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Independent Smallholders' Perceptions towards MSPO Certification in Sabah, Malaysia

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Abstract

In a wake of concern towards sustainable palm oil products, the Malaysian government had continuously formulated various guidelines for palm oil industries in fulfilling the international sustainability requirement. In 2013, Malaysia has launched Malaysian sustainable palm oil (*MSPO*)*, which eventually become mandatory requirement in January 2020, including the independent smallholders. However, the numbers of independent smallholders that acquired MSPO was relatively low, stood at 30.66%. Therefore, this study aims to analyse the perceptions of independent smallholders towards MSPO in Malaysia. A structured questionnaire was used for data collection instrument that been distributed among 350 independent smallholders, with a response rate of 74.5%. Results from descriptive analysis showed that independent smallholders have a good perception towards MSPO certification. Furthermore, multiple regression analysis revealed that all three factors were significant to influence the perceptions, where the risk perception became the most important contributor. This study enhances the awareness of sustainability practices among independent smallholders and contributes to the implementation of MSPO certification. Since risk perception has emerged as the primary contributor, regulators or governing bodies must seriously consider risk mitigation concerning independent smallholders about risk exposure such as continuous monitoring to comply environment impact assessment requirement, improve the availability and accessibility of information and aggressive awareness campaign on MSPO.*

Keywords: *sustainability, RSPO, MSPO, risk perception, financial incentive*

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Introduction

Palm oil is amongst the most profitable commercial crops in the tropical region (Dey et al., 2020; Kannan et al., 2021), which been used worldwide as part of a wide range of daily products (Ayompe et al., 2021). In Malaysia, palm oil sector has contributed 37.7% to the agricultural sector (DOSM, 2020) and 7.1% (MYR101.5 billion) to the Malaysian gross domestic product (GDP) in 2019. In fact, the importance of the palm oil sector to the Malaysian economy is aligned with its status as the second largest producer and exporter of palm oil in the world (MPOB, 2021a). As for 2020, China and India were the two largest importers of Malaysian palm oil, with an intake of 2.731 million tonnes and 2.727 million tonnes, respectively, followed by the Netherlands with 1.073 million tonnes, Pakistan with 1.004 million tonnes, the Philippines with 0.693 million tonnes, and Turkey with 0.616 million tonnes (Rahman, 2020; Nordin et al., 2021). However, the palm oil development is still being criticised, with claims of deforestation, peat destruction, biodiversity loss, exploitation and health issues (Mukherjee & Mitra, 2009; McNamara, 2010; Sun et al., 2015; Alam et al., 2016; Ching et al., 2019; Majid et al., 2021).

Accordingly, palm oil importing countries are emphasising the importance of sustainable palm oil products, which could lead to the increase demand for sustainable palm oil products (Kadir, 2021). In ensuring that palm oil production meets the international sustainability standards, Malaysian sustainable palm oil (MSPO) certification was officially implemented in 2015 (Kadir, 2020). This certificate intends to reduce the social and environmental impacts of the industry while assisting the independent smallholders to comply with sustainable palm oil requirement for export (MPOCC, 2021a). According to Kumaran (2019), MSPO served as the foundation for Malaysian palm oil brand in terms of sustainable, healthy and safe. Furthermore, MSPO, which became mandatory in January 2020, upholds the compliance of the entire supply chain of domestic palm oil industry with the international sustainability standard (Kadir, 2020; Majid et al., 2021). Apart from government incentives to smallholders, MSPO certification also provide an opportunity for smallholders to generate more income as the results of greater global market access (Kadir, 2020). It also offers both certification for oil palm management and supply chain management (Daniel, 2019). To date, more than 88% of oil palm cultivation land were MSPO certified (MPOC, 2020; Kolandai et al., 2021). Nevertheless, less than 31% of the independent smallholders have been certified under MSPO as per November 2020, while according to Kadir (2020), at least 150,000 independent smallholders nationwide have not register for certification (Kadir, 2020).

Despite the fact that Malaysia has a large numbers of

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independent smallholders, they are the most difficult players to achieve sustainable production due to huge challenges and constraints (Ador et al., 2016). Therefore, this study aims to analyse the perceptions of independent smallholders towards MSPO in Malaysia, and also the factors influencing those perceptions. It is critical to understand their perception to ensure the success of MSPO initiative. This study contributes to the growing literature on smallholder certification, considering limited studies addressing this issue in Malaysian perspective. Furthermore, this study is timely for governing bodies to strengthen the implementation of MSPO especially those issues related to risk exposure.

Sustainable palm oil development The most commonly cited definition of sustainable development states that "*sustainable development is a development that meets the needs of the present without compromising the needs of future generations to meet their own needs*" (UN, 1987; Keeble, 1988). It highlighted the importance of socially and environmentally sustainable in the new era of economic growth (UN, 1987). The adoption of the sustainable development goals (SDGs) has further accelerated to protect environment, poverty eradication as well as promoting peace and prosperity by 2030 (UNDP, 2021).

Sustainability in oil palm industry requires producing safe, high-quality oil palm fruits while protecting the environment, growers' social and economic conditions, workers' health and safety, best practises, and the surrounding community (Kuntom, 2014). Furthermore, it aims to fulfil the world food demand at affordable price as well as helping to ease poverty (RSPO, 2020a; MPOCC, 2021c). In Malaysia, MSPO and roundtable on sustainable palm oil (RSPO) are the two common sustainability certification applied in palm oil industry (Ng, 2019; Majid et al., 2021). However, international sustainability and carbon certification (ISCC) is also applicable for palm oil industry, with as specific certification for biofuels (Kannan et al., 2021).

RSPO was founded in 2004 and has been well recognized as an international sustainability certification for oil palm industry. RSPO covers all members form each stage in the supply chain of palm oil industry (Kannan et al., 2021; Majid et al., 2021). Accordingly, voluntary standards such as RSPO not only support and overlap with the UN SDGs, but can also contribute to a stronger governance ecosystem to aid in the achievement of the SDGs (RSPO, 2020b). RSPO certification assists smallholder farmers in increasing yields, entering international markets, improving their livelihoods, enhancing the fresh fruit bunches quality, as well as lowering the risk of land conversion. Currently, 21,210 independent smallholders worldwide as September 2021 have obtained the RSPO certificate (RSPO, 2021). However, RSPO certification is considered costly and unaffordable by certain smallholders. Therefore, Malaysia has developed its own certification scheme which is called as MSPO certification. The scheme reframes the concept of sustainability in order to maintain attractiveness and marketability by focusing on the existing main exporters i.e., China and India, and those markets with RSPO certified palm oil are less prevalent (Higgins & Richards, 2019; Rahman, 2020).

Similar to RSPO, MSPO certification was officially implemented in 2015 on voluntary basis. However, MSPO had become a mandatory requirement in January 2020. Indeed, MSPO is a certification by the government of Malaysia which means to protect the local palm oil industry, especially smallholders. According to Yap et al. (2021), the compulsory requirement for MSPO is a step forward in tackling the unfavourable and fabricated information related to oil palm. The scheme outlines general principles for producing sustainable palm oil without forest and worker exploitation (Kadir, 2020). MSPO's seven principles (Figure 1) address the core issues in regard to sustainability within the industry, such as the environment and biodiversity, best practises, and social responsibilities (Kumaran, 2019; Ng, 2019; MPOCC, 2021b). The Malaysian palm oil board (MPOB) administers the MSPO scheme in Malaysia and aiming fully certification for the entire plantations nationwide by 2020 (Rahman, 2020).

Perception and influence factors of independent smallholders on sustainability certification The palm oil industry is important in Malaysia because it creates jobs and improves people's well-being and living standards, particularly in rural areas. According to the Ministry of Primary Industries (MPI), as of December 2018, nearly 670,000 smallholders, accounting for nearly 40% or 2,280,805 ha of total oil palm planted areas, relied on the oil palm plantation for a living, while the remaining 60% or 3,568,525 ha were owned by private estates (Zakaria et al., 2020). In Malaysia, there are three main players that dominate palm oil industry including private companies, organised smallholders, and independent smallholders (Zakaria et al., 2020). As of December 2019, independent smallholders accounted for less than 17% of total planted oil palm and 260,353 farmers (Arshad et al., 2020), with most of the independent smallholders reside in Johor, Sarawak, and

Source: MPOCC (2021b)

Figure 1 7 MSPO principles.

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Sabah (Rahman, 2020). Accordingly, Kannan et al. (2021) suggested that the international and domestic sustainability requirement was the paramount challenges for smallholders in Malaysia.

Nur et al. (2016) suggested that only 26% of smallholders have adopted the good agricultural practices (GAP) practices as stated in principle 6 of MSPO. It's indicated the necessity for proactive mindset among smallholders. By having MSPO certification, smallholders will be exposed to practice GAP and effective farm management without harming the environment. These practises increase productivity, lowering production costs, and indirectly increasing smallholder income. In fact, Shahida et al. (2019) reported that MSPO certification has a positive relationship with financial performance. Specifically, companies with MSPO increases their profitability by 3.5%. However, the actual impact of GAP or MSPO might be different across independent smallholders due to the diversity of farmers characteristics (e.g., age, knowledge, capital) as well as palm oil tree characteristics (e.g., quality of seed, age of the tree). For instance, after 15 years the productions of oil palm would start to declines as the productive period for oil palm is between 915 years (Fairhurst & Hardter, 2003).

Kannan et al. (2017) highlighted that smallholders in Malaysia were difficult to accept any changes in relation to MSPO, due to the ageing farmer population. Furthermore, Abazue et al. (2019) revealed that most of the smallholders have little knowledge regarding MSPO certification. In reality, there are policies in supporting the participation of smallholders especially on the benefit of MSPO such as wider market access and quality fresh bunches practices. However, the study found that there is a lack of exposure regarding sensitization programs to educate the smallholders. Many smallholders are unaware of the requirements for oil palm certification, including the existence of MSPO and RSPO. According to Rahman (2020), lacking information and communication technology facilities and knowledge had limit the accessibility of online resources in the rural area. Smallholders are generally lack of knowledge and skill to implement the certification on their own (Majid et al., 2021). Knowledge about MSPO is important, especially the knowledge of harmful chemicals. It leads to the reduction of the cost of pesticide and herbicide usage, which helps to increase profits (Hidayat et al., 2015; Shahida et al., 2019). In fact, leveraging sustainable palm oil clusters (SPOC) initiative to encourage the participation in MSPO certification has resulted a more sustainable smallholders (Hafizuddin-Syah et al., 2018). SPOC is one of the MPOB's initial initiatives in preparing smallholders for MSPO certification. Under the SPOC, smallholders will be placed in a cluster based on their location. This cluster is led by smallholders and assisted directly by the TUNAS officer of MPOB. SPOC aims to ensure a sustainable oil palm production that can meet current and future needs. In realizing this aim, SPOC program emphasizes on two main components, i.e., smallholder's certification program and the establishment of the sustainable oil palm growers cooperative (KPSM). The KPSM establishment focuses on increasing the income of cooperative members, reducing production costs, encouraging the purchase of inputs in groups, and improving the production and quality of fresh fruit bunches (FFB).

Financial characteristics have been considered as one of the factors that influence the perception of smallholders to adopt environmental certification (Knowler & Bradshaw, 2007; Daloğlu et al., 2014; Meijer et al., 2015; Wang et al., 2016; Majid et al., 2021). Some studies found that many smallholders find it difficult to properly access certification schemes due to a lack of financial incentives (Welch & Marc-Aurele, 2001; Brandi et al., 2015; Martin et al., 2015). For example, fees to certify their palm oil become a burden to the small farmers unless there is financial support provided by the government (Barrett et al., 2001). Besides, government subsidies and credit loans are positively correlated in motivating small farmers to adopt sustainable certification (Reimer et al., 2014; Ward et al., 2016). Similarly, Ni et al. (2016) claimed that the perception of Malaysian smallholders toward MSPO certification was influenced by the perceived benefits of certification program and government support. According to Barreiro-Hurlé et al. (2010) and Wang et al. (2016), the perception on financial characteristics should be looked on the outside supports and the accessibility towards credit facilities.

According to Barreiro-Hurlé et al. (2010), risk perception may influence farmers' interest to participate in the sustainable program. Indeed, risk perception toward sustainability could arise by adopting or decline the sustainability certification. By adopting sustainability certification, smallholders may perceive the risk of increasing production costs (which subsequently reduce earnings) and possibility of non-compliance sustainability requirement in the future that lead to cancellation of license. For instance, Lee (2005) highlighted that perception of risk reduce the attractiveness of sustainable practices and lead to failure. Accordingly, risk is found to be negatively related with sustainable certification scheme (Ghadim et al., 2005; Jerneck & Olsson, 2013). As the main priority of a small farmer is economically rational and maximizes profits (Pannell et al., 2006), the possibility of reduction in earnings would deteriorate the interest in sustainability certification. Besides, Vignola et al. (2013) found that small farmers in developing countries have a negative perception on sustainable certification adoption. It generally associated with poor education, low income and difficulties to obtain credit facilities. Thus, policy makers should mitigate the risk perception from an early stage of production like adverse climate impacts to the market (Pannell et al., 2014). On the other hand, rebuffing sustainability certification would cause independent smallholders facing a risk of being rejected by global market, risk of environmental pollution, risk of losing the opportunities to improve palm oil quality as well as profile in global market. As such, aggressive awareness campaign should be conducted continuously to enhance independent smallholders' understanding and knowledge on the sustainability certification scheme.

Methods

Research design In this study, data was collected through structured questionnaire. According to Saunders et al. (1997), a survey questionnaire is an important measuring

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instrument that provides reliable and valid data. Part 1 of the questionnaire was on the demographic and social economic trends of the respondents. It included respondents' profile and farms or lands profile. Part 2 of the questionnaire looked into the "Independent Smallholders Perception" towards MSPO certification. Lastly, Part 3 of the questionnaire focused on the factors that influenced the perception, which include financial incentive, training and skills development and risk perception. Each of these items was measured using five-point Likert scale (1-strongly disagree to 5-strongly agree). Specifically, financial incentive is referring to any incentive available under MSPO certification, while training and skills development covers opportunities to improve skills, facilities to access information on farming inputs as well as awareness toward sustainable palm oil. Finally, risk perceptions denote smallholder's view and belief on risks related to oil palm prices, market access and branding as well as environment consideration. All items in Part 2 and 3 were adapted from the previous studies (Welch & Marc-Aurele, 2001; Ghadim et al., 2005; Lubell & Fulton 2008; Januchowski-Hartley et al. 2012; Odgaard et al., 2013; Haghjou et al., 2014. Pannell et al., 2014; Prokopy et al., 2014; Lapple & Hennessy 2015; Rolfe & Gregg, 2015; Kalcic et al., 2015; Ulrich-Schad et al., 2016; Liu et al., 2018), with certain modifications in conjunction with MSPO as well as the purpose of this study.

Sampling procedure and data collection Primary data has been collected through face-to-face interviews using a structured questionnaire in a selected area. The study was done on the independent smallholders in Sabah, Malaysia due to the following reasons. First, Sabah is the third highest number of independent smallholders i.e., 32,566 individuals (12.51%) in Malaysia. Second, the level of MSPO certification is relatively low among independent smallholders in Sabah, with more than 13,000 have not acquire MSPO certification (Rahman, 2020). A total of 350 independent smallholders have been selected from the survey population of 260,352 Malaysian independent smallholders. This study used random sampling for sample selection in the main plantation areas of independent smallholders in Sabah such as Tawau, Sandakan, Lahad Datu, Telupid, Ranau, Keningau and Kota Belud. However, the allocation of questionnaire across these areas has been done randomly due to the unavailability of data related to the numbers of independent smallholders in each of the selected area. Out of 350 questionnaires that were distributed, 261 respondents (74.6%) have completed the survey and valid to be utilized in this research. The certified independent smallholders' information was obtained from the MSPO website. The distribution process as well as collection of questionnaires took almost two months to be completed. The overall sample size has been calculated based on Krejcie and Morgan (1970) as shown in Equation *[1]*.

$$n = \frac{X^2 NP(1-P)}{ME^2(N-1) + X^2 P(1-P)} \quad [1]$$

note: n = sample size; X^2 = chi-square for the specified confidence level at 1 degree of freedom; N = population size; P = population proportion (0.5); and ME = desired margin of error (0.05).

In this study, a descriptive analysis approach was used to interpret the data collected, which were mostly categorical. Apart from frequencies and percentages (to understand the general pattern of responses for all parts of the questionnaire), the mean and standard deviations of each variable were created by the application of descriptive statistics. For the purpose of fulfilling the main objective of this study, a multiple regression analysis using IBM SPSS Statistics Version 26 was applied to examine the factors that influenced independent smallholders' perception towards MSPO certification. Generally, multiple regression use known independent variables to predict the single dependent variable. The regression analysis procedure weights each independent variable to ensure maximum prediction from the set of independent variables (Hair et al., 2014).

For multiple regression, four basic assumptions must be met including linearity of the phenomenon measured (linearity), constant variance of the error terms (homoscedasticity), normality of the error term distribution (normality) and independence of the error terms (multicollinearity) (Hair et al., 2014). The results of multiple regression analysis were considered statistically significant if p-value is < 0.05 (Meyers et al., 2013; Field, 2016).

Since a questionnaire survey was applied to this study, all items that construct the variables need to be tested using Cronbach's Alpha test to ensure all variables are correctly measured. Cronbach's Alpha test assure that all items were homogeneous, measuring the concept of interest (Taber, 2018). Cronbach's Alpha measure the reliability across items and the acceptance thresholds value from 0.60 to 0.70 (Hair et al., 2014; Field, 2016). Table 1 shows that all variables have scored more than 0.8 in Cronbach's Alpha test. Therefore, all items have been maintained.

Results

Demographic trend of respondents This study found that 70.2% of the respondents were male and most of them were in the age range of 4554 years (30.3%). Furthermore, there were more than 26% of the respondent aged above 55 years old,

Table 1 Reliability test

Variable	Number of item	Cronbach's Alpha
Financial incentives	10	0.927
Training and skills development	10	0.952
Risk perception	10	0.944
Perception towards MSPO certification	10	0.834

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Scientific Article
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while only 2.3% were below 25 years old. This finding is consistent with Kannan et al. (2017) on their argument of difficulties to adapt changes among aging farmers. Bumiputera Sabah/Sarawak represent 78.1% out of the total respondents, followed by Malay (8.8%), Other of comprised Bugis (5.4%), Chinese (7.3%), and India (0.4%). In terms of level of education, 60.5% of the respondents completed secondary school while 16.9% completed primary school. As stated above, almost half of the respondents (47.9%) have 4–6 household members. Only 12 respondents (4.6%) have more than 10 household members. More than half of the respondents (56.3%) earned between MYR1,001 and MYR3,000 month^{-1} which is around the minimum wage level in 2021 which is MYR920 month^{-1}. Very few of them (1.5%) earned more than MYR10,000 month^{-1}. In term of years of experience, almost half of the respondents (49.8%) have 610 years of planting experience while 7.3% had 26 years' experience and above in the palm oil industry. Majority of the respondents (80.5%) are full-time independent smallholders and almost all of them (99.6%) own their lands. It also indicates that 19.5% of the respondents are part-time smallholders and have other sources of income from full time employment. Furthermore, majority of the respondents (69.7%) managed their lands with the help of family members with 66.7% of the respondents hired 1–5 people to be their employees. Precisely, the independent smallholders revealed that almost half of them (122 individuals) which is equivalent to 47.8% were MSPO-certified while 26.7% were in process of getting the certificates. Nevertheless, only a quarter of them (25.5%) admitted that they have not attained the MSPO certification yet. Table 2 described the respondents.

Descriptive analysis This study mainly focused on the perception of independent smallholders towards MSPO certification thus examining the influence factors of the perceptions. 10 items were discussed, explicitly on the perception of independent smallholders towards MSPO certification. Table 3 described the descriptive analysis of each item. In 261 questionnaires that were filled out and returned, the highest and lowest mean values were identified. Precisely, the highest mean value (M = 4.49, SD = 0.612) was attributed to the "MSPO practices bring good impact to environment" of each independent smallholders responding to the survey, while with the lowest mean values was “MSPO leads to higher production cost” (M = 1.94, SD = 0.988), respectively. The lowest mean score showed that independent smallholders perceive MSPO does not lead to higher production costs. Precisely, on average, all independent smallholders preferred "MSPO practices bring good impact to the environment” as the most favourable perception they have of MSPO certification. The overall mean score for the perception towards MSPO certification is 4.14. Thus, it is proved that the independent smallholders have a good perception towards MSPO certification.

Multiple regression The analysis of multiple regression was conducted to examine the factors that influenced perception of independent smallholders towards MSPO certification. Three independent variables were included in this study. They comprised the financial incentives, training and skills development and risk perception. Four assumptions were needed to be fulfilled before proceeding to multiple regression analysis. They consist of linearity, homoscedasticity, normality and multicollinearity as prescribed in the previous section. The scatterplot of residuals versus predicted values can be used to test the assumption of linearity and homoscedasticity. According to Coakes and Ong (2011), the absence of clear relationship between residuals and predicted values indicates that assumption of linearity and homoscedasticity should also be met, as shown in Figure 2. Therefore, all the assumptions have been met for linearity and homoscedasticity (Figure 2), Shapiro-Wilk test with (p-value > 0.05) for normality and Table 4 representing multicollinearity. Thus, multiple regression analysis could be performed consequently.

The multicollinearity assumption is tested by computing the variance inflation factor (VIF) and the tolerance statistic. Generally, the accepted level of multicollinearity is VIF value below 10 (Hair et al., 2014), while VIF value more than 10 reflect the presence of multicollinearity (Senaviratna & Cooray, 2019). Table 4 suggested that all independent variables have VIF value below 10 (2.577–5.573). Therefore, there is no serious multicollinearity issues detected.

Table 5 presents the multiple regression results. The results were tested using the two-tailed where a p-value of < 0.05 was considered statistically significant (Meyers et al., 2013; Field, 2016; Bjørnshagen & Ugreninov, 2020). Based on Table 5, the overall model fit was R^2 = 0.636. It suggests that 63.6% of the variation in perceptions of independent smallholders towards MSPO certification could be explained by the financial incentives, training and skills development and risk perception.

Furthermore, all the three factors, financial incentives (β = 0.158; p-value = 0.009), training skills and development (β = 0.313; p-value = 0.001) and risk perception (β = 0.376; p-value = 0.000) were significantly influence the perception of independent smallholders towards MSPO certification at 1 percent significant level, as shown in Table 5. According to (Meyers et al., 2013), the variable with highest parameter, as indicated by β, is considered the most important. Therefore, it was discovered that the risk perception made the greatest contribution with a value of β = 0.376. It was followed by the training and skills development factor and financial incentives factor, respectively. Therefore, the risk perception was proved to be the most significant contributor to the perceptions towards MSPO certification.

Discussion

Based on the results of our investigation, independent smallholders revealed that almost half of the respondents (47.8%) have acquired MSPO certification while 26.7% were in process of getting the certificates. Nevertheless, only a quarter of them (25.5%) admitted that they have not registered for the MSPO certificate which is considered as low. Therefore, this study explored the perceptions of independent smallholders towards MSPO. Further, multiple regression analysis was conducted to examine the factors influencing the MSPO perceptions, where all the three factors were significantly influence the smallholders' perceptions towards MSPO.

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Table 2 Description of the sample ($n = 261$)

	Demographic variables	Frequency (*f*)	Percentage (%)
1	**Gender**		
	Male	174	70.2
	Female	74	29.8
2	**Age**		
	Below 25 years old	6	2.3
	25–34 years old	46	17.6
	35–44 years old	61	23.4
	45–54 years old	79	30.3
	Above 55 years old	69	26.4
3	**Race**		
	Malay	23	8.8
	India	1	0.4
	Chinese	19	7.3
	Bumiputra Sabah/Sarawak	203	78.1
	Other	14	5.4
4	**Education level**		
	Primary	44	16.9
	Secondary	158	60.5
	Diploma/Certificate	39	14.9
	Degree	11	4.2
	Master/PhD	3	1.1
	No formal education	6	2.3
5	**Household numbers**		
	1–3 people	72	27.6
	4–6 people	125	47.9
	7–9 people	52	19.9
	>10 people	12	4.6
6	**Monthly Income**		
	<MYR1,000	21	8
	MYR1,001– MYR3,000	147	56.3
	MYR3,001–MYR5,000	68	26.1
	MYR5,001–MYR7,000	16	6.1
	MYR7,001–MYR9,000	5	1.9
	>MYR10,000	4	1.5
7	**Years of planting experience**		
	Less than 5 years	66	25.3
	6–10 years	130	49.8
	11–15 years	7	2.7
	16–20 years	27	10.3
	21–25 years	12	4.6
	26 years and above	19	7.3
8	**Smallholder category**		
	Full-time	210	80.5
9	**Land ownership**		
	Self-owned	260	99.6
	Rent/Lease	1	0.4
10	**Farm/land location**		
	Sabah	261	100

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Table 2 (continued)

	Demographic variables	Frequency (*f*)	Percentage (%)
11	**Accessed to labour**		
	Family member	182	69.7
	Hired	79	30.3
12	**Number of employees**		
	0	77	29.5
	1–5 people	174	66.7
	6–10 people	10	3.8
13	**Enrol under MSPO certification**		
	Yes	122	47.8
	In process	68	26.7
	No	65	25.5

Table 3 Descriptive analysis of the perceptions towards MSPO

Perception towards MSPO		Mean	Std. deviation
1	MSPO is a proactive initiative by government to protect smallholders' interest	4.36	0.634
2	MSPO promotes sustainable palm oil	4.47	0.647
3	MSPO is one of the regulatory requirements associated with environmental management	4.46	0.629
4	**MSPO practices bring good impact to environment**	**4.49**	**0.612**
5	MSPO increases land aesthetic value.	4.40	0.653
6	Application process of MSPO is easy and timely	4.23	0.815
7	MSPO is cost-effective	4.32	0.682
8	MSPO practices increase income of smallholders	4.29	0.733
9	MSPO leads to higher production cost	1.94	0.988
10	MSPO practices increases oil palm production	4.39	0.691
	Overall mean score	**4.14**	

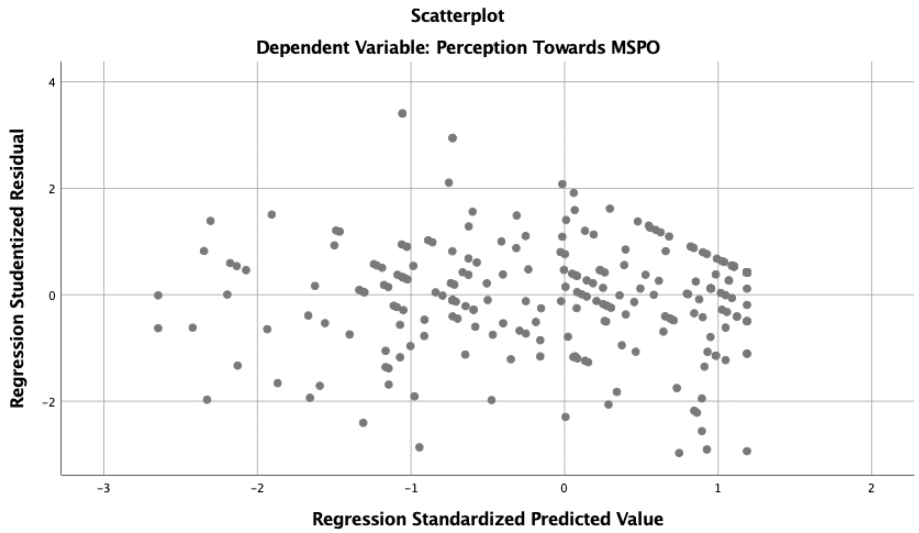

Figure 2 Scatter plot between perception towards MSPO certification and three independent variables.

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Table 4 Multicollinearity test

Variable (Factor)	Collinearity statistics	
	Tolerance	VIF
(Constant)		
Financial incentives	0.388	**2.577**
Training and skills development	0.179	**5.573**
Risk perception	0.217	**4.608**

Note: Perception towards MSPO

Table 5 Regression results

Variables	β
Constant	0.716*** (0.174)
Financial incentives	0.158*** (0.054)
Training and skills development	0.313*** (0.091)
Risk perception	0.376*** (0.079)
R-square	0.636
Adjusted R-square	0.632
Std. error of the estimate	0.329

Inclusively, on average, independent smallholders believed that MSPO practices bring good impact to the environment. This is consistent with the main objective of MSPO certification, which is to protect the environment and biodiversity (Ng, 2019; MPOCC, 2021b). moreover, it has been acknowledged under the Principle 5 of MSPO principles i.e., environment, natural resources, biodiversity and ecosystem services (Kolandai et al., 2021; MPOCC, 2021b). According to the principle, the requirements for environmental management, energy use, water resources, waste and pollution management, and the protection of species or habitats are implemented by the organization's management (Kolandai et al., 2021). Besides, on average, majority of the respondents mentioned that MSPO certification does not lead to higher production costs. One of the explanations on this finding is the effect of claimable MSPO auditing fee and preparation costs as well as personal protection equipment. Currently, these costs will be borne by the government of Malaysia and not resulting to an increase of independent smallholders' whole production costs. However, Arshad et al. (2020) found that the cost of production increased significantly after applying the MSPO certification. Specifically, they have discovered that the cost of fertilisers used increased significantly by 102.10% after MSPO certification, with the highest increase in Sabah at 85.96% and the lowest in Peninsular Malaysia at 46.71%. It then leads to the higher cost after MSPO certification. Nevertheless, the resulting improved fresh fruit bunches yield led to a net additional income (Arshad et al., 2020).

Based on the analysis conducted in this study, there were three factors influencing the perceptions of independents smallholders towards MSPO certification. The independents smallholders have addressed the risk perception as the main driver that influenced their perceptions towards MSPO certificates. Indeed, this findings consistent with Barreiro-Hurlé et al. (2010). Furthermore, the potential termination and suspension of license as a result of failure to initiate MSPO certification process after January 1, 2022 (Kaur, 2020) could be one of the reasons to explain the influenced the risk perception. The independent smallholders were also concerned about their rejection of palm oil production since the global markets are practicing sustainability. The debates on this issue have been continuously discovered throughout the world among practitioners, academicians, economists and politicians (Alam et al., 2016; Ng, 2019; Rahman, 2020; Ayompe et al., 2021; Kannan et al., 2021; Majid et al., 2021; Nordin et al., 2021). Indeed, financial constraints have become one of the main challenges for sustainability certification among independent smallholders (Qijun & Batt, 2016), that would affect their risk perception.

Financial incentives play one of the key roles in influencing the independent smallholder perceptions towards MSPO, which consistent with Brandi et al. (2015) and Martin et al. (2015). They found that many smallholders find it difficult to properly access certification schemes due to a lack of financial incentives. Indeed, sustainability certification could be very costly for independent smallholders due to various factors such as land size, farmers' skills and capital resources. According to Aziz et al. (2021), MSPO certification costs for each smallholder is approximately USD9,630. However, auditing fee and preparatory costs for MSPO can be claimed by independent smallholders.Thus, government incentives are critical and significant to ensuring the acquisition of MSPO certificates by independent smallholders (Ni et al., 2016). Coherently, Budget 2021 has proven a great concern of the Malaysian Government to enhance the implementation of MSPO. Budget 2021 under Strategy 2: Strengthening key dectors promised to develop the commodity sector where MYR50 million was allocated for the palm oil industry. Precisely, MYR20 million was provided to continue MSPO certification program. Moreover, a MYR30 million matching grant was allocated to encourage mechanisation & automation for the palm oil industry (MoF, 2021). These incentives were expected to further boost growth and enhance the competitiveness of the country's palm oil industry. The incentives are able to improve sustainability practices and competitiveness of the palm oil industry.

Moreover, training and skills development also may influence independent smallholders' perception towards MSPO certification, which consistent with several studies in the past (Nur et al., 2016; Kannan et al., 2017; Hafizuddin-

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Syah et al., 2018; Abazue et al., 2019; Rahman, 2020). A recent study found that many smallholders were unaware of the requirements for oil palm certification; in fact, some were unaware of the existence of MSPO and RSPO (Rahman, 2020). SPOC program has promoted more sustainable smallholders (Hafizuddin-Syah et al., 2018). Under SPOC program, groups of independent smallholders devoted their commitment in producing fresh fruit bunches (FFB) under the supervision of MPOB. In fact, MPOB was responsible to the development of palm oil industry in Malaysia (MPOB, 2021b). Independent smallholders also been trained to improve their production as well as the quality of FFB under sustainable palm oil growers cooperative (KPSM). In addition, TUNAS MPOB further enhanced the skills of independent smallholders in various areas particularly in farm management (Hafizuddin-Syah et al., 2018; Senawi et al., 2019).

Conclusion

Palm oil importing countries are emphasising the importance of sustainable palm oil products, which could lead to increase in demand. MSPO certification was officially implemented in 2015 and eventually become mandatory in January 2020 promotes sustainability practice in palm oil industry and subsequently comply with the international sustainability standards. As per June 2020, the total of oil palm land that been MSPO certified were approximately 96%. However, statistics showed that less than 31% of the independent smallholders have been certified under MSPO. Therefore, the government has extended the mandatory period to be effectively July 1, 2020, whereby all smallholders must be MSPO certified. Failure to start MSPO certification process by January 1, 2022, will results the potential of suspension or termination of their license. This could be one of the reasons to explain the influenced the risk perception towards MSPO certification. Based on the independent smallholders' profile, it showed that almost half of them (47.8%) have attained the MSPO certification. Meanwhile, 26.7% of them were in process of getting the certificates. Contrarily, only 25.5% of the independent smallholders admitted that they have not registered yet. Therefore, this study explored the perception and influence factors of independent smallholders on the MSPO certification simultaneously. The most favourable perception was that MSPO practices bring good impact to the environment. Furthermore, all three factors i.e. financial incentives, training and skills development and risk perception, were significantly influenced the independent smallholders' perceptions towards. Interestingly, this study suggests that risk perception has become the most important contributor towards MSPO perception among independent smallholders in Malaysia. Thus, regulators or governing bodies must seriously consider risk mitigation to address the concerns of independent smallholders about risk exposure. For instance, governance bodies must ensure data and information are easily accessible without costs, continuous monitoring to ensure the compliance of environment impact assessment (EIA) requirements and aggressive awareness campaign on MSPO among independent smallholders. This study enhances the awareness of sustainability practices among independent smallholders and contributes to the implementation of MSPO certification This research was conducted during the COVID-19 pandemic. It is proposed that future studies should explore the independent smallholders' perceptions and factors influencing their perceptions towards MSPO certification in the post-COVID-19 pandemic. Also, rigorous research on the impact of MSPO certification should be emphasised on society, economy and nation.

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References

Abazue, C., Choy, E., & Lydon, N. (2019). Oil palm smallholders and certification: Exploring the knowledge level of independent oil palm smallholders to certification. *Journal of Bioscience and Agriculture Research*, *19*(1), 1589–1596. https://doi.org/10.18801/jbar.190119.193

Ador, S. F, Siwar, C., & Ghazali, R. (2016). A review of palm oil impact on sustainability dimension: SPOC initiative for independent smallholders. *International Journal of Agriculture, Forestry and Plantation*, *2*, 104–110.

Alam, A. S. A., Er, A. C., Begum, H. & Siwar, C. (2016). Smallholders the prominent contributor towards sustainable oil palm sector. *International Journal of Advanced and Applied Sciences*, *3*(2), 20–24.

Arshad, F., Ahmad, S. M., Salleh, K. M., Hashim, K., Rahami, M. S., Nambiappan, B. & Ismail, A. (2020). A comparative analysis of agricultural practices, costs and yields of pre- and post-Malaysian sustainable palm oil (MSPO) certification for independent smallholders in Malaysia. *Oil Palm Industry Economic Journal*, *20*(1), 36–44.

Ayompe, L. M., Schaafsma, M., & Egoh, B. N. (2021). Towards sustainable palm oil production: The positive and negative impacts on ecosystem services and human wellbeing. *Journal of Cleaner Production*, *278*, 123914. https://doi.org/10.1016/j.jclepro.2020.123914

Aziz, N. F, Chamhuri, N, & Batt P. J .(2021). Barriers and benefits arising from the adoption of sustainable certification for smallholder oil palm producers in Malaysia: A systematic review of literature. *Sustainability*, *13*(18), 10009. https://doi.org/10.3390/su131810009

Barreiro-Hurlé, J., Espinosa-Goded, M. & Dupraz, P. (2010). Does intensity of change matter? Factors affecting adoption of agri-environmental schemes in Spain. *Journal of Environmental Planning and Management*, *53*(7), 891–905. https://doi.org/10.1080/09640568.2010.490058

Barrett, C. B., Bachke, M. E., Bellemare, M. F., Michelson, H., Narayanan, S. & Walker, T. F. (2012). Smallholder participation in contract farming: Comparative evidence from five countries. *World Development*, *40*(4), 715–730. https://doi.org/10.1016/j.worlddev.2011.09.006

Bjørnshagen, V. & Ugreninov, E. (2020). Labour market inclusion of young people with mental health problems in Norway. *ALTER, European Journal of Disability Research*, *15*(1), 46–60. https://doi.org/10.1016/j.alter.2020.06.014

Brandi, C., Cabani, T., Hosang, C., Schirmbeck, S., Westermann, L., & Wiese, H. (2015). Sustainability standards for palm oil: Challenges for smallholder certification under the RSPO. *The Journal of Environment & Development*, *24*(3), 292–314. https://doi.org/10.1177/1070496515593775

Ching, J. Y. L., Yaman, I. C., Khoon, K. L., Hong, C. K. & Melayong, G. (2019). A case study into the sustainability journey and biodiversity conservation projects in Sarawak by Sarawak Oil Palms Berhad. *Journal of Oil Palm Research*, *31*(3), 489–495. https://doi.org/10.21894/jopr.2019.0036

Coakes, S. J., & Ong, C. (2011). *SPSS: Analysis without anguish: version 18.0 for windows*. Milton, Queensland: John Wiley & Sons

Daloğlu, I., Nassauer, J. I., Riolo, R. L., & Scavia, D. (2014). Development of a farmer typology of agricultural conservation behavior in the American Corn Belt. *Agricultural System*, *129*, 93–102. https://doi.org/10.1016/j.agsy.2014.05.007

Daniel, A. N. A. (2019, October 10). Crucial for all to be MSPO-certified. *New Straits Times.* https://www.nst.com.my/opinion/letters/2019/10/528748/crucial-all-be-mspo-certified

[DOSM] Department of Statistics Malaysia. (2020). Selected agricultural indicators, Malaysia, 2020. https://dosm.gov.my/v1/index.php?r=column/ctwoByCat&parent_id=45&menu_id=Z0VTZGU1UHBUT1VJMFlpaXRRR0xpdz09

Dey, S., Reang, N. M., Das, P. K., & Deb, M. (2020). A comprehensive study on prospects of economy, environment, and efficiency of palm oil biodiesel as a renewable fuel. *Journal of Cleaner Production*, *286*, 124981. https://doi.org/10.1016/j.jclepro.2020.124981

Fairhurst, T. & Hardter, R. (Eds.). (2003). *Oil palm: Management for large and sustainable yields*. Singapore: Potash & Phosphate Institute.

Field, A. (2016). *Discovering statistics using IBM SPSS Statistics* (4th ed.). California: SAGE Publications Ltd.

Ghadim, A. K.A., Pannell, D. J., & Burton, M. P. (2005). Risk, uncertainty, and learning in adoption of a crop innovation. *Agricultural Economics*, *33*(1), 19. https://doi.org/10.1111/j.1574-0862.2005.00433.x

Hafizuddin-Syah, B. A. M., Shahida, S. & Fuad, S. H. (2018). Sustainability certifications and financial profitability: An analysis on palm oil companies in Malaysia. *Jurnal Pengurusan*, *54*, 143–154. https://doi.org/10.17576/ pengurusan-2018-54-12

Haghjou, M., Hayati, B., & Momeni-Choleki, D. (2014). Identification of factors affecting adoption of soil conservation practices by some rainfed farmers in Iran. *Journal of Agricultural Science and Technology*, *16*(5), 957–967. http://jast.modares.ac.ir/article-23-399-en.html

Hair, J. H., Black, W. C., Babin, B. J., & Anderson, R. E. (2014). *Multivariate data analysis* (7th ed.). Harlow, UK: Pearson Education Limited.

Hidayat, K. N., Glasbergen, P., & Offermans, A. (2015). Sustainability certification and palm oil smallholders' livelihood: A comparison between scheme smallholders and independent smallholders in Indonesia. *International Food and Agribusiness Management Review*, *18*(3), 25–48. https://doi.org/10.22004/ag.econ.208400

Higgins, V., & Richards, C. (2019). Framing sustainability: Alternative standards schemes for sustainable palm oil and South-South trade. *Journal of Rural Studies*, *65*, 126–134. https://doi.org/10.1016/j.jrurstud.2018.11.001

Januchowski-Hartley, S. R., Moon, K., Stoeckl, N. & Gray, S. (2012)**.** Social factors and private benefits influence landholders' riverine restoration priorities in tropical Australia. *Journal of Environmental Management*, *110*, 20–26. https://doi.org/10.1016/j.jenvman.2012.05.011

Jerneck, A., & Olsson, L. (2013). More than trees! Understanding the agroforestry adoption gap in subsistence agriculture: Insights from narrative walks in Kenya. *Journal of Rural Studies*, *32*(1), 114–125. https://doi.org/10.1016/j.jrurstud.2013.04.004

Kadir, A. P. G. (2020, November 17). MSPO certification the key. *New Straits Times*. https://www.nst.com.my/opinion/columnists/2020/11/641988/mspo-certification-key

Kadir, A. P. G. (2021, March 26) Demand for sustainable palm oil increasing. *Bernama THOUGHTS*. https://www.bernama.com/en/thoughts/news.php?id=1945759

Kalcic, M. M., Frankenberger, J. & Chaubrey, I. (2015). Spatial optimization of six conservation practices using SWAT in tile-drained agricultural watersheds. *Journal of the American Water Resources Association*, *51*(4), 956–972. https://doi.org/10.1111/1752-1688.12338

Kannan, P., Peng, T. S., Ahmad, S. M., Seman, I. A., Ayatollah, K. A. R., Hashim, K., ..., & Omar, W. (2017). Knowledge assessment of basal stem rot disease of oil palm and its control practices among recipients of replanting assistance scheme in Malaysia. *International Journal of Agricultural Research*, *12*(2), 73–81. https://doi.org/10.3923/ijar.2017.73.81

Kannan, P., Hanani, M. N., & Peng, T. S. (2021). A review on Malaysian sustainable palm oil certification process among independent oil palm smallholders. *Journal of Oil Palm Research*, *33*(1), 171–180. https://doi.org/10.21894/jopr.2020.0056

Kaur, D. (2020, July 7). Up to 96% of oil palm estates in Malaysia MSPO-certified. *The Malaysian Reserve*. https://themalaysianreserve.com/2020/07/07/up-to-96-of-oil-palm-estates-in-malaysia-mspo-certified/

Keeble, B. R. (1988). The brundtland report: "Our common future". *Medicine and War*, *4*(1), 17–25. https://doi.org/10.1080/07488008808408783

Knowler, D. & Bradshaw, B. (2007). Farmers' adoption of conservation agriculture: A review and synthesis of recent research. *Food Policy, 32*(1), 25–48. https://doi.org/10.1016/j.foodpol.2006.01.003

Kolandai, S. K, Seng, C. J. & Nambiappan, B. (2021). Moving forward with mandatory MSPO certification standards. *Oil Palm Industry Economic Journal*, *21*(1), 1–12. https://doi.org/10.1080/13642987.2020.

Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and psychological measurement*, *30*(3), 607–610. https://doi.org/10.1177/001316447003000308

Kumaran, S. (2019). The dynamics for mandatory MSPO certification scheme to be successfully implemented. *Journal of Oil Palm, Environment & Health, 10*(148), 1–7. https://doi.org/10.5366/jope.2019.01

Kuntom, A. (2014). Malaysian sustainable palm oil. *Palm Oil Developments*, *60*, 1–4.

Lapple, D. & Hennessy, T. (2015). Exploring the role of incentives in agricultural extension programs. *Applied Economic Perspectives and Policy*, *37*(3), 403–417. https://doi.org/10.1093/aepp/ppu037

Lee, R. G. (2005). Resources, rights, and environmental regulation. *Journal of Law and Society, 32*(1), 111–130. https://doi.org/10.1111/j.1467-6478.2005.317_1.x

Liu, T., Bruins, R., & Heberling, M. (2018). Factors influencing farmers' adoption of best management practices: A review and synthesis. *Sustainability*, *10*(2), 432. https://doi.org/10.3390/su10020432

Lubell, M., & Fulton, A. (2008). Local policy networks and agricultural watershed management. *Journal of Public Administration Research and Theory*, *18*(4), 673–696. https://doi.org/10.1093/jopart/mum031

Majid, N. A., Ramli, Z., Sum, S. M., & Awang, A. H. (2021). Sustainable palm oil certification scheme frameworks and impacts: A systematic literature review. *Sustainability*, *13*(6), 32–63. https://doi.org/10.3390/su13063263

[MPOB] Malaysian Palm Oil Board. (2021a). Malaysian palm oil industry. Retrieved from http://www.palmoilworld.org/about_malaysian-industry.html

[MPOB] Malaysian Palm Oil Board. (2021b). About the Malaysian palm oil board. Retrieved from http://www.palmoilworld.org/about_mpob.html

[MPOC] Malaysian Palm Oil Council. (2020). Palm oil-based product manufacturers asked to display MSPO logo on packaging. Retrieved from http://mpoc.org.my/ palm-oil-based-product-manufacturers-asked-to-display-mspo-logo-on-packaging/

[MPOCC] Malaysian Palm Oil Certification Council. (2021a). *MSPO certification scheme*. Retrieved from https://www.mpocc.org.my/about-mspo

[MPOCC] Malaysian Palm Oil Certification Council. (2021b). *The 7 principles of MSPO standards*. Retrieved from https://www.mpocc.org.my/oil-palm-management-standard

[MPOCC] Malaysian Palm Oil Certification Council. (2021c). *Why sustainability certification needed for palm oil*. Retrieved from https://www.mpocc.org.my/ about-mspo

Martin, S., Rieple, A., Chang, J., Boniface, B., & Ahmed, A. (2015). Small farmers and sustainability: Institutional barriers to investment and innovation in the Malaysian palm oil industry in Sabah. *Journal of Rural Studies*, *40*, 46–58. https://doi.org/10.1016/j.jrurstud.2015.06.002

McNamara, D. J. (2010). Palm oil and health: A case of manipulated perception and misuse of science. *Journal of the American College of Nutrition*, *29*, 240S–244S. https://doi.org/10.1080/07315724.2010.10719840

Meijer, S. S., Catacutan, D., Ajayi, O. C., Sileshi, G. W., & Nieuwenhuis, M. (2015). The role of knowledge, attitudes and perceptions in the uptake of agricultural and agroforestry innovations among smallholder farmers in Sub-Saharan Africa. *International Journal of Agricultural Sustainability*, *13*(1), 40–54. https://doi.org/10.1080/14735903.2014.912493

Meyers, L. S., Gamst, G., & Guarino, A. J. (2013). *Performing data analysis using IBM SPSS* (1st ed.). John Wiley & Sons, Inc. Retrieved from http://library1.nida.ac.th/ termpaper6/sd/2554/19755.pdf

[MoF] Ministry of Finance. (2021, May 28). Budget 2021

touchpoints. Retireved from http://www1.treasury.gov.my/pdf/touchpoints/budget-2021-touchpoints-en.pdf

Mukherjee, S., & Mitra, A (2009). Health effects of palm oil. *Journal of Human Ecology*, *26*(3), 197–203. https://doi.org/10.1080/09709274.2009.11906182

Ng, M. (2019). Malaysian sustainable palm oil (MSPO) to be made mandatory by 2019. Retrieved from http://mpoc.org.my/malaysian-sustainable-palm-oil-mspo-to-be-made-mandatory-by-2019/

Ni, L. X., Ali, F., & Zainudin, Z. H. (2016). Factors influencing the implementation of Malaysia sustainable palm oil (MSPO) among oil palm smallholders in Malaysia. *International Journal of Academic Research in Business and Social Sciences*, *6*(12), 272–284. https://doi.org/10.6007/IJARBSS/v6-i12/2495

Nordin, I., Hassan, Z., & Razali, N. A. M. (2021). Malaysian palm oil sector performance in 2020 and market opportunities. Retrieved from http://mpoc.org.my/malaysian-palm-oil-sector-performance-in-2020-and-market-opportunities/

Nur, H. M., Nazirah, C. J., Ainul, S. S., Mohamad, A. J., Amran, A., Nursuhan, D., …, & Hamdan, A. B. (2016). Penerimaan guna amalan pertanian baik (GAP) di kalangan pekebun kecil sawit persendirian di Malaysia. In *Prosiding Persidangan Pekebun Kecil Sawit 2016*: *Memperkasakan peranan, memperjuangkan harapan* (pp. 169183). Lembaga Minyak Sawit Malaysia (MPOB). Retrived from http://ired.mpob.gov.my/wp-content/uploads/2016/09/FINAL-PROSIDING-POSTER-PKPKS-2016.pdf

Odgaard, P., Stoustrup, J. & Kinnaert, M. (2013). Fault-tolerant control of wind turbines: A benchmark model. *IEEE Transactions on Control Systems Technology*, *21*(4), 1168–1182. https://doi.org/10.1109/TCST.2013.2259235

Qijun, J. & Batt, P. J. (2016). Barriers and benefits to the adoption of third-party certified food safety management system in the food processing sector in Shanghai, China. *Food Control*, *62*, 89–96. https://doi.org/10.1016/J.FOODCONT.2015.10.020

Pannell, D. J., Marshall, G. R., Barr, N., Curtis, A., Vanclay, F., & Wilkinson, R. (2006). Understanding and promoting adoption of conservation practices by rural landholders. *Australian Journal of Experimental Agriculture*, *46*(11), 1407–1424. https://doi.org/10.1071/EA05037

Pannell, D. J., Llewellyn, R. S., & Corbeels, M. (2014). The farm-level economics of conservation agriculture for resource-poor farmers. *Agriculture, Ecosystems & Environment*, *187*(1), 52–64. https://doi.org/10.1016/j.agee.2013.10.014

Prokopy, L., Towery, D. & Babin, N. (2014). *Adoption of agricultural practices: Insights from research and practice.* Purdue Extension: FNR-488-W.

Rahman, S. (2020). Malaysian independent oil palm smallholders and their struggle to survive 2020. *ISEAS Perspective*, *144*, 1–16. http://hdl.handle.net/11540/12953

Reimer, A., Thompson, A., Prokopy, L. S., Arbuckle, J. G., Genskow, K., Jackson-Smith, D., …, & Nowak, P. (2014). People, place, behavior, and context: A research agenda for expanding our understanding of what motivates farmers' conservation behaviors. *Journal of Soil Water Conservation*, *69*(2), 57A–61A. https://doi.org/10.2489/jswc.69.2.57A

Rolfe, J. & Gregg, D. (2015). Factors affecting adoption of improved management practices in the pastoral industry in Great Barrier Reef catchments. *Journal of Environmental Management*, *157*, 182–193. https://doi.org/10.1016/j.jenvman.2015.03.014

[RSPO] Roundtable on Sustainable Palm Oil. (2020a). About sustainable palm oil. Retrieved from https://rspo.org/about#about-sustainable-palm-oil

[RSPO] Roundtable on Sustainable Palm Oil. (2020b). From farm to plate: how sustainable is the palm oil in your food? Retrieved from https://www.rspo.org/news-and-events/news/from-farm-to-plate-how-sustainable-is-the-palm-oil-in-your-food

[RSPO] Roundtable on Sustainable Palm Oil. (2021). RSPO smallholders. Retrieved from https://rspo.org/smallholders

Saunders, M., Lewis, P., & Thornhill, A. (1997). *Research methods for business students.* London: Pitman Publishing.

Senaviratna, N. A. M. R., & Cooray, T. M. J. A. (2019). Diagnosing multicollinearity of logistic regression model. *Asian Journal of Probability and Statistics*, *5*(2), 1–9. https://doi.org/10.9734/ajpas/2019/v5i230132

Senawi, R., Rahman, N. K., Mansor, N., & Kuntom, A. (2019). Transformation of oil palm independent smallholders through Malaysian sustainable palm oil. *Journal of Oil Palm Research*, *31*(3), 496–507. https://doi.org/10.21894/jopr.2019.0038

Shahida, S., Hafizuddin-Syah, B. A. M., & Fuad, S. H. (2019). Does MSPO certification matter for profitability of Malaysian palm oil companies? *International Journal of Economics and Management*, *13*(2), 357–369.

Sun, Y., Neelakantan, N., Wu, Y., Lote-Oke, R., Pan, A., & van Dam, R. M. (2015). Palm oil consumption increases LDL cholesterol compared with vegetable oils low in saturated fat in a meta-analysis of clinical trials. *Journal of Nutrition*, *145*(7), 1549–1558. https://doi.org/

10.3945/jn.115.210575

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

Ulrich-Schad, J. D., Babin, N., Ma, Z., & Prokopy, L. S. (2016). Out-of-state, out of mind? Non-operating farmland owners and conservation decision making. *Land Use Policy*, *54*, 602–613. https://doi.org/10.1016/j.landusepol.2016.02.031

[UN] United Nation. (1987). *Report of the world commission on environment and development: Our common future.* Oxford: Oxford University Press.

[UNDP] United Nations Development Programme. (2021). What are the sustainable development goals? Retrieved from https://www.undp.org/sustainable-development-goals

Vignola, R., Klinsky, J., Tam, J., & McDaniels, T. (2013) Public perception, knowledge, and policy support for mitigation and adaption to climate change in Costa Rica: Comparisons with North American and European studies. *Mitigation and Adaptation Strategies for Global Change*, *18*(1), 303–323. https://doi.org/10.1007/s11027-012-9364-8

Wang, N., Gao, Y., Wang, Y., & Li, X. (2016). Adoption of ecofriendly soil-management practices by smallholder farmers in Shandong Province of China. *Soil Science and Plant Nutrition*, *62*(2), 185–193. https://doi.org/10.1080/00380768.2016.1149779

Ward, P. S., Bell, A. R., Parkhurst, G. M., Droppelmann, K., & Mapemba, L. (2016). Heterogeneous preferences and the effects of incentives in promoting conservation agriculture in Malawi. *Agricultural Ecosystem Environment*, *222*, 67–79. https://doi.org/10.1016/j.agee.2016.02.005

Welch, E. W., & Marc-Aurele, F. J. (2001). Determinants of farmer behavior: Adoption and compliance with best management practices for nonpoint source pollution in the Skaneateles Lake Watershed. *Lake Reservation Management*, *17*, 233–245. https://doi.org/10.1080/07438140109354133

Yap, P., Rosdin, R., Abdul-Rahman, A. A. A., Omar, A. T., Mohamed, M. N., & Rahami, M. S. (2021). Malaysian sustainable palm oil (MSPO) certification progress for independent smallholders in Malaysia. *IOP Conference Series: Earth and Environmental Science*, *736*, 012071. https://doi.org/10.1088/1755-1315/736/1/012071

Zakaria, Z., Rahim, A. R. A., & Aman, Z. (2020). Issues and challenges of oil palm cooperatives towards greater sustainability: A proposal of conceptual framework. *International Journal of Academic Research in Business and Social Sciences*, *10*(1), 46–69. https://doi.org/10.6007/IJARBSS/v10-i1/6806