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REVIEW ARTICLE

Exploring the wellbeing and challenges faced by smallholder plantation farmers in Malaysia: A systematic review

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Abstract: This systematic review article focuses on the wellbeing, challenges and issues faced by smallholder plantation farmers in Malaysia. Malaysia's smallholder plantation farmers come from diverse backgrounds and contribute significantly to the nation's economy. In spite of this, their plantations are not immune from constraints that influence their survival as well as their economic well-being. Additionally, several reports indicate that various efforts and support have been made by stakeholders to improve the situation, but to no avail, since there are still issues and challenges in place despite more than a decade of implementation. Hence, this study aims to systematically identify these challenges and issues faced by the smallholder plantation farmers in Malaysia. Through four steps of systematic review process, 23 related articles from 2010–2022 were analyzed. Eight categories have been identified to be the challenges faced by the smallholder plantation farmers and were grouped into two different categories. The categories and subcategories namely formal challenges include quality of government aid, unresolved land ownership issue among the smallholders, unstable market price and harming of environmental sustainability and the informal challenges include reluctant of young generation in smallholding plantation, lack of related knowledge in plantation, lack of finance stability and cultivation issues. With two main categories, the challenges and issues have been more clarified and seemlier manageable for their wellbeing. Furthermore, a number of recommendations were mentioned in this study for future research.

Keywords: challenges; issues; systematic review; smallholder plantation farmers; wellbeing

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1. Introduction

The agricultural is a significant sector in Malaysia because food security ensures the country's sovereignty. In this sector, farmers have become the main player that ensure the development and success of the overall production. Successful farmers are said to be those who are hard-working, intelligent and willing to serve others[1]. They also tend to have all other risk sources relatively well

under control and have closer mutual support from other fellow farmers[2]. Above all, their goods are valuable and assist all households in feeding their families by producing food crops. Food crops such as rice, vegetables, and fruits are essential in daily life, in addition to sources of food and animal husbandry, as well as industrial crops for export.

Smallholder farmers play a significant role on the global agenda in terms of reducing poverty and promoting rural development. Nevertheless, smallholder farmers faced their own unfavorable condition especially for independent farmers. They are unable to manage some challenges, but still can influence others. Examples of uncontrollable variables include fluctuations in the weather and open market prices. These basic and technical elements have an impact on market mood[3]. Taking everything into account, the development of smallholding plantation in a developing country like Malaysia is crucial as they had a direct impact on the social and economic status of the people. It is undeniable for this group to face challenges in their development whether from the management aspect or personal aspect. However, if not systematically identifi d, these challenges may require more effort to address and cater to accordingl .

The situation in Malaysia for the past several years has been severely affe ted by the pandemic caused by the COVID-19. The smallholder plantation farmers sector in Malaysia is one of the economic sectors that was most directly impacted by this situation. The Movement Control Order that has been enforced during the pandemic had reduced the income of small traders, particularly in rural areas[4]. Not only that, as for the smallholder plantation farmers, they also faced a variety of constraints, including control and exploitation, in addition to the issue related to the seeds and market place. All of these had brought challenges that may affect the quality of the sector in general. It is important for this group of farmers to be supported for the agricultural development as this sector had accounted for 40% of the total output of national production of palm oil alone[5]. This huge contribution should be awarded with more attention and efforts to improve them in all aspects of their development. In order to do that, it is important to understand their needs based on challenges they had to face along the way.

Due to this, this study aims to systematically identify the challenges faced by the smallholder plantation farmers in Malaysia with a hope to provide better understanding in developing this sector. The rest of the paper is organized as follows: In Section 2, Literature review, we discussed the plantation farming and smallholders farmer plantation in Malaysia; In Section 3, Methods, we discussed the resources and the systematic literature process, focusing on exploring the issues through the chosen methods; In Section 4, Results, we discussed the results from the analysis which were divided into general results on the articles used in the analysis and main results which has focused on the discovered theme. We then further discussed on this theme in Section 5, Discussion, we intellectually discussed the theme in general and specific manner. In section 6, Recommendation, we listed several recommendations for future research and finally in Section 7, Conclusion, we concluded the overall study of this article.

2. Literature review

2.1. Plantation farming

Plantation farming activity is a worldwide sector that was practiced for thousands of years.

Large-scale developments have taken place, covering a wide range in this sector, such as crops, technologies and farmers. For the past of few years, researches on plantation farming can be searched with different objectives and interesting results that contribute towards its development. For instance, a quick search using Google Scholar with key word "plantation farming" from "2019 to 2023" had produced 16,200 results within 0.11 seconds. With this key word alone, there are abundance of articles that discussed on this matter to prove the richness of this research field

Among the objectives in plantation farming research includes the sustainability of the plantation activities. These researches trend has become mainstream since the development of Sustainability Development Goals in 2015. Under the second goals, SDG2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture, it requires that agriculture systems worldwide to become more productive and less wasteful. Sustainable agricultural practices and food systems, including both production and consumption, must be pursued from a holistic and integrated perspective[6]. Due to this, many studies were done with the reference from SDG2 in order to support the objectives in this goal. One of the sustainability aspects of plantation that was studied is the environmental sustainability impact from the plantation activities. Meanwhile, Bayle's[7] study had revealed that the Eucalyptus plantation may had led to environmental degradation as it uses a lot of nutrients which is leading to soil exhaustion and reduction of crop yields, secretion of allelochemical and decreasing crop production. Nevertheless, this plantation at the same time had released pressure on the natural forest by avoiding the logging that could led to land degradation and ecological destruction. Meanwhile, Novara *et al*.[8] reported that soil management under organic farming can enhance soil organic carbon, thereby mitigating atmospheric greenhouse gas increases. On the other hand, Kenney-Lazar *et al*.[9] reveal that sustainable rubber, if rigorously and specifically defined, would be exceedingly difficult to reach, due to the ways in which political-economic and governance factors interact with the biophysical and social characteristics of the crop.

Another area studied in plantation farming is related to the technology. A study by Rachmani and Zulkifl [10] had successfully designed an IoT monitoring system for starfruit plantation whereby the interface can be accessed through desktop and smartphone. The uses of IoT are in line with IR4.0 that requires the uses of IoT in the industries. Furthermore, studies on the farmers themselves also took place around the world. The studies revolve around several topics such as training of the farmers as revealed by Syahza *et al*.[11], whereby providing training can increase needed knowledge and experience about palm oil plantation replanting among the farmers. Past studies also had focused on the farmers awareness of farming technique including fertilization practices[12] and on their decision making regarding the production[13]. Nevertheless, these studies had focused on the farmers per se and in the context of different countries. All these past studies in a way indicated that study on plantation farming is crucial towards the sustainability of the world.

2.2. Smallholders plantation in Malaysia

The process of agricultural transformation, which affects a number of sectors and is also backed by precise productivity increases, has had an impact on Malaysian agriculture. Annual Gross Domestic Product (GDP) in primary agricultural production averaged 2.5% between 1990 and 2005. By 2005, it had made up 8.2% of the GDP (RM 21.6 billion at 1987 prices) and 13.3% of all jobs (1.4 million). Agriculture's contribution to total employment in 2016 was 11.4%, while its part of the nation's GDP was 8.7%. Industrial commodities account for 4.7% and 3.9% of the 8.7% share of the

Table 1. The percentage share of agricultural sector based on type of economic activities in 2020[16]

Economic activities	Percentage share %
Rubber	2.5
Oil palm	37.1
Forestry & logging	5.2
Fishing	11.2
Livestock	16.1
Other agriculture	27.9
Total	100

country's GDP that is supported by the agro–food subsector, respectively[14].

There are two main categories of crops in Malaysian agriculture: food crops and industrial crops. Food crops refer to vegetables, fruits, root crops, and grain crops associated with smallholdings managed by individual farmers. Industrial crops refer to oil palm, rubber, tea and other crops that are associated with large estates managed by corporations[15]. The majority of agricultural land in Malaysia is typically devoted to oil palm crops because they generate a higher return and can be enjoyed by the subsector. However, the production of major commodity crops in 2020 has decreased as compared to 2019. The production of fresh fruit bunches (oil palm) decreased by 2,096.1 thousand tones or 2.1% but it was the highest production in agricultural commodities[16]. This decreased trend can be due to the pandemic that affect the whole world including agricultural industries. **Table 1** shows the percentage share of agricultural sector based on type of economic activities in 2020[16].

Smallholders comprise farmers who own 100 acres of land or less (40.46 ha)[17]. Their involvement in oil palm cultivation is said to be growing. This situation explains why the country's oil palm production is not only contributed by estates, but also by smallholders, including private smallholders. Accordingly, smallholders own 40% of the five hectares of land planted with oil palm crops. This explains why the oil palm industry has played an important role in reducing poverty standards and improving the well-being of rural communities.

Generally, there are two types of oil palm smallholder in Malaysia namely independent smallholders, and government supported smallholders. The first category, independent smallholders refer to growers without any direct assistance from the government, or private entities[15], whereby 13.6% of Malaysian independent smallholders are family-run with poor social and environmental standards due to capital constraints with income about RM 1,600 per month (USD 354), well below the new national poverty line of RM 2,208 (USD 488)[17].

The second category, organized smallholders received support from the government or the private sector. This support may be in the form of loans, technical assistance, guaranteed markets or prices, assistance with land access or titling, legal support or institutional development. In Malaysia, this scheme is primarily driven by three main agencies namely Federal Land Development Authority (FELDA), Federal Land Consolidation and Rehabilitation Authority (FELCRA) and Rubber Industry Smallholder Development Authority (RISDA)[15]. This group of smallholder makes up 40% of the Malaysia's palm oil output[17].

3. Methods

This research uses a systematic review technique that involved analysis of documents from past studies. A systematic review differs with literature review as in this approach, the goal is to uncover all the relevant evidence on a question by focusing on research that reports data rather than theories and concepts[18]. For this, the research had undergone systematic review process with details discussed on sections below.

3.1. Resources

The systematic review of academic literature in this study was conducted to identify some published information on the challenges faced by the smallholder farmers in Malaysia. Several open access databased were used to search the articles with related keywords and search strings. The search was conducted in November 2022 until January 2023 and results were restricted within the period of 2010 to 2022.

3.2. Systematic review process

This section explained the steps in the systematic review procedure that consisted of four steps. The steps are identification, screening, eligibility and exclusion of duplication and data abstraction and analysis.

Identification: To conduct a systematic review, key words need to be identified for searching information online. As can be seen in **Table 1**, the keywords that were used to search for related articles in the search engine are listed. Dictionary and thesaurus searches, as well as previously published articles, were used to obtain keywords. The literature search was carried out on academic literature sourced from several open access databased including Google Scholar. Google Scholar was used in this study as it is said to have the best performance compared to other open access databases[19,20]. Other open access databases include IEEE Xplore, ScienceOpen.com, ERIC, Myjurnal and Semantic Scholar. In this study, authors limited the country to Malaysia in order to provide a clearer picture of challenges faced by local smallholders. There is a reason for this, which is due to the fact that international data can be influenced by other factors such as demography, government management, and climates that are more conducive to other regions than Malaysia. It was also decided by the author to use a timeframe from 2010 to 2022. This is in order to be able to better understand the challenges that emerge and persist over time. In this sense, the stakeholder group may be able to determine the urgency of the challenge or issue. This process resulted in 226 documents being retrieved from Google Scholar. **Table 2** shows the keywords and search strings used in this study.

Out of these six databases, only three databases produced related search results while others have zero (0) related result with the keywords used. Searches within the six databases resulted a total of 248 academic citations which are Google Scholar (226 citations), IEEE Xplore (0 citation), ScienceOpen.com (0 citation), ERIC (0 citation), Myjurnal (11 citations), and Semantic Scholar (11 citations).

Screening (inclusion and exclusion criteria): Screening is a process to include or exclude articles according to criteria determined by the authors with the assistance of the specific databases[8]. In order to determine the suitability of the articles, eligibility, inclusion and exclusion criterion were identifi d, including timeline (between 2010 to 2022), document types (journal articles) and language (Malay and English). Articles with other criterion were excluded from this study. **Table 3**

Table 2. Keywords and search strings

Databases	Keywords and search strings
Google Scholar	All in title: "cabaran pekebun kecil" and "Malaysia" or "pekebun kecil"
	All in title: "Challenges smallholder plantation farmers" and "Malaysia" or "issues" or "farmer"
IEEE Xplore	No results found for ("All Metadata": smallholder) and ("All Metadata": plantation) and ("All Metadata": Malaysia) Filters applied: 2010–2023
ScienceOpen.com	Small plantation in Malaysia
ERIC	"smallholder" "plantation" "Malaysia"
Myjurnal	Plantation in Malaysia
Semantic Scholar	"smallholder plantation farmers in Malaysia" + filter 10 years back conference and journal

Table 3. Criteria for inclusion and exclusion

Criteria	Eligibility	Exclusion
Timeline	Between 2010 and 2022	<2010
Document type	Journals (research articles)	Review articles, books, chapters in books, and conference proceedings
Language	English and Malay	Other than English and Malay
Country	Malaysia	Other than Malaysia

shows the inclusion and exclusion criteria in this study.

Eligibility and duplication exclusion (manual screening): A process of eligibility involves manually selecting or excluding articles based on the authors' specific criteria[21]. A thorough review of the articles was conducted during this phase, and those that did not meet the criterion were rejected. There were 16 duplicate articles detected and removed beforehand. A manual screening process was used to assess literature focused on the challenges and issues faced by smallholder plantation farmers. The initial process of screening was done by referring to the title and abstract and yielded total of 38 citations for full text review. After all, 23 articles have been accepted for data abstraction and analysis. **Figure 1** shows the process of the systematic review[22].

Data abstraction and analysis: The 23 articles were then evaluated, reviewed and analyzed using thematic analysis as the first stage to extract statement and data based on the study's objective. For any study examining interpretations, thematic analysis is deemed to be the most appropriate. The method facilitates the analysis of data in a systematic manner. This approach allows a researcher to link an analysis of the frequency of a sub-category to one of the whole contents[23] and developed meaningful groups through a coding technique in the next phase. Overall, eight challenges have been identified, namely (1) reluctant of young generation in smallholding plantation, (2) lack of related knowledge in plantation, (3) lack of fi ance stability, (4) cultivation issues, (5) quality of government aid, (6) unresolved land ownership issue among the smallholders, (7) unstable market price, and (8) harming of environmental sustainability. In order to ensure that the categories and sub-categories are appropriate, ongoing discussions and re-evaluations are conducted. Disputes and inconsistencies were resolved amicably. The study fl w can be referred to **Figure 1**. The diagram was developed by referring to the work of Shaffril *et al*.[22].

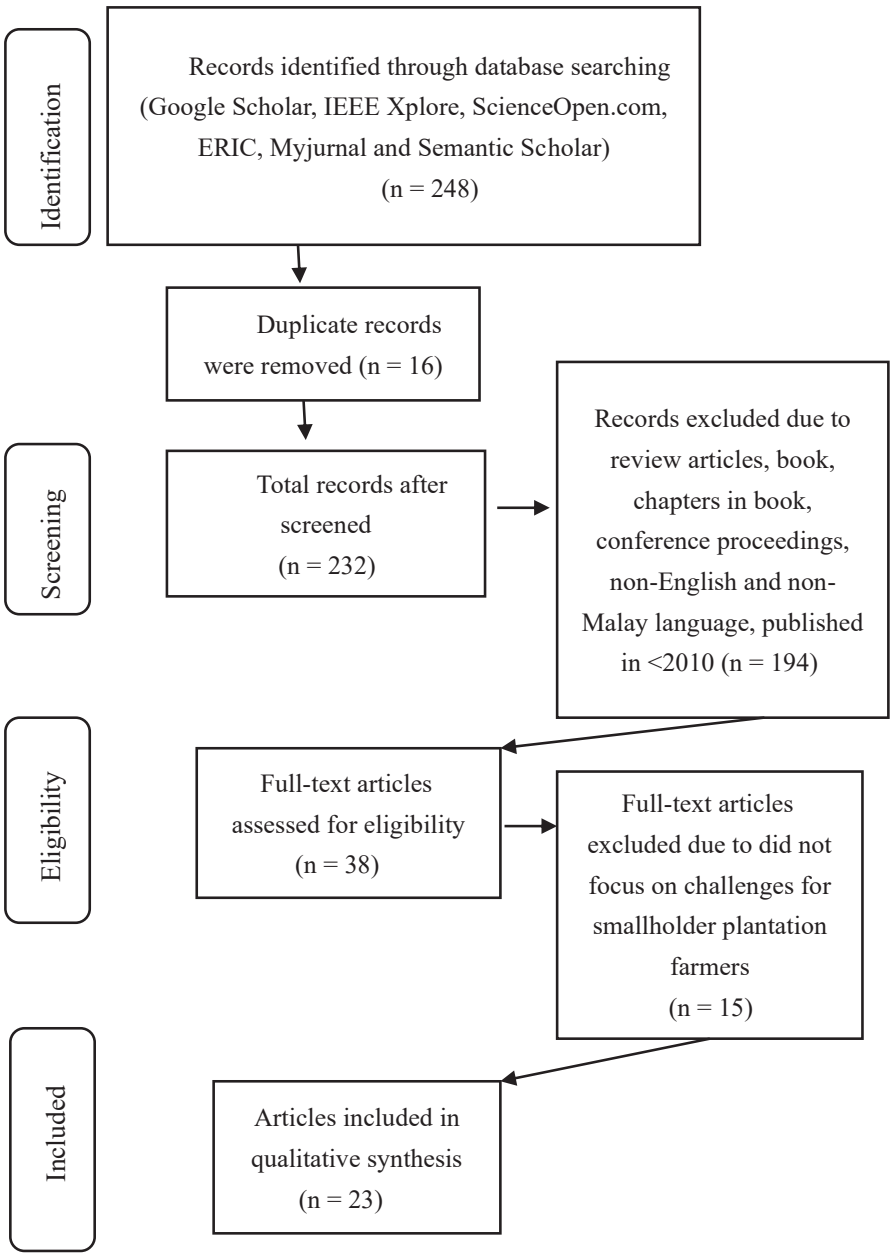

Figure 1. The study flow diagra [22].

4. Results

4.1. General results

Results in this study were discussed into two subsections. The general results report on the background of the articles while the main results report on the categories emerged in this study. This study had involved 23 articles from all over Malaysia. From these 23 articles, six articles involve study that was done in Sarawak, followed by Sabah with five articles, Johor, Selangor and Pahang with two articles respectively and one article from Perak and peninsular Malaysia correspondingly and the rest of four articles involved data from all over the country. One article was done through

systematic literature review that involved articles from Malaysian perspectives. Regarding the year of study, the earliest articles were from 2012 and the latest were 2022. Only one article comes from 2012[24], 2013[25], 2014[26] and 2015[27], respectively. The most published articles were from 2021[28–33] with six articles. Next, four articles were published in 2020[34–37] and three articles from 2018[38–40]. Two articles were published in 2017[41, 42], 2019[43,44] and 2022[45,46]. **Figure 2** shows the states where the studies were conducted. **Table 4** shows the details of the 23 articles that have been identified to be fit for the analysis in this stud .

Based on **Figure 2**, most articles were collecting data from the state of Sarawak. Being among the largest state in Malaysia, Sarawak main economic activity is plantation making it more suitable for research. On the other hand, there are state with no article published that derived data from it. It cannot be concluded that this state does not have any smallholder plantation farmers, but it provides opportunity for future research to be done. As for this study, 23 articles have been identified to be suitable for this study. **Table 4** listed the details of the articles involved in this study.

In this section, the discussion revolves around eight main sub-categories, namely (1) reluctant of young generation in smallholding plantation, (2) lack of related knowledge in plantation, (3) lack of finance stability, (4) cultivation issues, (5) quality of government aid, (6) unresolved land ownership issue among the smallholders, (7) unstable market price, and (8) harming of environmental sustainability. The subcategories were group into two distinctive categories which is formal challenges and informal challenges.

Formal challenges focus on the challenges faced by the smallholder plantation farmers from the aspect of governance. This includes the involvement of stakeholders and the market price situation as well. It revolves around challenges that is out of farmers' jurisdiction. Under these categories,

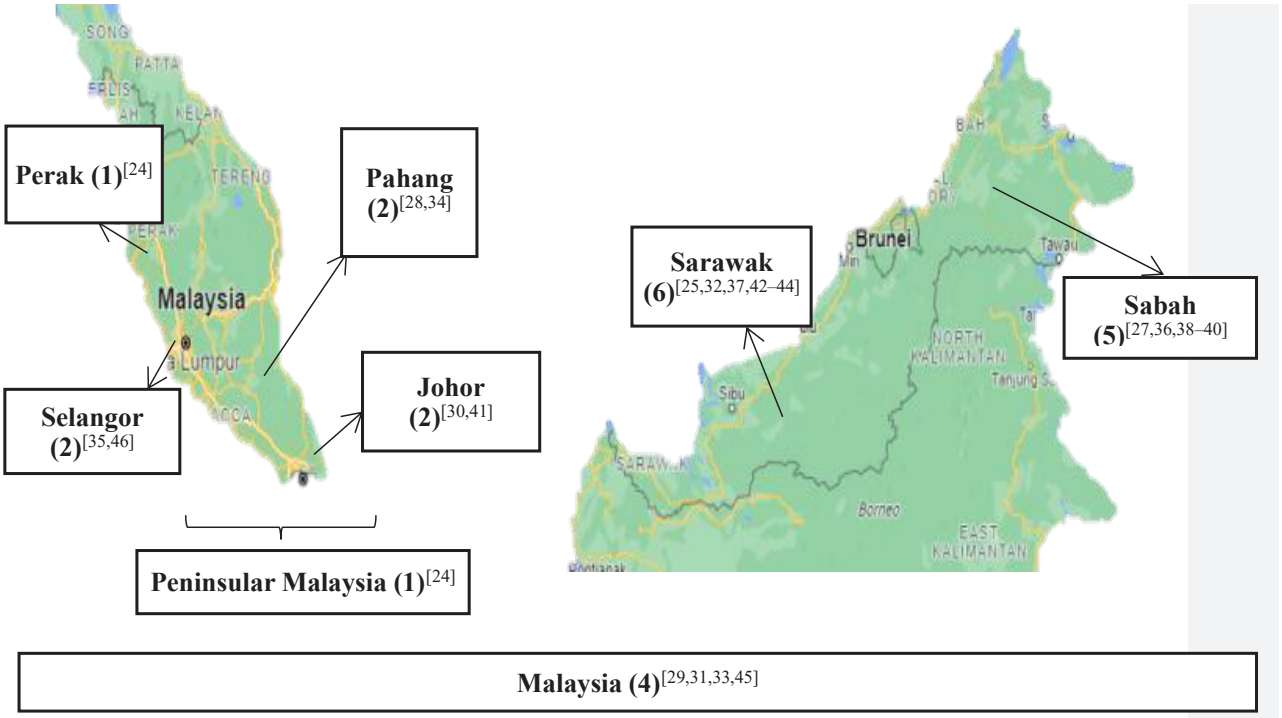

Figure 2. The location of each article based on state in Malaysia.
Source: Google Map.

Table 4. Details on the 23 articles identified through systematic review of article journal

Author	Title	Year	Source	Information on smallholder plantation farmers' challenges
Riduwan *et al*.[24]	Small farmers and factors that motivate them towards agricultural entrepreneurship activities	2012	Journal of Agribusiness Marketing	Acknowledgement of challenges faced by smallholder plantation farmers in Malaysia
Shafinah *et al*.[25]	Kebolehcapaian nasihat bagi pengurusan penyakit tanaman oleh pekebun kecil lada hitam, Sarawak: Tinjauan awal	2013	Geografia–Malaysian Journal of Society and Space	Acknowledgement of challenges faced by black pepper farmers in Sarawak
Yew *et al*.[34]	Sustainable farming of indigenous oil palm smallholders in Peninsular Malaysia	2020	Journal of Sciences and Humanities	Acknowledgement of challenges faced by oil palm smallholders in Peninsular Malaysia
Zaimah *et al*.[40]	Amalan dan kelangsungan integrasi sawit dalam kalangan pekebun kecil sawit di Sabah	2018	International Journal of Accounting	Acknowledgement of challenges faced by oil palm smallholders farmers in Sabah
Che Rose and Elias[28]	Implikasi kejatuhan harga buah kelapa sawit dan pengaruhnya terhadap pendapatan penduduk setempat	2021	E-Jurnal Penyelidikan dan Inovasi	Acknowledgement of challenges faced by oil palm smallholders farmers in Pahang
Ligong and Imang[42]	Penglibatan penduduk Rumah Panjang Kampung Sungai Bawang, Sibu dan Sungai Saeh, Miri, Sarawak dalam sektor tanaman kelapa sawit: Isu dan cabaran	2017	Geografi	Acknowledgement of challenges faced by oil palm smallholders farmers in Sarawak
Hua and Choy[43]	Sustainable farming practices amongst oil palm smallholders in Sri Aman, Malaysia	2019	Jurnal Wacana Sarjana	Acknowledgement of challenges faced by oil palm smallholders farmers in Sarawak
Hashim *et al*.[35]	Analisis appraisal mengenai keterlibatan generasi muda FELDA dalam industri kelapa sawit	2020	Malaysian Journal of Social Sciences and Humanities (MJSSH)	Acknowledgement of challenges faced by oil palm smallholders in farmers Selangor
Saad *et al*.[41]	Peranan pemimpin pendapat dalam penyebaran inovasi penanaman kelapa sawit	2017	Jurnal Komunikasi Malaysian Journal of Communication	Acknowledgement of challenges faced by oil palm smallholders farmers in Johor
Jalil *et al*.[26]	Economic status of coconut smallholders in Hilir Perak and Perak Tengah	2014	Management Research Journal	Acknowledgement of challenges faced by oil palm smallholders farmers in Sarawak
Mohd Shafiai *et al*.[36]	Kesan sikap, faktor halangan dan manfaat tanggapan pekebun kecil sawit persendirian kepada niat menggunakan mikro kredit Islam	2020	Islamiyyat	Acknowledgement of challenges faced by oil palm smallholders farmers in Perak
Manaf *et al*.[39]	Mendepani kekangan inovasi dan teknologi dalam kalangan pekebun kecil sawit di Sabah	2018	Geografia–Malaysian Journal of Society and Space	Acknowledgement of challenges faced by oil palm smallholders farmers in Sabah
Zainha *et al*.[38]	Sumbangan integrasi sawit dalam meningkatkan pendapatan keluarga-pekebun kecil sawit di Sabah	2018	Geografi	Acknowledgement of challenges faced by oil palm smallholders farmers in Sabah
Rahim *et al*.[29]	Ketirisan skim subsidi baja: Punca dan peruntukan perundangan di Malaysia	2021	Jurnal Undang-Undang Dan Masyarakat	Acknowledgement of challenges faced by paddy farmers in Malaysia
Ali[30]	Industri nanas: Peranan dan cabaran dalam penjanaan ekonomi Malaysia	2021	Journal of Economics and Sustainability	Acknowledgement of challenges faced by pineapple farmers in Johor

Table 4. (*Continued*)

Author	Title	Year	Source	Information on smallholder plantation farmers' challenges
Manaf and Choy[27]	Isu pemilikan tanah dan implikasinya terhadap produktiviti pekebun kecil: Kajian kes pekebun kecil di Lahad Datu, Sabah	2015	Geografi	Acknowledgement of challenges faced by smallholders plantation farmers in Sabah
Jalaluddin[45]	Perceptions on the challenges of banana cultivation and bio-based tech-nology use among malaysian small-holder farmers	2022	Asian Journal of Agriculture and Development	Acknowledgement of challenges faced by banana smallholder farmers in Peninsular Malaysia
Ratnasingam *et al*.[31]	Perceptions by smallholder farmers of forest plantations in Malaysia	2021	Forests	Acknowledgement of challenges faced by forest plantation smallholder farmers in Malaysia
Mazlan *et al*.[37]	Exploring the challenges of pepper smallholder farmers in Sarawak: A qualitative study	2020	Food Research	Acknowledgement of challenges faced by pepper smallholder farmers farmers in Sarawak
Andrew *et al*.[46]	Use of modern technology and innovations to increase the productivity of oil palm smallholders	2022	International Journal of Advanced and Applied Sciences	Acknowledgement of challenges faced by oil palm smallholders farmers in Selangor
Abazue *et al*.[44]	Oil palm smallholders and certification: Exploring the knowledge level of independent oil palm smallholders to certification	2019	Journal of Bioscience and Agriculture Research	Acknowledgement of challenges faced by oil palm smallholders farmers in Sarawak
Saad *et al*.[32]	Use of local labour in oil palm agriculture	2021	International Journal of Academic Research in Business and Social Sciences	Acknowledgement of challenges faced by oil palm smallholders farmers in Sarawak
Ahmad Rizal *et al*.[33]	Beyond rational choice theory: Multi-faceted determinants of participation in palm oil sustainable certification amongst smallholders in Malaysia	2021	Frontiers in Sustainable Food Systems	Acknowledgement of challenges faced by oil palm smallholders farmers in Malaysia

there are four subcategories, namely (1) quality of government aid, (2) unresolved land ownership issue among the smallholders, (3) unstable market price, and (4) harming of environmental sustainability.

Meanwhile, the second category is informal challenges. This category forces on challenges caused by the internal situation of the smallholder plantation farmers. This includes the attitude of the farmers themselves and also the cultivation situation. There are four subcategories in this category, namely (1) reluctant of young generation in smallholding plantation, (2) lack of related knowledge in plantation, (3) lack of fin nce stability, and (4) cultivation issues. **Table 5** shows the summary of category and subcategories derives from each article.

4.2. Main results

Formal challenges: As aforementioned, challenges that has been deemed to be a formal challenge for the smallholder plantation farmers revolves around the governance issues. These challenges involved higher stakeholders including government and the related officers. Since smallholder plantation farmers depends largely on the government, especially those that falls under the organized smallholders that received support from the government, they had faced several issues regard-

Table 5. The summary of category and sub-categories derived from each article

No.	Article/Author	Location	Formal challenges				Informal challenges			
			QG	LO	MP	ES	YG	KP	FS	CV
1	Riduwan *et al*.[24]	Peninsular Malaysia					/	/		
2	Shafinah *et al*.[25]	Sarawak	/							/
3	Yew *et al*.[34]	Pahang				/	/			
4	Zaimah *et al*.[40]	Sabah							/	
5	Che Rose and Elias[28]	Pahang		/						
6	Ligong and Imang[42]	Sarawak			/	/		/	/	
7	Hua and Choy[43]	Sarawak	/			/			/	
8	Hashim *et al*.[35]	Selangor					/			
9	Saad *et al*.[41]	Johor					/			
10	Jalil *et al*.[26]	Perak	/		/					/
11	Mohd Shafiai *et al*.[36]	Sabah							/	
12	Manaf *et al*.[39]	Sabah	/	/	/			/	/	
13	Zainha *et al*.[38]	Sabah					/		/	
14	Rahim *et al*.[29]	Malaysia	/					/		
15	Ali[30]	Johor					/		/	
16	Manaf and Choy[27]	Sabah		/				/		/
17	Jalaluddin *et al*.[45]	Malaysia						/	/	/
18	Ratnasingam *et al*.[31]	Malaysia			/		/	/		/
19	Mazlan *et al*.[37]	Sarawak	/		/					/
20	Andrew *et al*.[46]	Selangor					/			
21	Abazue *et al*.[44]	Sarawak						/	/	
22	Saad *et al*.[32]	Sarawak					/			
23	Ahmad Rizal *et al*.[33]	Malaysia	/					/		

Note: QG: Quality of government aid; LO: Unresolved land ownership issue among the smallholders; MP: Unstable market price; ES: Harming of environmental sustainability; YG: Reluctant of young generation in smallholding plantation; KP: Lack of related knowledge in plantation; FS: Lack of finance stability; C : Cultivation issues.

ing this collaboration. Thus, this category further detailed on the formal challenges faced by the smallholder plantation farmers based on the result from the analysis.

Quality of government aid: The government aid in this sub-category includes both information provided and the performance of the officers in charged. As the regulated body, the government through several other department has the responsibility to provided smallholders with accurate and current information. This includes information on the current market place for the price update[43] and government-aided subsidies[27–29]. However, the assistance provided by the government was not enough and inefficientl distributed[37]. It is concerning when leakage of this subsidies happens as it may benefit a lot of potential smallholders. Overall, it is also reported on the absence of body appointed or tasked to oversee the smallholding plantation and the fate of the smallholders[26,39]. The government's involvement and the role it plays are not comprehensive[26]. Without an authorized body, they will be more misconduct by the other players of this industry. Some smallholders also faced with lack of authorities for their own plantation and forced to follow the deficiencies and weaknesses of the management at the level of the parties involved[29]. Despite the existence of government officer on this field, they also had showed no significant influence on the smallholders' participation in sustainable certifi ation[33]. This indicates the incapacity of the government in enhancing the quality of the smallholder plantation farmers industries through their representative.

Unresolved land ownership issue among the smallholders: A total of three studies focused on land ownership of the smallholders as one of the main issues faced by them. Most of the studies were done in Sabah. This situation arises when the right to ownership is often not recorded in a formal context. Where ownership is not clearly recorded in the land title grant. Among them include customary land belonging to an indigenous tribe in an area in Sabah[27]. Land ownership is important for the smallholders as the government aid for instance was only available to those with officia grant[39]. Without it, the smallholders probably have to survive on their own. There is also problem related to ownership whereby smallholders without the official ownership might face the risk of being taken back by the land owner. Thus, all the hard work will come to no avail. Meanwhile, on the other part of the country, land issue faced by the smallholders when their land borders were not clearly mark as the border traditionally used the natural landmark. Therefore, when forest clearing work is done for oil palm plantation activities, then the border landmarks are destroyed and the environmental landscape changes which causes border confusion[28]. This confusion leads to bigger problem as trespassing might be charged.

Unstable market price: Smallholder plantation farmers affected closely by the market price of their crops. This unstable market caused by the imported crops that caused the price to be low and volatile[26]. Smallholders also faced with the issues related to lack places for them to sell their fresh crops[42]. This constraints for access to output markets also often cause smallholders to use middlemen in marketing their produce[39]. The existence of middle men in the plantation markets has its own issues. They affect the market place thus create a "black market" of the plantation. Some smallholders reportedly prefer to sell their produce in this black market since they can get their money faster[39]. This will negatively affect the market price and the stability of crop production. There are also cases where the middle men reported to purchase at a low price thus puts a heavy burden on the smallholders in the hinterland[28]. Nevertheless, the middle men also exist due to the unable of the smallholders to market their productivity results to factories due to long distances and vehicle constraints[42]. Thus, it opens up an opportunity to provide those services to the smallholders and this opportunity were taken up by the middle men.

Harming of environmental sustainability: Plantation Malaysia often took place in rural area involving forest area. Opening of new plantation area requires logging and clearing of forest area that seem to harm to environment sustainability. This had triggered the international environment organization on the deforestation in Malaysia. The large-scale clearing of forests by smallholders for the purpose of palm oil cultivation has an impact on the lack of flora and fauna in the two villages concerned[42]. To worsen the case, the smallholders themselves were reported to be less concerned with environmental care in the oil palm cultivation process[34]. Even though the deforestation for new plantation might benefit the owner of the plantation, for others, it has forced them to buy all the necessities, because the necessary forest resources have been destroyed[42]. With this, smallholders not only faced challenges from the international bodies, but also have to face the challenges to ensure the biodiversity is not highly affected by their plantation

Informal challenges: Other than formal challenges, smallholder plantation farmers have been facing issues and challenges that come from within the plantation itself. These informal challenges and mainly due to the attitude of the people who directly involved in the plantation including the manpower and the farmers themselves. Even the cultivation itself had caused great challenges to the plantation and effect the yield quality of the plantation. This category comprised of several elements

that contribute towards the informal challenges which the smallholder plantation farmers should be aware of.

Reluctant of young generation in smallholding plantation: A total of six studies focus on issue related to the low participation of young generation in the small holding plantation. The low participation of young people leads to long term issues. They prefer to move out from the rural area where most of the plantation located to work in another sector[41]. They are reportedly uninterested to serve in the industry and choose to work in the manufacturing and retail sector[35]. This situation has led the older generation to monopoly this industry which may create further issues. As Saad *et al*.[41] mentioned, most of the credit system by the government does not approve those above 45 years old to apply making monetary has become other challenges faced by the smallholder's plantation. Old age also had cost them the fitness to do the plantation work that requires both energy and capability[34]. What needed by this young people is a role model in this industry to attract them to be part of it. The absence of role model to guide them need to be cater accordingly[41].

Lack of related knowledge in plantation: The ever-changing world of plantation with invention and innovation, reskilling and upskilling knowledge has become a staple skill for the smallholders. Without this, they may face challenges to healthily compete in this industry. A total of five studies focus on the prior knowledge of the farmers in plantation that were lacking or outdated. This knowledge includes knowledge on modern technologies that can induce the plantation production[42]. Not only that, they were also having troubles with the plantation itself including identifying quality seedling and not skilled in handling the oil palm cultivation process[27,39]. This affects the plantation performance that hinder high production rate. To further things up, the smallholders also reported to be lacked of knowledge in managing the plantation including knowing the marketing knowledge[24]. Nevertheless, it has been reported that the smallholders portraying negative attitude towards training as one of the reasons for these outdated skills and knowledge among them[27,39]. They also reported to have negative perception towards technologies that can assist them in producing better yield.

Lack of finance stability: Smallholding plantation normally run by personal individual with restricted finance for plantation. Thus, it has become one of the major challenges faced by the smallholders. A total of nine studies have discussed on this matter. The finance stability can then be divided into two sub categories namely income instability and insufficien capital. Income instability has become an issue since smallholders are those with minimum income and depends on the plantation as main source of income. This unsustainable income has led to their welfare being not guaranteed[34]. The unstable of market pricing also led to this unstable income of the smallholders[28]. On the other hand, the insufficien capital of the smallholders has become a more concerning issues when it comes to finance. This insufficien had hinder many developments project in the industry including integration program[38,40]. Despite being a successful program and beneficial for the smallholders, it still cannot be implemented due to the lack of capital. Without sufficien capital, the control and treatment also had become a burden to the smallholders[25] including buying fertilizer[42] and managing the plantation[39].

Cultivation issues: As farmers, the quality of crops is one of the most important aspects in their plantation. A total of four studies have focused on the challenges regarding the cultivation from seeds to the disease affecting the crops. Smallholders have mentioned that quality coconut seeds are difficul to obtain[26], while there are some refuses to use seedling provided by the Malaysian

Palm Oil Board (MPOB) and use seeds obtained from nurseries, as well as fertilizers. This situation causes the harvest not to meet the specification required by the MPOB[27]. As for the disease, smallholders have reported that their crop area is often exposed to disease attacks which affect the production[25]. In recent years, disease is still deemed to be the main challenges in plantation[30]. This had caused the smallholders to face the constraints to increase their production yield[39]. All of these results have been summarized in **Table 6** that had listed the quote of each category and subcategory from the articles.

Table 6. The quotation of each sub-category from the articles

Categories	Sub-categories	Quotation	Article
Formal challenges	Quality of government aid	The frequency with which smallholders can meet with agricultural officials and plant experts is quite long and there are a few sma - holders who have never met with agricultural officials and plan experts.	Shafinah *et al*.[25]
		In the absence of information and places to sell oil palm products, smallholders cannot sell their oil palm products in a short time and will cause the products to be of poor quality and lower the market price.	Hua and Choy[43]
		The government's involvement and the role it plays are not comprehensive, there is no body appointed or tasked to oversee the coconut industry and the plight of small coconut farmers.	Jalil *et al*.[26]
		This lack of support from the public sector involves regional farmers' associations and cooperatives.	Manaf *et al*.[39]
		The rice farmers had to follow only the shortcomings and weaknesses of the management at the level of the parties involved.	Rahim *et al*.[29]
		The extension officers showed no significant influence on smallholders' participation in sustainable certification	Ahmad Rizal *et al*.[33]
		The assistance provided by the government was not enough and inefficiently distribute	Mazlan *et al*.[37]
	Unresolved land ownership issue among the smallholders	The financial incentives provided by the MPOB cannot be fully utilized because there are other constraints, i.e., non-grant land.	Manaf *et al*.[39]
		When forest clearing work is carried out for oil palm plantation activities, then the border landmarks are destroyed and the environmental landscape changes which causes border confusion.	Che Rose and Elias[28]
		They described the concerns of the local community on several matters related to land law causing smallholder production to be unable to increase.	Manaf and Choy[27]
	Unstable market price	Referring to observations in the field as well, the lack of places to market fresh fruit bunches causes smallholders to often be exploited by middlemen.	Ligong and Imang[42]
		Among the causal factors (low income) that are meant are; The volatile and low price of coconuts is the result of competition with imported coconuts.	Jalil *et al*.[26]
		Constraints for access to output markets also often cause smallholders to use middlemen in marketing their produce.	Manaf *et al*.[39]
		Expressed concern over the low selling price for their harvest and the minimal profits they gain, as opposed to la ge commercial plantations, which they perceived to earn enough profits and, thus, can sustain their operations.	Mazlan *et al*.[37]

Table 6. (*Continued*)

Categories	Sub-categories	Quotation	Article
		Small land holdings, poor market structure and the improperly developed supply chain are the other major concerns that hinder the participation of smallholder farmers in forest plantation schemes.	Ratnasingam *et al*.[31]
	Harming of environmental sustainability	The issues raised by the countries of the European Union through the banning of palm oil will at least interfere with the development of the national economy and the lives of small farmers, including Orang Asli (indigenous people) small farmers.	Yew *et al*.[34]
		The large-scale clearing of forests by smallholders for the purpose of palm oil plantations has an impact on the lack of flora and fauna in both villages.	Ligong and Imang[42]
		Palm oil smallholders in the study area did not achieve the environmental sustainability aspect where the measurement environment by using good agricultural policy.	Hua and Choy[43]
Informal challenges	Reluctant of young generation in smallholding plantation	Involvement of young people in farming remains low.	Riduwan *et al*.[24]
		The youth group in Kampung Sungai Mai is mostly not interested in farming oil palm.	Yew *et al*.[34]
		Most young people are not interested to serve in the industry, instead of choosing to work in the manufacturing and retail sector.	Hashim *et al*.[35]
		Majority of village youths go out to work in factories in Senai and Kulai. Some also continue their studies and move to the city. Many are not interested because of lack of responsibility, like to follow friends, lack of skills, lack of land ownership which causes them not to participate in the agricultural sector.	Saad *et al*.[41]
		The youth are less interested in agricultural activities.	Zainha *et al*.[38]
		In addition, the lack of labor also has a negative impact on the pineapple plant.	Ali[30]
		The rubber, palm oil and tree crop cultivation is not deemed attractive to the tertiary educated workforce, which explains the dependency on ageing 1st generation smallholder farmers and growers.	Ratnasingam *et al*.[31]
		While many youths do not think highly of working in oil palm planting, they should be aware that this is a major economic activity of the country that brings in a good income for the worker.	Andrew *et al*.[46]
		The average local is less interested in working in this industry. Most smallholders prefer to use imported labour which is considered more productive.	Saad *et al*.[32]
	Lack of related knowledge in plantation	Other than knowledge of agribusiness management and marketing, the factors capital, the environment, and availability of training were the constraints that prevented small farmers from engaging in agribusiness activities.	Riduwan *et al*.[24]
		Based on observations, they are less exposed to modern technology to increase crop productivity.	Ligong and Imang[42]
		Another constraint faced by smallholders is labor that is not skilled in handling the oil palm cultivation process. Most smallholders stated that they were less interested in attending courses organized by MPOB due to the age factor.	Manaf *et al*.[39]
		Among the factors why there are groups of farmers who do not obey the law is illiteracy and ignorance.	Rahim *et al*.[29]

Table 6. (*Continued*)

Categories	Sub-categories	Quotation	Article
		They don't know about the help they can get from related agencies.	Manaf and Choy[27]
		While they have been using farming techniques, including bio-based technologies, to improve fruit yield, the farmers perceived the current technologies as inadequate in mitigating the impacts of frequent disease outbreaks. It appears that the farmers were not aware of the new technologies or did not have access to them.	Jalaluddin *et al*.[45]
		The lack of interest among smallholder farmers to participate in establishing forest plantations, although they have a strong presence in the palm oil and rubber sectors.	Ali[31]
		Independent oil palm smallholders' participation on certification Roundtable on Sustainable Palm Oil (RSPO) has been found to be limited despite efforts by several certifying bodies to encourage their involvement in sustainable palm oil practices.	Abazue *et al*.[44]
		As of 2021, only 30% smallholders were certified despite the rigorous efforts made	Ahmad Rizal *et al*.[33]
	Lack of finance stability	The main obstacle they face in implementing oil palm integration is the lack of financial assistance and the cost of implementing oil palm integration which is quite burdensome.	Zaimah *et al*.[40]
		Many small oil palm farmers, especially residents of longhouses, are constrained in terms of capital to buy oil palm fertilizer.	Ligong and Imang[42]
		Smallholders do not achieve sustainability from the economic aspect as a whole.	Hua and Choy[43]
		The high management cost factor causes them to be unable to change their land ownership status. This situation limits the opportunities of smallholders in the study area to take advantage of all forms of assistance provided by the MPOB.	Manaf *et al*.[39]
		Capital is the main obstacle in implementing oil palm integration. Capital does not simply refer to money, but includes labor capital.	Zainha *et al*.[38]
		Pineapple cultivation is also limited by financial resources	Ali[30]
		The respondents generally have limited financial capital to establish and manage their plantations.	Jalaluddin *et al*.[45]
		Some of the reasons adduced include; limited financial resources (unable to secure loans due to high collateral demanded by banks), lack of technical know-how, land resources and others.	Abazue *et al*.[44]
		Lack of cash reserves exacerbates the problem as their income depends on daily sales.	Mohd Shafiai *et al*.[36]
	Cultivation issues	Black pepper crop area is often exposed to disease attacks.	Shafinah *et al*.[25]
		Quality coconut seeds are difficult to obtai	Jalil *et al*.[26]
		Gardeners who do not use seeds supplied by the MPOB. On the contrary, they use seeds obtained from nurseries, as well as fertilizers. This situation causes the harvest not to meet the specifications required by the MPOB.	Manaf and Choy[27]
		Almost 60% of the respondents said their farms had been infected at least once in the past five years by either Fusarium, Moko, or Sigatoka diseases.	Jalaluddin *et al*.[45]

Table 6. (*Continued*)

Categories	Sub-categories	Quotation	Article
		Even with the current forest plantations throughout the country, the threats posed by pests and diseases remain serious.	Ratnasingam *et al*.[31]
		There were pest and disease infestations that occurred in their farms.	Mazlan *et al*.[37]

5. Discussion

In this section, the challenges faced by the smallholder's plantation were grouped into two categories namely formal challenges and informal challenges. The first category refers to the challenges caused by the governmental aspects and the market place that requires the involvement of several stakeholders in finding the solution. The latter categories refer to the challenges caused by surrounding factors that can be solved with the involvement of the smallholders themselves and under their control.

Formal challenges: Formal challenges include quality of government aid, unresolved land ownership issue among the smallholders, unstable market price and harming of environmental sustainability. These are challenges that need government intervention to be resolves as it involved policies, rules and regulation. The role of government in any national plan is crucial including the plantation by providing support and assistance. The forms of assistance provided by the government can be in terms of the monetary scheme, fertilizer scheme, farming tools, equipment scheme, and conducting guideline courses[37]. In Malaysia, one of the regulated bodies to manage small plantation is the Malaysia Palm Oil Board (MPOB). MPOB intends to promote knowledge transfer (KT) and technology transfer (TT) procedures where they already exist[47]. Agents give training and counselling on new agricultural technology, codes of practise, and innovative programmes to meet the demand for sustainable palm oil[48]. The occurrence of market price swings crude fossil fuel oil prices follows commodity prices[49,50]. The market sentiment at the time determines whether the position is bullish or bearish. Market participants use hedging strategies to protect against currency losses by taking positions in contracts on commodity exchanges[51]. Physical contracts and futures contracts with speculators are two examples of these practises. Market makers, also known as speculators, play an important role in the marketplace. To enter the market, it is frequently necessary to trade a large number of lots. Market readers assist market participants in determining whether to buy or sell based on stock availability, economic and political factors[52]. Furthermore, smallholder plantation farmers frequently lack the financial resources to participate in agricultural practise programmes that aim to advance agricultural knowledge and resources. Fertilizer and farm maintenance costs are extremely high. Due to a lack of agricultural inputs and the yield optimization programme is ineffective. All these formal challenges may be effective in reducing the yield of the country in terms of plantation. the main player, the government need to take action to counter these challenges.

Informal challenges: The informal challenges include reluctant of young generation in smallholding plantation, lack of related knowledge in plantation, lack of finance stability and cultivation issues. All these challenges had affected smallholders their crop production as well as the future of their plantation. Previous research has extensively discussed smallholders' failure to capitalize on agricultural extension agencies' innovation and technology. According to the findings discussed by

Mahendra Dev[53] and Savastano and Scandizzo[54] , the majority of smallholders were unable to benefit from any form of technology or innovation brought to them. This is evident when the majority of smallholders continue to fall into poverty, despite various techniques and innovations in increasing production results. This is a very sad situation, especially for those who received assistance and incentives but did not take advantage of the opportunity to increase production per hectare. This had affected the welfare of the farmers in general as they solely dependent on their plantation to survive economically. The decrease in the price of commodities coupled with the increasing cost of inputs has made it difficul for farmers to make a profit, leading to a decrease in their quality of life. Additionally, the lack of access to financial services and capital has also made it difficul for farmers to grow their businesses.

Apart from that, the use of technology should begin to be applied and revealed to modern farmers. The goal of agricultural technology transfer is to generate new agricultural innovations. This situation necessitates close collaboration between recipients and technology transfer agents. The effectiveness of technology transfer is highly dependent on the ability of extension agents to transfer technology to smallholders. For example, MPOB programs that aim to provide new knowledge to smallholders in order to increase their productivity. In order to cater these challenges, the perception and attitude towards this industry need to be improved. The smallholders must be willing to upskill and reskill themselves. There are many training programs provided to improve the skills and knowledge of farmers and smallholder plantation farmers. This learning opportunity provided should not be taken for granted as it will help them improve themselves. Not only they will gain new skills and knowledge, it also provides them with opportunity to have new networking with other stakeholders. Having strong networking in industries may ease some of the challenges through new business opportunity and so forth.

6. Recommendation

A number of recommendations have been derived from the findings and systematic review process of this study that may prove helpful in future research. First, future research should focus on the challenges either formal or informal distinctively. By focusing on the particular challenges, more detail and precise result can be obtained. It is also vital to examine each sub-categories as smallholder had mention how it affected their crop production. With the country heading towards becoming developed nation, issues related to rural area should be cater especially regarding out dated technologies and knowledge. On another note, this study focused only on Malaysia perspectives and should be noted that the distribution of research done in each state are not fairly distributed. Further research can be done to explore this situation. Other than that, similar research can be done with larger context to other country in this region. This may provide data for comparison and sharing knowledge across the countries. Challenges faced by developed countries can also be explored to provide better understanding of this industry.

7. Conclusion

The articles involved in this study indicate challenges faced by the smallholder plantation farmers. Eight sub-categories have been identified which then grouped into two categories, formal challenges and informal challenges. The eight sub-categories are reluctant of young generation in

smallholding plantation, lack of related knowledge in plantation, lack of finance stabilit , cultivation issues, quality of government aid, unresolved land ownership issue among the smallholders, unstable market price and harming of environmental sustainability. Sub-categories that fall under the formal challenges include quality of government aid, unresolved land ownership issue among the smallholders, unstable market price and harming of environmental sustainability while sub-categories that fall under informal challenges include reluctant of young generation in smallholding plantation, lack of related knowledge in plantation, lack of finance stability and cultivation issues. This study had several limitations including research area and search engine. Future research that covers wider and variety of search engine such as Scopus can be included. This research can also be replicated to other regions and countries with similar key words. This may create a data bank that allows for international comparison on this body of knowledge. Overall, these challenges had provided an insight for the stakeholders including the government and the smallholder themselves on issues to focus in order to develop this industry.

Conflict of interest

No conflicts of interest were reported by the authors

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