (2021). In both questionnaires for workers and local communities, the initial sections obtained data on the respondents' demographic profile, as listed in Table 1.

Content Validity Process

Content validity guarantees the meticulous design of the questionnaires and their accurate representation of the study's context. A panel of experts, selected for their professional skills and knowledge in the relevant sector would assess these questions. The present study employed two procedures to identify the experts. Table 2 outlines these techniques.

The present study first selected the experts who would assess the pertinence of the proposed questions before moving forward with the reliability study using questionnaires. In this process, the experts completed questionnaires and rated the items' relevance on a four-point Likert scale (1 = not relevant, 2 = somewhat relevant, 3 = quite relevant, and 4 = highly relevant) (Abu Sabra, 2023). They deemed the

Table 1: Stakeholder categories and subcategories developed for the questionnaires

Questionnaires/Stakeholder Categories	Sections/Subcategories	Number of Questions
Questionnaire 1 (workers)	(a) Demographic profile	9
	(b) Work discrimination	11
	(c) Fair salary/wages	9
	(d) Working hours	9
	(e) Social benefits/security	10
	(f) Health and safety	10
Questionnaire 2 (local communities)	(a) Demographic profile	12
	(b) Safety and healthy living conditions	10
	(c) Local employment	9
	(d) Community engagement	9
	(e) Cultural heritage	10

Table 2: Techniques used to identify the expert panel for the content validity process

Approaches	Descriptions
(a) Documents and web searching	The researchers conducted document searches to identify experts from public and private universities and research institutes. Face-to-face evaluations ensued to address pertinent issues and comments (Darusalam & Hussin, 2016).
(b) Snowball technique	Respective government agencies provided a referral process to search for experts from universities and industries. The technique relied on information from a convenience sample subject (Etikan, 2016).

ratings of 3 and 4 to be relevant while the ratings of 1 and 2 were considered irrelevant. The study assessed the data from this process using the Individual-Content Validity Index (I-CVI), subsequently converting it into an overall analysis using the Scale-Content Validity Index per average (S-CVI/Ave).

Reliability Study

Reliability studies, also known as pilot studies, aim to anticipate potential challenges during the actual survey and validate the questionnaire's contents. In this study, the proposed actual study area consisted of the pineapple cultivation areas in the four major districts of pineapple production in Johor, Malaysia. These districts, according to the order of highest production areas are Kluang (4,135.6 ha), Pontian (2,019.4 ha), Batu Pahat (1,863.7 ha), and Muar (996.2 ha) (MPIB, 2022). The significance of these locations is that Johor produces 74.9% of the country's pineapple production, with an approximate volume of 402,555.30 metric tonnes (MPIB, 2023). Out of these, the four districts produce approximately 92.7% of the pineapples within the Johor state (MPIB, 2023).

Meanwhile, the present study applied Krejcie and Morgan's method to estimate the total population of workers and local communities (Krejcie & Morgan, 1970). Although more sophisticated tools exist to measure the sample size, the Krejcie and Morgan's method was preferred due to its simplicity, as it is still widely accepted (relevancy) and very user-friendly, especially when the formula has also been converted into a sample size table for ease of use. This decision was based on an assessment of the studies by Memon *et al*. (2020) and Bujang (2021). The following equation describes the formula used for this estimate (Krejcie & Morgan, 1970):

$$S = X^2NP(1 - P) / d^2(N - 1) + X^2P(1 - P)$$

where S is the required sample size, X^2 is the value of chi-square for one degree of freedom at the desired confidence level (3.841), N is the population size, P is the population proportion (0.5), and d is the degree of accuracy expressed as a proportion (0.05).

The calculation used for these estimates was based on the number of farm owners in Johor's four districts, resulting in a total of 584 farms (MPIB, 2023b). To estimate the number of farm workers, this study further divided the farms into three categories: (a) farms with equal to or less than 0.5 hectares (no workers); (b) farmers who own other crops (palm oil or coconuts), who normally hire at least one permanent worker; and (c) farms with a size of more than 0.5 hectares. This third category implies that the farms normally hire contract workers (up to three personnel) to rotate their work within the estimated 10 farms. Using this approach, the total estimated number of workers was 192. Similarly, this study estimated the local population by multiplying the data on the number of farms by the population density within 1-kilometre-radius areas. The method has yielded a total estimated population of 116,480 people.

Using Krejcie and Morgan's method, the sample size for workers consisted of 128 individuals while the local population comprised 383 individuals. The selection of respondents for the reliability study is 10% of the sampling size (Hertzog, 2008). Therefore, the total number of respondents for the reliability study was 61 individuals: 13 workers and 38 local communities. Out of the four districts mentioned earlier, the pilot study would focus on those in Kluang and Pontian. The locations of these two districts within the state of Johor, Malaysia are shown in Figure 1, drawn with a map using ArcGIS version 10.8.2. These two districts are the centre of pineapple research in Malaysia (Ghani *et al*., 2018) and they also rank as the top two producers in terms of production quantity within the state (MPIB, 2023). Therefore, it represents the vital location for the response required in this study.

The researchers developed five-point Likert scale questions for the reliability study and future social studies. The responses have a range of categories, from "strongly agree" to "strongly disagree" (Harpe, 2015). These gave the respondents options to indicate their level of agreement or disagreement with each question. A number of agricultural-related studies have employed the method of five-point Likert scale questions, showing its wide-scale applications (Allahyari *et al*., 2008; Ntshangase *et al*., 2018; Prasetyaningrum *et al*., 2022). Additionally, this method also provides the respondents with simplicity and ample time to respond while minimising respondent fatigue (Babakus & Mangold, 1992; Sachdev & Verma, 2004). Subsequently, this study employed IBM SPSS Statistics version 26 to analyse the results, focusing on internal consistency and reliability by utilising Cronbach's Alpha value.

Results and Discussion

Content Validity Study

Using both document and web searching methods and the snowball approach, this study identified a total of nine experts who participated in the content validity process

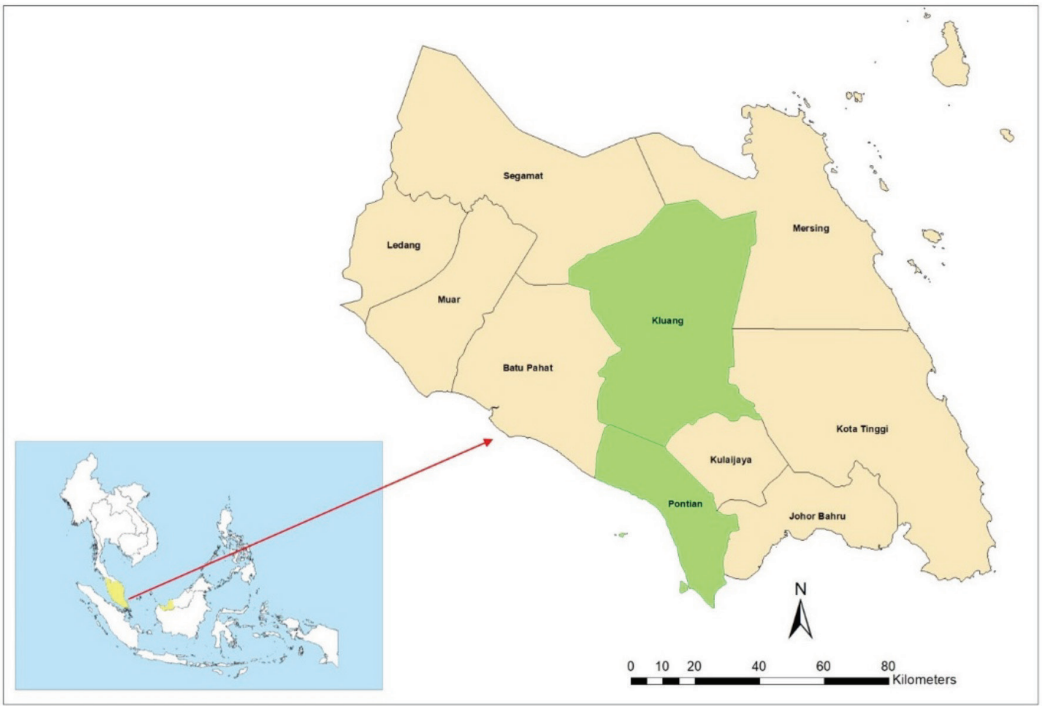

Figure 1: Locations of the pilot study (Kluang and Pontian) within the state of Johor, Malaysia

(Table 3), based on their academic knowledge in social studies with more than five years of experience (Mat Said *et al*., 2022). Furthermore, the process of selecting experts from industries also necessitates more than five years of applied or field experience (Usry *et al*., 2018). The study also encouraged the selection of experts who have dealt with multi-crop production because they would provide a better perspective on crop cultivation issues.

Three important criteria of knowledge (K), awareness (A), and practice (P) were followed to avoid potential biases in the selection of experts. To ensure that the experts would offer valuable opinions to the questionnaires, the three essential criteria are as follows: The individual must at least possess either in-depth knowledge (K) in social studies or pineapple farming; attitudes or awareness (A) of pineapple production; and active participation or practice (P) in pineapple cultivation. Overarchingly, the employed KAP approaches also ensure that the selected experts include individuals from diverse expertise, backgrounds, and experiences, enhancing the process's comprehensiveness (Torres-Malca *et al*., 2022).

Data in Table 3 indicates that the experts have between six and 30 years of experience. Four academics were selected, with two of them possessing a background in the development of social studies (experts no. 1 and no. 3), one in agricultural research (expert no. 2), while another (expert no. 4) is an expert in Life Cycle Assessment (LCA). Meanwhile, one research officer was selected from an agricultural research institute (expert no. 5). The selected research officer has vast knowledge in the development of social studies for agricultural research, including pineapple crops. Additionally, four industrial experts were chosen, who have direct experience and involvement in pineapple cultivation (experts no. 6 to no. 9). Experts no. 7 to no. 9 have also experienced managing other types of crops, including oil palm. The industrial experts' opinions were crucial for describing the reality and situation of pineapple cultivation with more clarity. By following the KAP criteria, the selected experts were found to have diverse

Table 3: List of experts involved in the validation study

No.	Designation	Identification Method	Years of Experience
(1)	Professor, Faculty of Human Ecology, Universiti Putra Malaysia (UPM)	Document searching	30
(2)	Associate Professor, Faculty of Agriculture, Universiti Putra Malaysia (UPM)	Document searching	27
(3)	Senior Lecturer, Faculty of Forestry and Environment, Universiti Putra Malaysia (UPM)	Snowball	19
(4)	Senior Lecturer, Faculty of Social Sciences and Humanities, Universiti Kebangsaan Malaysia (UKM)	Web searching	20
(5)	Senior Research Officer, Socioeconomic, Market Intelligence and Agribusiness Research Centre, Malaysian Agricultural Research and Development Institute (MARDI)	Snowball	13
(6)	Farm owner, Saudagar Nanas Agrofarm (Selangor, Malaysia); also a board member for Malaysian Pineapple Industrial Board (MPIB)	Snowball	6
(7)	Estate Manager, MAB Agri-Horti Sdn. Bhd., KLIA Estate	Snowball	15
(8)	Farm Manager, Pusat Pertanian Putra, Universiti Putra Malaysia (UPM)	Snowball	16
(9)	Assistant Farm Manager, Pusat Pertanian Putra, Universiti Putra Malaysia (UPM)	Snowball	11

knowledge and expertise, which contributed greatly to the improvement of questionnaires during the content validity study.

From a technical viewpoint, the consensus among specialists is that the number of selected experts often falls between five and 10 (Almanasreh *et al*., 2019). However, experts beyond 10 can decrease the likelihood of a random agreement, which can impact the overall validity of the results (Polit & Beck, 2006). According to Ayre and Scally (2014), if the proportion agreeing on assessment values greater than 0.9 is to be achieved, there should be at least nine experts involved. Consequently, the study selected a total of nine experts who met the content validity study criteria.

Tables 4 and 5 present the validity of the research results for workers and local communities. This study transformed the individual Content Validity Index (I-CVI) results into the Scale-level Content Validity Index (S-CVI/Ave) to assess the overall appropriateness of the questionnaire. Scholars deemed a total value over 0.8 to be acceptable (Shrotryia & Dhanda, 2019). As a result, the findings, ranging from 0.94 to 1.00, demonstrated that the set of questionnaires possessed appropriate structural content to proceed with the reliability or pilot study. In general, the experts have concurred with the main contents of the questionnaires. Nonetheless, there were some modest suggestions and feedback to improve the structural phrases of certain questions to provide greater clarity to the respondents. The researchers replied favourably to these remarks and implemented enhancements to both questionnaires.

The five subcategories selected for S-LCA evaluation on workers highlighted in Table 4 are pertinent to the scenario of the labour and farm workers who work in the pineapple industry in Malaysia. There are some concerns about work discrimination, especially among migrant workers (Badarulzaman *et al*., 2016; Noor & Shaker, 2017). The issues also reflected on local workers, especially in relation to the way employer-employee communication is being effectively implemented and how workers are being treated at the workplace (Faraain *et al*., 2019).

Similarly, fair salary is examined to assess whether the workers receive their pay according to the standard rate of minimum wage set by the Malaysian government (Haryati *et al*., 2021) while appropriate working hours are also a matter of concern to avoid the burden from overwork. The last two subcategories of social benefits and security, as well as health and safety issues are interrelated, highlighting their importance among workers (Ningsih, 2019). Previous studies have also highlighted several health and safety issues related to pineapple farm workers, including effects from ergonomic hazards and work-related injuries (Rani *et al*., 2016; Salleh *et al*., 2019).

Meanwhile, explicit attention should be given to local communities whenever social sustainability is the objective of society (Table 5). Many of the pineapple farms are located in villages and on the outskirts of the cities, therefore, the impacts, especially on rural communities should be evaluated. The study of local communities emphasises the safety and health of the pineapple farm's neighbours, ensuring peace and harmony in their community.

Table 4: Results of the content validity study on workers

Variable	Content Validity Index (S-CVI/Ave)
Work discrimination	0.96
Fair salary/wages	0.96
Working hours	0.98
Social benefits/security	1.00
Health and safety	0.98

Additionally, pineapple activity should also assess the positive impacts of economic advantage, including generating more employment opportunities (Tripathy, 2024). Another area of social impact is the level of engagement between farm owners and the surrounding communities. Several studies have shown that positive relationships ensure sustainable rural populations alongside economic and environmental empowerment (McManus *et al*., 2012; Naseer *et al*., 2024). While culture plays an important role for many Asians, the preservation and impact of pineapple activities are indicators that should be explored.

Reliability Study

This study used the internal reliability method to analyse the correlations between each element (McCrae *et al*., 2011; Green *et al*., 2016). Table 6 describes the results of the Cronbach's Alpha analysis on workers. Generally, the values for Cronbach's Alpha have to be greater than 0.7 to be acceptable for further research (Md. Ghazali, 2016). Meanwhile, Taber (2018) described threshold Alpha values of 0.7 or more as widely described as desirable values for instruments to be considered reliable. The data in Table 6 identified that two of the variables initially had a lower Alpha value, including subtopics on work discrimination and working hours.

To improve the Alpha values, this study removed item B6 from the subtopic of work discrimination, which contributed to the Alpha value increasing from 0.694 to 0.719. Meanwhile, the study also removed three items from the subtopic of working hours, namely D4, D5, and D6. This modification substantially improved the Alpha value from 0.473 to 0.708. The respondents essentially understood the removed items (questions) as questions about knowledge, not perception. Therefore, the variation in the responses is unsuitable for being used as an instrument to measure perception among respondents. Item B6 primarily addresses questions about the treatment of workers based on different religious backgrounds. Respondents could not give a clear answer, as most of the workers are Muslims, although they may represent either local or foreign workers. Observations from the survey also revealed that most of the pineapple workers are Muslims, so, this question may be difficult to answer among the workers, especially for the eventual field survey (actual study).

Table 5: Results of the content validity study on local communities

Variable	Content Validity Index (S-CVI/Ave)
Safety and healthy living conditions	0.97
Local employment	0.98
Community engagement	0.98
Cultural heritage	0.94

Table 6: Results of the pilot study conducted on workers

Type of Variables	Item Number (Questions)	Initial Cronbach's Alpha Value	Item Removed	New Cronbach's Alpha Value	Overall Cronbach's Alpha Value
(a) Work discrimination	B1–B11	0.694	B6	0.719	
(b) Fair salary/wages	C1–C9	0.716	Nil	0.716	0.938
(c) Working hours	D1–D9	0.473	D4, D5, D6	0.708	
(d) Social benefits/security	E4–E10	0.756	Nil	0.756	
(e) Health and safety	F1–F10	0.888	Nil	0.888	

Meanwhile, the subsequent items on D4 (understanding of the Work Act 1955), D5 (consent for working overtime), and D6 (safety precautions for working at night) were also considered questions of comprehension rather than questions of perception. Although the Work Act 1955 (item D4) is closely related to the workers, most of them have not made an effort to understand the whole detail and structural context of the act. Thus, many did not have any particular understanding of the details. The feedback received also identified that respondents have a vague understanding of item D5, although it is relevant to their job scope. Their duties at the farm are basically task-based and not as rigid as time-based (such as from 8:00 am to 5:00 pm). Respondents explained that they were unable to provide clear, perceptive answers to the question. This situation was similar to item D6, where some farm workers have no experience working at night, leading to variations in their answers.

The subsection on social benefits and security excluded three items (E1, E2, and E3) because foreign workers were unable to respond to these questions, as they could not provide any answers. These items pertain to retirement savings through the Employee Provident Fund (EPF) (E1), contributions to social security through the Social Security Organisation (SOCSO) (E2), and contributions to life insurance (E3). The respondents classified these questions as knowledge enquiries rather than perceptions. Indeed, most of the foreign workers did not seem to understand the details about the EPF contribution. They were therefore unable to respond to these questions with any perception-based responses. This was the primary feedback that the researchers received during the reliability study. Nonetheless, the government is planning to require foreign workers to make contributions starting in 2027 with the implementation of several policies (Yeap, 2025). It is expected that foreign workers' understanding of their compulsory contribution to EPF will be of importance to the respective government agencies.

In the meantime, the local communities' pilot study analysis yielded high Alpha values (Table 7). The questionnaire (item C6), which primarily focuses on local communities' perceptions of the proportion of local workers compared to foreign workers is the only item that needs removal. Respondents provided various answers to this question, indicating that different localities (areas) may have different proportions of local and foreign workers. Therefore, the question was considered unsuitable for an eventual field study.

Essentially, removing all the items mentioned above will not impact the comprehensiveness and clarity of the questionnaire. This reliability study aims to eliminate potential ambiguities that may arise during the actual field survey (Downing, 2003). Prior to remove the items, a

Table 7: Results of the pilot study conducted on local communities

Type of Variables	Item Number (Questions)	Cronbach's Alpha Value	Item Removed	New Cronbach's Alpha Value	Overall Cronbach's Alpha Value
(a) Safety and healthy living conditions	B1–B10	0.817	Nil	0.817	
(b) Local employment	C1–C9	0.664	C6	0.803	0.930
(c) Community engagement	D1–D9	0.838	Nil	0.838	
(d) Cultural heritage	E1–E10	0.834	Nil	0.834	

thorough investigation of their relevancy had determined whether their inclusion may affect the overall interpretation of the data obtained by the respondents during the actual study. In terms of the final questionnaires with five-point Likert-scale structures, the number of items (questions) for workers was reduced from 49 to 42 while the number of items in the questionnaire for local communities was reduced from 38 to 37.

The improved Alpha values obtained the final values of 0.938 and 0.930, respectively (Table 6 and Table 7). In terms of the minimal number of respondents to be considered appropriate in the pilot study, Bujang *et al*. (2018) highlighted that for an item between 35 and 40 with 0.90 internal consistency, the minimum sample size (respondents) is between 6 and 7 for the power of 80% and 90%, respectively. Therefore, the pilot study's sample size for both workers (13 respondents) and local communities (38 respondents) exceeded the minimum requirements.

Future Works and Recommendations

The steps highlighted in this study ascertain the need to conduct a validity and reliability study prior to the actual field survey. The selection of subcategories for S-LCA reflects the specific issues faced by workers and local communities in Malaysia's pineapple subsector. Other countries may have different domestic issues that require further assessment, considering differences in demographic and social structure. In a subsequent process, several important steps need to be followed during the actual field survey, especially for data analysis. The ISO 14040 and 14044 standards highlight the importance of effectively measuring and assessing the indicators. These include characterisation, normalisation, and weighting, which are essential steps for a comprehensive S-LCA study (Kalvani *et al*., 2022).

Although normalisation and weighting can also be considered optional in a Life Cycle Assessment (LCA), they are important steps for an overarching sustainability assessment (Du *et al*., 2019; Omran *et al*., 2021). Thus, it is important to ensure that all due processes are fulfilled to obtain a high-quality S-LCA study.

Conclusions

The procedures for conducting a content validity and reliability study are crucial in the process of developing social studies. Both steps in this study yielded valuable contributions to the creation of comprehensive and top-notch questionnaires that are appropriate for distribution among the targeted respondents. The Scale-level Content Validity Index (S-CVI/Ave) demonstrated a high level of agreement with the experts in terms of its relevancy and clarity. Subsequently, the pilot study identified several steps for improving the development of questions aimed at analysing respondents' perceptions. This study excluded some questions that focused on knowledge rather than perception. The workers' and local communities' questionnaire had final Cronbach's Alpha values of more than 0.9, indicating high reliability.

Therefore, it is acceptable to use the improvised questionnaires for an eventual field study. In summary, the methods outlined in this article are important for developing a questionnaire framework for a proposed study on Social Life Cycle Assessment (S-LCA) in the pineapple subsector. The outcome of this study will support government policies toward achieving sustainable pineapple production, which include addressing social importance. Since the study focuses on Johor as the major producer of pineapple in Malaysia, there are several limitations. For example, the diverse concerns and issues about workers and local communities only apply to the studied districts; thus, similar aspects in other regions, states, and countries require further evaluation. Nevertheless, this study should serve as a benchmark for future studies to evaluate social impacts on pineapple production specifically and subsequently, overall agricultural production.

Acknowledgements

The authors would like to thank the Malaysian Agricultural Research and Development Institute (MARDI) (PRS-505) and Universiti Putra Malaysia (UPM) (GPI/2023/9757900) for the research grants provided to conduct this study. We extend our special appreciation to Mr. Ahmad Fitri Shah Mohd Yussof, Hj. Muhamad Yusni Ramelan, and Mr. Muhamad Khairul 'Azmi Mat Som from the Malaysian Pineapple Industrial Board (MPIB), as well as Mr. Mohd Azlan Pauzi from MARDI, for their invaluable technical assistance during the study.

Conflict of Interest Statement

The authors declare that they have no conflict of interest.

References

Abu Sabra, M. A. (2023). An adapted management of early warning signs of relapse questionnaire: Validity and reliability. *Archives of Psychiatric Nursing*, *45*, 16-25. https://doi.org/10.1016/j.apnu.2023.04.015

Allahyari, M. S., Chizari, M., & Homaee, M. (2008). Perceptions of Iranian agricultural extension professionals toward sustainable agriculture concepts. *Journal of Agriculture and Social Sciences*, *4*(3), 101-106.

Almanasreh, E., Moles, R., & Chen, T. F. (2019). Evaluation of methods used for estimating content validity. *Research in Social and Administrative Pharmacy*, *15*(2), 214-221. https://doi.org/10.1016/j.sapharm.2018.03.066

Ayre, C., & Scally, A. J. (2014). Critical values for Lawshe's Content Validity Ratio: Revisiting the original methods of calculation. *Measurement and Evaluation in Counseling and Development*, *47*(1), 79-86. https://doi.org/10.1177/0748175613513808

Babakus, E., & Mangold, W. G. (1992). Adapting the SERVQUAL scale to hospital services: An empirical investigation. *Health Services Research*, *26*(6), 767-786.

Badarulzaman, M. H., Ayub, Z. A., Yusoff, Z. M., & Wahab, H. A. (2016). Discrimination against migrant workers in Malaysia. *Jurnal Mimbar Hukum*, *28*(3), Article 3. https://doi.org/10.22146/jmh.16692

Benoît, C., Norris, G. A., Valdivia, S., Ciroth, A., Moberg, Å., Bos, U., Prakash, S., Ugaya, C., & Beck, T. (2010). The guidelines for social life cycle assessment of products: Just in time! *The International Journal of Life Cycle Assessment*, *15*(2), 156-163.

Benoît Norris, C., Traverso, M., Valdivia, S., Vickery-Niederman, G., Franze, J., Azuero, L., Ciroth, A., Mazijn, B., & Aulisio, D. (2013). *The Methodological Sheets for Subcategories in Social Life Cycle Assessment (S-LCA)*. United Nations Environment Programme (UNEP) and the Society of Environmental Toxicology and Chemistry (SETAC). https://www.lifecycleinitiative.org/wp-content/uploads/2013/11/S-LCA_methodological_sheets_11.11.13.pdf

Bujang, M. A. (2021). A step-by-step process on sample size determination for medical research. *The Malaysian Journal of Medical Sciences (MJMS)*, *28*(2), 15-27. https://doi.org/10.21315/mjms2021.28.2.2

Bujang, M. A., Omar, E. D., & Baharum, N. A. (2018). A review on sample size determination for Cronbach's Alpha Test: A simple guide for researchers. *Malaysian Journal of Medical Sciences*, *25*(6), 85-99. https://doi.org/10.21315/mjms2018.25.6.9

Cooke, P., Yun, J., Zhao, X., & Kim, Y. (2018). The digital, quaternary or 4.0 web economy: Aspects, effects and implications. *International Journal of Knowledge-based Development*, *10*(3), 193-212. https://doi.org/10.1504/IJKBD.2019.10024722

Darusalam, G., & Hussin, S. (2016). *Metodologi penyelidikan dalam pendidikan: Amalan dan analisis kajian*. Kuala Lumpur: Penerbit Universiti Malaya.

Dhankhar, N., & Kumar, J. (2023). Impact of increasing pesticides and fertilisers on human health: A review. *Materials Today: Proceedings*, *Article in Press*. https://doi.org/10.1016/j.matpr.2023.03.766

Di Cesare, S., Silveri, F., Sala, S., & Petti, L. (2018). Positive impacts in social life cycle assessment: State of the art and the way forward. *The International Journal of Life Cycle Assessment*, *23*(3), 406-421. https://doi.org/10.1007/s11367-016-1169-7

Downing, S. M. (2003). Validity: On the meaningful interpretation of assessment data. *Medical Education*, *37*(9), 830-837. https://doi.org/10.1046/j.1365-2923.2003.01594.x

Du, C., Dias, L. C., & Freire, F. (2019). Robust multi-criteria weighting in comparative LCA and S-LCA: A case study of sugarcane production in Brazil. *Journal of Cleaner Production*, *218*, 708-717. https://doi.org/10.1016/j.jclepro.2019.02.035

Etikan, I. (2016). Comparision of snowball sampling and sequential sampling technique. *Biometrics & Biostatistics International Journal*, *3*(1), 00055. https://doi.org/10.15406/bbij.2016.03.00055

Faraain, N., Musairah, S., & Md Sabri, S. (2019). Exploring workplace injustice and employees' well-being in Malaysia. *International Journal of Accounting, Finance and Business (IJAFB)*, *4*, 76-91.

Ghani, N. S. A., Razali, M. S. N., Sarip, J., Mustaffa, R., Zainol, R., & Ismail, M. A. (2018). Upscaling of potential pineapple hybrid to small and medium-scale grower in Johor, Malaysia. *Journal of Agriculture, Forestry and Plantation*, *7*, 69-72.

Green, S. B., Yang, Y., Alt, M., Brinkley, S., Gray, S., Hogan, T., & Cowan, N. (2016). Use of internal consistency coefficients for estimating reliability of experimental tasks scores. *Psychonomic Bulletin & Review*, *23*(3), 750-763. https://doi.org/10.3758/s13423-015-0968-3

Harpe, S. E. (2015). How to analyse Likert and other rating scale data. *Currents in Pharmacy Teaching and Learning*, *7*(6), 836-850. https://doi.org/10.1016/j.cptl.2015.08.001

Haryati, Z., Subramaniam, V., Zainon, N. Z., Loh, S. K., & Abd Aziz, A. (2021). Complementing social life cycle assessment to reach sustainable development goals—A case study from the Malaysian oil palm industry. *Chemical Engineering Transactions*, *83*, 331-336. https://doi.org/10.3303/CET2183056

Hertzog, M. A. (2008). Considerations in determining sample size for pilot studies. *Research in Nursing & Health*, *31*(2), 180-191. https://doi.org/10.1002/nur.20247

ISO 14040. (2006). *Environmental management—Life cycle assessment—Principles and framework, Geneva*. https://www.iso.org/obp/ui/en/#iso:std:iso:14040:ed-2:v1:en

ISO 14044. (2006). *Environmental management—Life cycle assessment—Requirements and guidelines*. https://www.iso.org/standard/38498.html

Jirapongsuwan, A., Klainin-Yobas, P., Songkham, W., Somboon, S., Pumsopa, N., & Bhatarasakoon, P. (2023). The effectiveness of ergonomic intervention for preventing work-related musculoskeletal disorders in agricultural workers: A systematic review protocol. *PLOS ONE*, *18*(7), e0288131. https://doi.org/10.1371/journal.pone.0288131

Kalvani, S. R., Sharaai, A. H., Masri, M. F., Yunus, N. F. M., Afendi, M. R., & Uchechukwu, O. B. (2022). Social impact and social performance of paddy rice production in Iran and Malaysia. *The International Journal of Life Cycle Assessment*, *27*(8), 1092-1105. https://doi.org/10.1007/s11367-022-02083-4

Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*, *30*, 607-610.

Marzuki, A., & Jais, A. S. (2020). Urbanisation and the concerns for food security in Malaysia. *Planning Malaysia*, *18*(3), 202-217. https://doi.org/10.21837/pm.v18i13.786

Mat Said, N. A., Bujang, S. M., Buang, N. A., Siraj@Ramli, H. H., & Awang Besar, M. N. (2022). Critical thinking transfer practice instrument: A content validity calculation steps based on expert panel evaluation. *Education in Medicine Journal*, *14*(3), 61-74. https://doi.org/10.21315/eimj2022.14.3.5

McCrae, R. R., Kurtz, J. E., Yamagata, S., & Terracciano, A. (2011). Internal consistency, retest reliability, and their implications for personality scale validity. *Personality and Social Psychology Review: An Official Journal of the Society for Personality and Social Psychology, Inc*, *15*(1), 28-50. https://doi.org/10.1177/1088868310366253

McManus, P., Walmsley, J., Argent, N., Baum, S., Bourke, L., Martin, J., Pritchard, B., & Sorensen, T. (2012). Rural community and rural resilience: What is important to farmers in keeping their country towns alive? *Journal of Rural Studies*, *28*(1), 20-29. https://doi.org/10.1016/j.jrurstud.2011.09.003

Md Ghazali, N. H. (2016). A reliability and validity of an instrument to evaluate the school-based assessment system: A pilot study. *International Journal of Evaluation and Research in Education (IJERE)*, *5*(2), 148-157. https://doi.org/10.11591/ijere.v5i2.4533

Memon, M. A., Ting, H., Cheah, J.-H., Thurasamy, R., Chuah, F., & Cham, T. H. (2020). Sample size for survey research: Review and recommendations. *Journal of Applied Structural Equation Modeling*, *4*(2), i-xx. https://doi.org/10.47263/JASEM.4(2)01

Mohamad Salleh, N. F., & Sukadarin, E. H. (2018). Defining human factor and ergonomic and its related issues in Malaysia pineapple plantations. *MATEC Web of Conferences*, *150*, 05047. https://doi.org/10.1051/matecconf/201815005047

MPIB. (2022). *Data Nanas 2021*. Malaysian Pineapple Industry Board (MPIB). https://www.mpib.gov.my/wp-content/uploads/2022/12/Data-Statistik-Nanas-2021.pdf

MPIB. (2023a). *Data Nanas 2022*. Malaysian Pineapple Industry Board (MPIB). https://www.mpib.gov.my/wp-content/uploads/2024/01/Data-Nanas-2022.pdf

MPIB. (2023b). *Data Utama Negeri Johor (2021 dan 2022)* [Unpublished Data]. Malaysian Pineapple Industry Board (MPIB).

Muhammad, K. I., Sharaai, A. H., Ismail, M. M., Harun, R., & Yien, W. S. (2019). Social implications of palm oil production through social life cycle perspectives in Johor, Malaysia. *The International Journal of Life Cycle Assessment*, *24*(5), 935-944. https://doi.org/10.1007/s11367-018-1540-y

Naseer, S., Rashid, Z., Majid, S., Rasool, F., & Dar, Z. A. (2024). 12. Community engagement and sustainable agriculture. In *Sustainable agriculture: A modern agronomist's perspective* (pp. 146-156). Kripa-Drishti Publications.

Ningsih, A. S. (2019). Regulation on social security system for workers to achieve safety and health at work; Comparison between Indonesia and Malaysia Labour Law. *Tadulako Law Review*, *4*(1), 100-117.

Noor, N. M., & Shaker, M. N. (2017). Perceived workplace discrimination, coping and psychological distress among unskilled Indonesian migrant workers in Malaysia. *International Journal of Intercultural Relations*, *57*, 19-29. https://doi.org/10. 1016/j.ijintrel.2017.01.004

Norris, C., Vickery-Niederman, G., Valdivia, S., Franze, J., Traverso, M., Ciroth, A.,

& Mazijn, B. (2011). Introducing the UNEP/SETAC methodological sheets for subcategories of social LCA. *The International Journal of Life Cycle Assessment*, *16*, 682-690. https://doi.org/10.1007/s11367-011-0301-y

Ntshangase, N. L., Muroyiwa, B., & Sibanda, M. (2018). Farmers' perceptions and factors influencing the adoption of No-Till conservation agriculture by small-scale farmers in Zashuke, KwaZulu-Natal Province. *Sustainability*, *10*(2), Article 2. https://doi.org/10.3390/su10020555

Omran, N., Sharaai, A. H., & Hashim, A. H. (2021). Visualisation of the sustainability level of crude palm oil production: A life cycle approach. *Sustainability*, *13*(4), Article 4. https://doi.org/10.3390/su13041607

Polit, D. F., & Beck, C. T. (2006). The content validity index: Are you sure you know what's being reported? Critique and recommendations. *Research in Nursing & Health*, *29*(5), 489-497. https://doi.org/10.1002/nur.20147

Prasetyaningrum, D., Ruminar, H., & Irwandi, P. (2022). The perception and interest of career choices in agriculture: Case of agroecotechnology and agribusiness students. *HABITAT*, *33*(2), 186-200. https://doi.org/10.21776/ub.habitat.2022.033.2.19

Rani, N. H., Zainal Abidin, E., Ya'acob, N. A., Karuppiah, K., & Rasdi, I. (2016). Musculoskeletal symptoms risk factors and postural risk analysis of pineapple plantation workers in Johor. *Journal of Occupational Safety and Health*, *13*(1), 17-26.

Sachdev, S. B., & Verma, H. V. (2004). Relative importance of service quality dimensions: A multisectoral study. *Journal of Services Research*, *4*(1), 93-116.

Salleh, N. F. M., Sukadarin, E. H., Khamis, N. K., & Ramli, R. (2019). Pattern of muscle contraction in different postures among Malaysia pineapple plantation workers. *IOP Conference Series: Materials Science and Engineering*, *469*(1), 012088. https://doi.org/10.1088/1757-899X/469/1/012088

Shaffril, H. A. M., Nasir, A. F. A., Idris, K., Uli, J., & D'Silva, J. L. (2010). Agriculture project as an economic development tool to boost socio-economic level of the poor community: The case of Agropolitan project in Malaysia. *African Journal of Business Management*, *4*(11), 2354-2361.

Sharaai, A. H., Muhammad, K. I., & Wah, Y. G. (2019). Social impact evaluation of tea production using social life cycle assessment (S-LCA) method in Cameron Highlands, Pahang, Malaysia. *Planning Malaysia*, *17*(2), 215-224. https://doi.org/10.21837/pm.v17i10.642

Shrotryia, V. K., & Dhanda, U. (2019). Content validity of assessment instrument for employee engagement. *SAGE Open*, *9*(1), 2158244018821751. https://doi.org/10.1177/2158244018821751

Taber, K. S. (2018). The use of Cronbach's Alpha when developing and reporting research instruments in science education. *Research in Science Education*, *48*(6), 1273-1296. https://doi.org/10.1007/s11165-016-9602-2

Torres-Malca, J. R., Vera-Ponce, V. J., Zuzunaga-Montoya, F. E., Talavera, J. E., & De La Cruz-Vargas, J. A. (2022). Content validity by expert judgment of an instrument to measure knowledge, attitudes and practices about salt consumption in the peruvian population. *Revista de La Facultad de Medicina Humana*, *22*(2), 273-279. https://doi.org/10.25176/RFMH.v22i2.4768

Tragnone, B. M., D'Eusanio, M., & Petti, L. (2022). The count of what counts in the agri-food Social Life Cycle Assessment. *Journal of Cleaner Production*, *354*, 131624. https://doi.org/10.1016/j.jclepro.2022.131624

Traverso, M., Luthin, A., Roche, L., Arcese, G., Neugebauer, S., Petti, L., D'Eusanio, M., Tragnone, B. M., Mankaa, R., Hanafi, J., Benoît Norris, C., & Zamagni, A.

(Eds.). (2021). *Methodological sheets for subcategories in Social Life Cycle Assessment (S-LCA) 2021*. United Nations Environment Programme (UNEP).

Tripathy, S. N. (2024). Pineapple cultivation enhances global demand, economic potential, and livelihoods for the Dongria Kondh. *Horticulture International Journal*, *8*(4), 116-121. https://doi.org/10.15406/hij.2024.08.00313

Usry, J., Partington, S. W., & Partington, J. W. (2018). Using expert panels to examine the content validity and Inter-Rater reliability of the ABLLS-R. *Journal of Developmental and Physical Disabilities*, *30*(1), 27-38. https://doi.org/10.1007/s10882-017-9574-9

Wijerathna-Yapa, A., & Pathirana, R. (2022). Sustainable agro-food systems for addressing climate change and food security. *Agriculture*, *12*, Article 10. https://doi.org/10.3390/agriculture12101554

Yeap, C. (2025). *The State of the Nation: Cutting 'leakages' would make EPF contributions for foreigners more palatable to employers*. The Edge Malaysia. https://theedgemalaysia.com/node/742497