

The Nexus between Socio-economics Diversity of Oil Palm Smallholders and Sustainable Development Goals: A Comparative Study in Sabah and Johor, Malaysia

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Abstract

The smallholders inclusive economic growth policies directly promote several Sustainable Development Goals (SDGs) especially in tackling extreme hunger, poverty, environmental degradation and gender inequality. Recent argument establishes that the socio-economic impact of oil palm on smallholders are inconsistent and varies across locations. In view of this, our study analyses the socio-economics status of oil palm smallholders and the variations in the extent of SDGs achievement in Sabah and Johor. The study retrieved primary data on relevant socio-economics conditions of oil-palm smallholders from both states using well-structured questionnaire. Analysis of the data involves descriptive techniques such as mean, standard deviation, frequencies, and percentages. While t-test and correlation analysis were used to determine the differences across states and gender in the achievement of SDGs. Findings indicate that smallholders have attained considerable number of SDGs in both Sabah and Johor. Although Johor was higher in terms of production, income, education, the gender inclusiveness was better in Sabah by having 29% female smallholders compared to 10% in Johor. Their average income was above national and international poverty line. Over 90% of smallholders attained at least primary education. Conclusively the smallholders have substantially achieved SDG1 (No poverty); SDG 2 (Zero hunger); SDG 4 (Quality education); SDG 12 (Responsible production and consumption); SDG 8 (decent work and economic growth); SDG 13 (climate action). While suggestions are enumerated on the approach to further support the SDGs through education on sustainable approaches.

Keywords: Oil palm, SDGs, Qualitative analysis, Malaysia, Socio-economic factors

1. Introduction

Most of the world's agricultural production takes place on small farms, and currently 90% of the 570 million farms globally are smallholdings with average farm sizes of about 2 ha (Rapsomanikis 2015). The development of smallholder agriculture fosters economic growth as smallholders account for a major proportion of the world food supply. Evidence has shown that the rapid improvement in smallholder farmers productivity greatly contribute to reduction in rural poverty, increased food supply and affordability especially in Asia and the sub-Saharan Africa. Therefore, economic policies should be smallholders engaged in production of important agricultural commodities such as oil palm.

Malaysia's position as one of the world's leading palm oil-producing country has paved way for the industry to thrive (MPOC, 2019). Oil palm contributes on average, 5% to 7% of Malaysia's GDP, with export revenue for the last five years averaging at USD 14.974 billion (RM 64.24 billion) annually (Nambiapan, et al., 2018). Malaysia's oil palm industry is dominated by the private estates, accounting for 60%, with 40% under the smallholding scheme (Mcbrown et al., 2015). The smallholders in the oil palm sector in Malaysia are more than 680,000 (both Independent and Organized Smallholders) with another 290,000 people employed in related industries (RSPO, 2018; Malaysian Palm Oil Council [MPOC], 2018). The Independent Smallholders cultivate oil palm without direct assistance from government, organizations or any private company, whereas the Organized Smallholders cultivate oil palm with support of either government or any organization which provide technical assistance, agriculture inputs or financing.

The economic relevance of oil palm sector cannot be over emphasized, aside its major contribution to GDP of producing countries, it is considered to be nutrient rich, cost effective and land efficient relative to other oil crops (Oil World, 2015). Thus oil palm possesses strong potentials to advance the Sustainable Development Goals (SDGs) agenda. The United Nations approved SDGs agenda comprised of 17 goals designed to take a holistic approach to addressing the social, economic, and environmental aspects of sustainable development. Several of these goals are related to agriculture, SDGs 2 is aimed at ending hunger and malnutrition and double agricultural productivity as well as incomes of smallholder farmers. While, eight other goals related to ending poverty, gender discrimination, inequality environmental degradation, tackling climate change, and promoting and ensuring healthy lives are linked to smallholders' development.

The aim of this study is to examine the various socio-economic conditions of oil palm smallholders in both Sabah and Johor and ascertain how these factors differ in each state to make a case for context-specific interventions to achieve the SDGs. Challenges in oil palm smallholdings at various stages of production requires interventions to improve productivity in the context of achieving various SDGs such as ending hunger, poverty, gender equality, and responsible production to ensure prosperity for all. Therefore, the study identifies the various SDGs whose achievement is explicitly dependent on smallholders' growth. This is critical in provision of urgent interventions to vulnerable smallholder groups.

2. Literature Review

Existing literature deliberates on the economic, environmental and social implications associated with oil palm production however, these three divides have been inconsistent in their findings. The differences in the bio-physical conditions in the areas studied and existing socio-economic situations prior to engagement in oil palm production have been cited as major factors responsible for the inconsistencies (Santika, Wilson, Budiharta, et al., 2019). As the benefits from oil palm likely depend largely on local context, particularly the nature of engagement between companies and destination communities (Meijaard & Sheil, 2019; Persch-Orth and Mwangi, 2016; Santika, et al., 2019; Baudoin et al., 2017). This section presents a review on the various divide in extant literature.

In the first group of studies, the concerns were majorly on issues of social and economic implications of oil palm production. According to Meijaard & Sheil (2019) the prohibition of oil palm development based on the argument of deforestation leaves deprive the populations in the tropical regions opportunities thus leaving them more vulnerable to livelihood challenges. Besides, ethical questions also play out in the contexts of biofuels and food security and of competition among oil crops, especially the crops at higher latitudes (e.g., soy, maize, sunflower, rapeseed, olive).

The study thus accentuate some of the distinctions that are salient in present debates. This is considered to provide better grasp of the ethical argument on palm oil production through a shared framework for development of both oil palm with substitute oil crops.

Several other studies have also ascertained the socio-economic impact of oil palm production. Highlighting these issues are studies of Susanti & Maryudi, 2016; Euler, Hoffmann, Fathoni & Schwarze, 2016; Bennett, Ravikumar & Cronkleton, 2018; Tambi, Choy, Yusoff, Abas and Halim 2021; Santika, et al., 2019; Syahza, Irianti, and Nasrul (2020); Martin et al., (2015); Susanti and Maryudi (2016); Euler, et al. (2016); Bennett, Ravikumar and Cronkleton (2018); Córdoba, Selfa, Abrams and Sombra (2018). These studies have independently examined implications based on the socio-economic dimensions. They also affirmed that oil palm production contributes to growth of rural areas.

Specifically, Tambi, et al., (2021); Choy, Yusoff, Abas and Halim (2021) assessed the challenges to improve the well-being of smallholder's oil palm communities in Malaysia. Their study identified factors including land shortage, limited credit and loans access, inadequate planting materials, scarcity of training, processing facilities, technological expertise, high fertilizer prices, and poor soil fertility. All these factors was consequently linked the challenges to the SDGs. Similarly, Santika, et al. (2019) found that oil palm production have economic benefit majorly for villages having past exposure in plantation management as

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well as market economy. The study examined the association between oil palm plantations across different aspects of well-being, by accounting for varying time delays in the accrual and realization of benefits after plantation development using the matching method. Particularly, the findings indicates that two groups of villages were identified. Those with low to moderate forest land and those with higher forest land. For the former group, the study indicated a better improvement in socio-economic welfare for oil palm producing villages compared to non-oil palm producing villages and vice versa for the second group. Therefore the study indicated that social impacts of oil-palm plantations are not uniformly positive, nor negative, and have varied systematically with biophysical locations and baseline socio-economic conditions of nearby communities prior to oil palm development.

Also, Talib & Darawi (2002) used data on total area, yield, domestic consumption, exports and imports of oil palm from 1997 to 1999 to describe the Malaysian palm oil industry. The study showed the importance of oil palm to Malaysian economy by affirming the significant effect of factors such palm oil stock level, prices, the exchange rate, global population, and the price of soybean oil. In the same vein, Syahza, Irianti, and Nasrul (2020) also assessed strategies to empower rural economies through oil palm production and also curtail the environmental impacts from oil palm expansion using the case study of Riau Province area, Indonesia. Findings indicates that oil palm farming has proven to be able to improve the welfare of the community and reduce poverty. The government has issued a policy, the development of oil palm plantations must be in line with the SDGs.

A recent systematic review of the literature on several aspect of the oil palm industry was carried by Ayompe, Schaafsma, Egoh (2020). The results showed that 109 studies indicated negative and 99 studies showed positive and direct impacts on humans. The most frequently studied direct negative impacts were conflicts (25%), housing conditions (18%) and land grabbing (16%) while the most frequently studied direct positive impacts were income generation (33%) and employment (19%). Most of the identified negative effects such as crises, poor housing conditions, land grabbing are not directly associated with oil palm but related to land resource scarcity. The study further asserted that there are ongoing initiatives to encourage sustainable practices and overcome the negative environmental impact.

Another group of studies are considered as proponents of the negative environmental impact of oil palm production includes, Tey, Brindal, Darham, et al. (2020); Ayompe, Schaafsma, Egoh (2020); Shevade and Loboda (2019); Santika, Wilson, Meijaard, et al. (2019); Syahza, Irianti, and Nasrul (2020). Specifically, Tey, Brindal, Darham, et al. (2020) used 16 years data from 2000 to 2016 for 39 plantation companies listed on the Kuala Lumpur Stock Exchange in Malaysia. The study affirmed that the plantation companies realised that early adoption of the RSPO is positively related with their return on investment. This positional advantage is likely to yield both operating and capital efficiencies, such as those predicated in the good management practices of the RSPO standard.

In the same vein on the assessment of environmental impacts, Shevade and Loboda (2019) examined the determinants and constraints on expansion of oil palm plantation with focus on Peninsular Malaysia. Using the data from 1988 and 2012, the study identified factors determining natural forest conversion into oil palm plantations using both logistic regression and hierarchical partitioning. Findings indicated that one major factor that determines forest expansion is the proximity to existing plantations. Although biophysical suitability is another relevant factor. Also, the study by Cazzolla Gatti et al. (2019) in Indonesia, Malaysia and Papua New Guinea from 2001–2016 showed a high rate of forest loss in the certification concession area (about 40%). The effects above have raised concerns about the negative impact that developing the palm oil industry in Indonesia and Malaysia will have on the environment.

In the wave of these studies on the environmental concerns of oil palm production is the emergence of RSPO, ISPO and MSPO at International, Indonesia and Malaysia level respectively (Hidayah et al., 2019; Abdul Majid, Ramli, Sum & Awang, 2021). These oil palm sustainability standards are committed to sustainable production of oil palm through recommendation of packages of sustainable practices and certification of compliant producers responsible for 21% of the global palm oil. Consequently, there is a major decline in the unsustainable practices across the sector and improvement in the livelihood of producing communities. Consequently, several studies have examined the effectiveness of these sustainability standards in ensuring their primary goal of sustainable practices in the oil palm sector.

Laskar and Gopal Maji (2018) and Hidayah et al. (2019) in Indonesia oil palm sector indicates less of environmental concerns, however certification was indicated as a major concern (Wardhani & Rahadian, 2021). Particularly, Laskar and Gopal Maji (2018) found that Indonesian companies' disclosure of environmental performance is lower and more dispersed than that of other countries (Japan, South Korea and India). Furthermore, the study indicates that companies pay attention to carbon emission issues, effluent and waste, water management, biodiversity, energy and environmental management certification. However, the sample companies did not pay attention to material and supplier compliance in applying sustainability in

environmental aspects. Similarly, Abdul Majid, Ramli, Sum and Awang (2021) carried out a systematic review of 174 related studies published from 2004 to 2019. They showed that majority of the study are focused on RSPO compared with variants like MSPO and ISPO. Consequently, the study recommended further research on MSPO and ISPO to enable understanding of the dynamics of the implementation of sustainability certification.

It is clear that much is left undone concerning the social and economic implications of oil palm production among the smallholders categories in Malaysia especially as they relate to the SDGs. Since, most studies have analysed environmental concerns with limited studies on the social impact of oil palm production (Abdul Majid et al., 2021). This necessitate further studies in Malaysian context especially as the impact of oil-palm plantations are not uniformly positive, nor negative across biophysical locations and baseline socio-economic conditions of neighbouring communities (Santika, Wilson, Budiharta, et al., 2019).

3. Methodology

The methodological section itemises the series of approaches that were used to enable the collection of data, and other procedures until analysis of the data. First the sub sections describes the study area, then procedure for sampling the population, type and method of data collection (that is using questionnaires). Then finally data analyses are discussed.

Study Area

Among the 15 states in Malaysia, Sabah and Johor are located far apart, while Sabah is located in the East Malaysia, Johor is located in Peninsular Malaysia.. Sabah which is located in East Malaysia represents one of the largest producing states in Malaysia. Sabah has oil palm planted area of around 1.55 million ha, representing 27% of total oil palm planted area in Malaysia (MPOB, 2019). On the other hand, Johor is located in the south of Peninsular Malaysia with land borders with other states like Pahang to the north and Malacca and Negeri Sembilan to the northwest (Farhaan Shah, 2018). The total oil palm planted area for Johor is 0.75 million ha representing about 27.4% of total oil palm planted area in Peninsular Malaysia and 12.8% of the overall oil palm planted area in Malaysia. The Gross Domestic Product (GDP) of Johor is RM 104.4 billion, the third highest among Malaysian states after Selangor and Sarawak.

Data Collection and Sampling

The study used the primary data comprised of the socio-economic profiles of oil palm smallholders in states of Sabah and Johor. For this study a well-structured questionnaire was used to elicit relevant data from the targeted respondents. A cover letter was included to emphasize the importance of the study and assure confidentiality to the respondents. Sampling was done by taking into consideration the population sizes of oil palm smallholders in both Sabah and Johor which is 33,669 and 69,606 respectively. This study followed the systematic random sampling of respondents. The random selection of oil palm smallholders was done by selecting the 3rd smallholder from the list of total population. The usable questionnaire was found to be 500 and 327 for Sabah and Johor respectively.

Data and Analyses

Descriptive statistics, correlation analysis and t-tests have been used in the present study. We performed descriptive statistics such as frequency distribution, percentages, measures of central tendency such as mean, median or mode and standard deviation. The graphical representations such as bar charts, pie charts and histogram were used to illustrate the findings. The survey report constitute numeric variables associated with demographic and economic characteristics of smallholders. The t-test and the spearman rank correlation analyses were conducted to examine the statistical difference in specific socio-economics factors and related SDGs.

4. Findings and Discussion

This section presents the findings of the study and also discusses the implication of the findings with relation to contribution to various SDGs for the cases of Johor and Sabah respectively. This section first presents the general result of the analysis of the socio-economics profile of the smallholders. Then the analysis of the data is extended based on some specific SDGs and the related socio-economic profiles. Specifically, the incomes distributions, production level and productivity, educational achievement and gender involvement both in Johor and Sabah.

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Socio Demographic Result

The socio-demographic characteristics of the oil palm smallholders in both Sabah and Johor are presented in Table 1. These include characteristics of oil palm smallholders such as; their age, gender, oil palm production experience, family sizes, education categories, and farm sizes.

Table 1: Socio-demographics of Oil Palm Smallholders in Sabah and Johor, Malaysia

Variables	Sabah		Johor	
	Number	Percentage	Number	Percentage
Age				
(0-30)	138	28	26	8
(30-60)	271	54	223	68
(61-Above)	91	18	78	24
Gender				
Male	353	71	293	90
Female	147	29	34	10
Marital Status				
Married	424	85	286	87
Single	45	9	13	4
Divorced	31	6	28	9
Palm Oil Experience				
(0-10)	264	53	73	22
(11-20)	129	26	98	30
(21-Above)	107	21	156	48
Family Size				
(0-4)	129	26	82	25
(5-8)	240	48	203	62
(8-Above)	131	26	42	13
Education Classification				
Non-Formal Education	86	17	29	9
Primary School Certificate	159	32	200	61
Secondary School Certificate	210	42	86	26
STPM / Diploma /Higher Education	45	9	12	4
Income Classification				
0 - 228.4 (RM 0- RM 980)	113	23	1	0.3
228.6 - 609.3 (RM 981-RM2,614)	77	15	22	7
609.6-1218.6 (RM 615-RM5,228)	69	14	98	30
1,218.9 - Above (RM 5,229-Above)	241	48	206	63
Average Income	USD 244 (RM 1,016)		USD 422 (RM 1,760)	

Source: Field Survey, 2015 Exchange rate US\$1=RM4.29

The lowest age of oil palm smallholders in Sabah is 22 while the highest age is 98 years. For Johor the lowest age is 20 and the highest is 78 years. Most smallholders, that is 54% and 68% for Sabah and Johor respectively are within the age of 31 to 60 years. Although, Sabah has higher percentage of younger oil palm smallholders that is, 28% as compared to 8% for Johor with ages below 30 years. While 18% and 24% are in the age bracket above 60 years for Sabah and Johor respectively, indicating that Johor has more of older oil palm Smallholders. The gender distribution shows that, majority of the smallholders or about 71% and 90% are male which indicates 29% and 10% female involvement for Sabah and Johor respectively. The greater

number of males in this study is consistent with general perception that oil palm production is a male dominated industry.

The analysis revealed that 17% and 9% of oil palm smallholders in Sabah and Johor respectively have no formal education. Those with Primary School Certificate are 32% and 61% for Sabah and Johor respectively. Secondary School Certificate 42% and 26% for Sabah and Johor respectively, while only 9% and 4% had STPM, Diploma or higher Education in Sabah and Johor respectively. This shows that Johor has more percentage of smallholders (61%) in the primary school category while, Sabah has more (42%) with secondary school certificate. In the marital status, majority 85% and 87% were married, 9% and 4% are single and 6% and 9% are divorcee for the cases of Sabah and Johor respectively. In terms of years of experience, 53% and 22% of smallholders in Sabah and Johor have 0-10 years of experience respectively. Similarly, 26% and 30% had 11-20 years of experience in Sabah and Johor respectively while, 21% and 48% of smallholders in Sabah and Johor have experience of 21 years and above.

Distribution of Oil Palm Smallholder based on FFB Production and Productivity (SDG 2)

Oil palm smallholders are closely linked with nutrition and food security in three ways. Firstly, it makes food available through production; secondly, it reduces the real cost of food, making it more affordable; and thirdly, it improves incomes of farming households, enabling them to access nutritious foods (Ivanic and Martin 2008; Pingali et al. 2015; Swinnen and Squicciarini 2012). Sufficient evidence exists to validate the relationship between agricultural growth and nutritional outcomes. This implies more on oil palm production is considered as an effort towards SDG 2. This sub-section presents a comparison of the monthly FFB production by smallholders in both Sabah and Sarawak.

As presented in Figure 1, our analysis of the data on oil palm production shows that 80% and 87% of smallholders produces between 0-5 tons of oil palm on monthly basis in Sabah and Johor respectively. While 14% and 4% of the smallholders produces between 5.1 to 10 tons monthly for Sabah and Johor respectively. This will support the goal to end hunger, achieve food security and improve nutritional status. Oil palm possesses high nutritional values and hence, it has many food uses such as cooking/frying, shortenings, margarines and confectionery fats (MPOB, 2015). This has the enormous potential of contributing to the second Sustainable Development Goal (SDG2) of Ending hunger, achieving food security and improved nutrition. Comparing the percentage of oil palm smallholder in Sabah and Johor with FFB production of 5.1 to 10 tons, Sabah is considered to thrive better in terms of contribution to SDG 2, although, Johor has more number of smallholders (14%) with larger number of oil palm production.

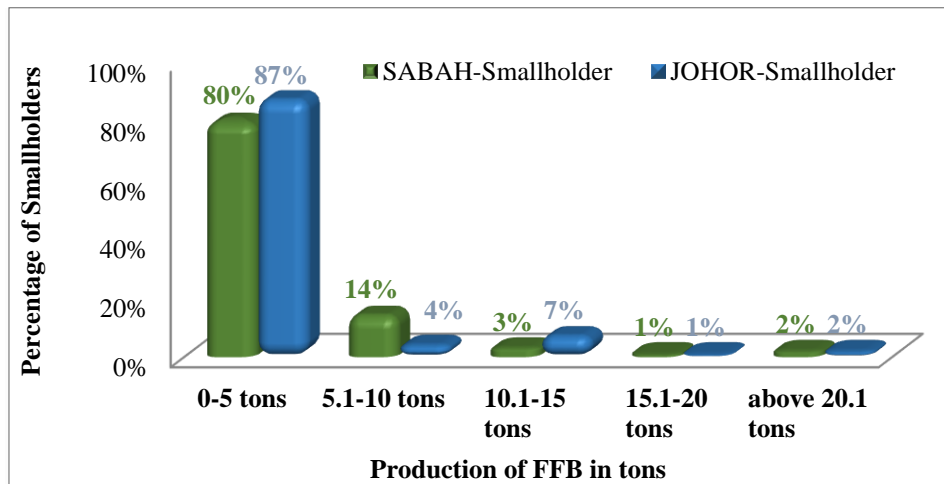


Figure 1: Monthly FFB Production by Smallholders

Furthermore, having access or control over land as an economic resource will support production of more oil palm and thus contributes more to SDG 2 (ending hunger). This study analysed and compared the extent of smallholder access to land for oil palm production by examining the distribution of oil palm smallholders' based on oil palm cultivated area in Sabah and Johor as presented in Figure 2. In terms of cultivated land area by smallholders 67% and 88.7% of oil palm smallholders in Sabah and Johor respectively have land area below 10 acres (about 4 ha), this represent the land size for majority of smallholders. While Sabah has more smallholders with larger land area as compared to Johor. About 33% and 11.30% of smallholders in Sabah and Johor have land size of 11 acres and above respectively.

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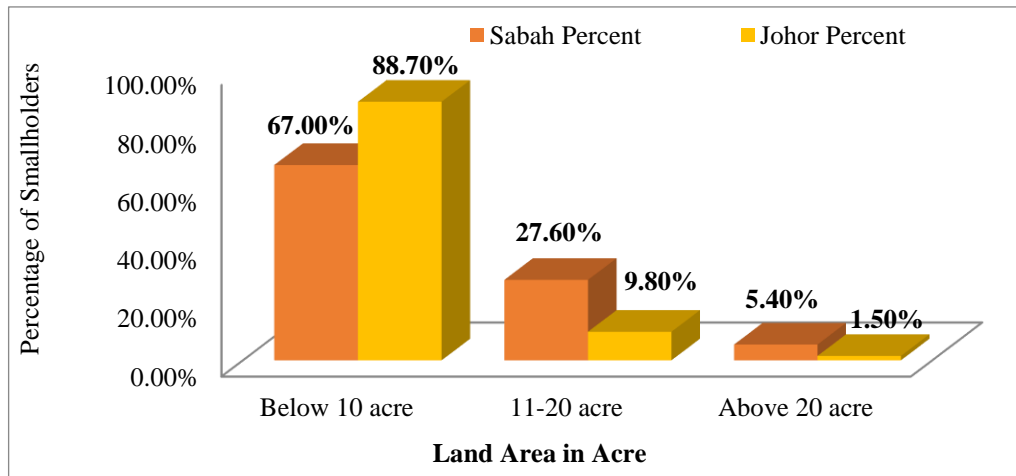


Figure 2: Distribution of Smallholder Monthly Income in USD and RM

Distribution of Oil Palm Smallholder in Sabah base on Income Classification (SDG 1)

The growth and development of the oil palm smallholders are central to achieving the poverty goals (SDG 1 and SDG 8). The result from other studies have shown the significant marginal effects of agricultural growth on poverty reduction (Ravallion & Chen 2007; Christiaensen et al., 2006). In Asia, Thirtle et al. (2003) affirmed the positive effect of productivity increase on poverty reduction. Similarly, in India, Fan et al. (2000) indicated a decline in poverty rate by 0.24% due to productivity growth in agriculture. Consequently, this study analysed the income classification of oil palm smallholders based on four categories defined in the income demarcation of households in the 11th Malaysian Plan (EPU, 2018). The first categories are those having income below national poverty line of USD 228 (RM 980) per month, the second category is the low income smallholders, followed by the low middle income and lastly the upper and high income categories. This was then compared with the national poverty line in accordance with SDG 1 (target 1.2): This is presented in Figure 3.

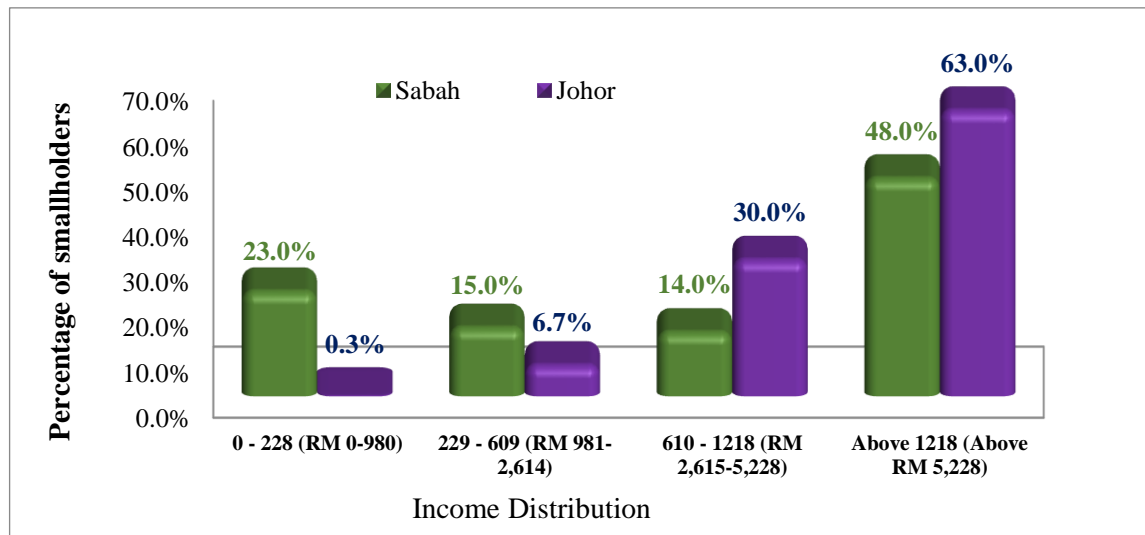


Figure 3: Distribution of Smallholder Monthly Income in USD and RM

Result shows that, about 23% of smallholders have monthly income below national poverty line in Sabah of USD 228 (RM 980) per month. On the contrary Johor has a lower proportion of 0.3% smallholders below national poverty line. While majority of smallholders, 77% and 99.7% have income above National poverty line for both Sabah and Johor respectively. Similarly, from Table 1, the average monthly income/acre is USD 244 (RM 1,016) and USD 422 (RM 1,760) for Sabah and Johor respectively. These are also higher than the national poverty line of USD 228 (RM 980). Thus, it is concluded that base on the incomes earned by oil palm smallholders, the sector is a strong contributor to SDG 1. Furthermore, Johor has a stronger contribution as shown by the higher average monthly income/acre (USD 422 or RM 1,760) and lower percentage of just 0.3% of smallholders earning below poverty line from oil palm production. The poverty related SDG,

particularly SDG1 (target 1.4) relates to ensuring equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources.

Distribution of Oil palm Smallholder in Sabah base on Education (SDG 4)

The socio-demographics of oil palm smallholders shows majority belongs to the active age class of 30 to 60 years and can be considered as youths and adults. Educational attainment among youths and adults is the focus of SDG 4. Specifically, SDG4 (Target 4.1) is concerned with ensuring that all girls and boys complete free, equitable and quality primary and secondary education. Similarly, SDG 4 (Target 4.4) is also concerned with substantially increasing the number of youths and adults that has relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship. Target 4.4 is in line with the agricultural extension services by Malaysian Palm Oil Board (MPOB) through its guidance and counseling officers (TUNAS).

In Malaysia TUNAS provides guidance/subsidy, access to skills, tools, inputs, and knowledge to oil palm smallholders (MPOB, 2018). To examine the extent of achievement of SDG4 (target 4.1) by oil palm smallholders, the study presents the percentages of smallholders by educational attainment. Similarly, contribution to SDG 4 (target 4.4) is assessed using the percentage of smallholders that have access to TUNAS for guidance and subsidy. The results are presented in Figure 5 and Figure 6 respectively.

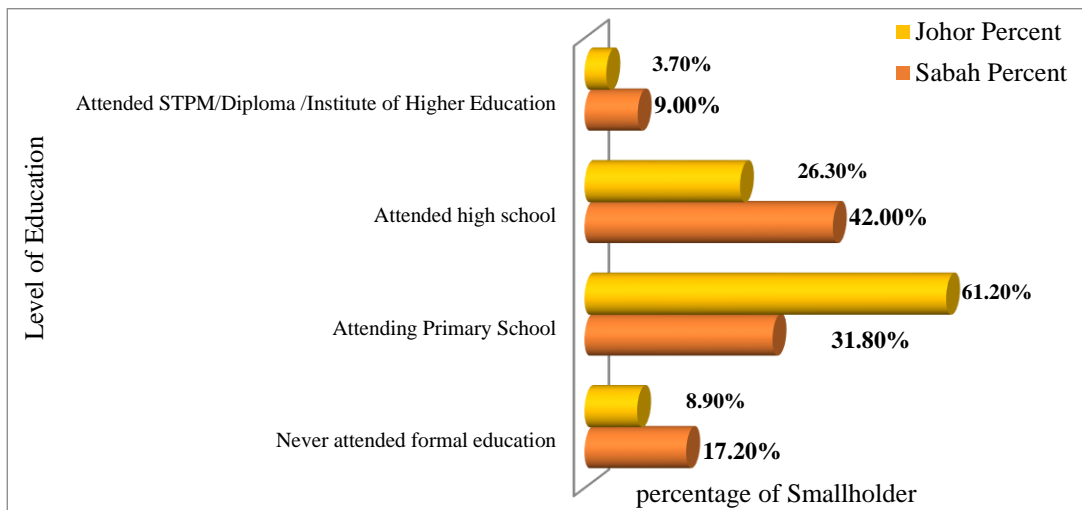
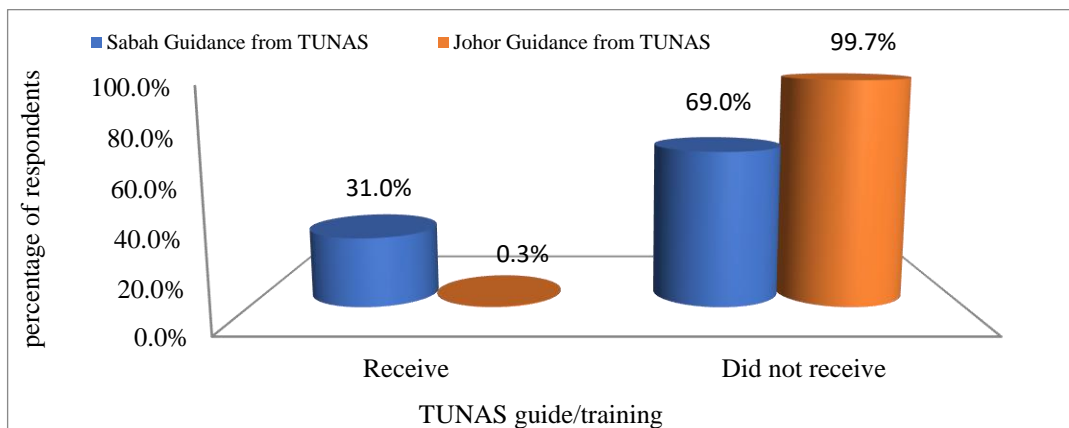


Figure 5: Distribution of Smallholders by level of education in Sabah and Johor

Source: Field Study, (2015)

Result indicates that, most of the oil palm smallholders has basic primary education and high school or secondary education. Those in Johor, 61.2% attended primary school, compared to 31.8% in Sabah. On the other hand, Sabah has 42% of its smallholders with high school education compared to Johor having 26.3% with high school education. Eventhough, smallholders in Johor has the higher percentage never attended any formal education (17.2%) almost twice that of Sabah (8.9%). Consequently, given the lower number of smallholders that never attended school (8.9%), Johor can be considered as a better contributor to SDG 4 (target 4.1).



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Figure 6: Distribution of smallholders by TUNAS training

Source: Field Survey, 2015.

Results from Figure 6 shows that Sabah has the largest number (31%) of smallholders receiving training from TUNAS, while only 0.3% receives training from TUNAS in Johor. This implies Sabah can contribute more to target 4.4 as compared to Johor although, TUNAS coverage can be considered to be generally low, therefore suggesting the need for expanding their coverage.

Distribution of Oil Palm Smallholders in Sabah and Johor based on Gender Equality (SDG 5)

Among the social goals of the SDGs is the SDG 5 (gender equality). Achieving the social goal of gender inequality depends on improved access to economic resources including land, natural resources, financial services and technology, for women and marginalised groups. In our analyses, women comprised of 29% and 10% of the total number of smallholders in Sabah and Johor respectively. Although agriculture is generally a male dominated industry, the oil palm industry also have substantial women composition which indicate equal opportunity for both genders. Thus despite the fact that majority of the oil palm smallholders are male, the participation of women in the sector is also well established considering that they constitute 29% of smallholders in Sabah and 10% in Johor.

Again, further analysis of the issue of gender equality (SDG5) among smallholders, the study made a comparison of selected socio-economic factors between male and female smallholders using pooled data from both Sabah and Johor. The independent sample T-test was used to achieve this and the results is as shown in Table 2.

Table 2
Independent sample T-test for Male and Female Smallholders

Socio-Economic Factors	Male (N= 807)	Female (N= 203)	t-test for Equality of Means		
	Mean	Mean	T	df	P-value
Smallholder type	1.516	1.645	-3.333	1008	0.001***
Education level	3.333	2.990	2.459	1008	0.014**
Experience (Year)	2.031	1.887	2.155	1008	0.031**
Other Income	1.190	1.153	0.831	1008	0.406
Guidance from TUNAS	1.835	1.872	-1.284	1008	0.199
RSPO Member	1.986	1.995	-1.023	1008	0.307
Oil palm Income	1396.61	1022.67	3.033	1008	0.002***
Monthly FFB Production Mt/ha	0.47	0.40	4.551	447	0.000***

FFB= fresh fruit bunches or oil palm.

*** and ** implies significance at 1% and 5% respectively.

The result in Table 2 revealed that both female and male smallholders do not differ in terms of three socio-economic factors (other income, training or guidance by TUNAS, membership of RSPO). The mean difference between male and female smallholders was not statistically significant for those factors given the P value of > 0.05. Thus establishing the issue of gender equality in access to training by extension services of TUNAS, the accessibility to other income and oil palm certification by RSPO. However, in terms of smallholder types, educational level, experience in oil palm production, income from oil palm, monthly production of oil palm, the result indicates a significant difference between genders.

The differences in the number of organised smallholders types, between male and female smallholders was significant (P= 0.001). This implies the male smallholders have more number of organised smallholders than female smallholders. Also, the differences in the level of education by male and female smallholders was significant (P= 0.014). This implies the male smallholders have higher education compared to female smallholders. Similarly, there is a significant difference between the years of experience in oil palm between the two genders (P= 0.031). This implies that generally the male smallholders have higher years of experience in oil palm production compared to the female counterpart. While, the differences in the level of income earned from oil palm production by male and female smallholders was significant (P= 0.002) with mean income of RM1396.61 for male and RM1022.67 for females. This implies the male smallholders earn

higher monthly income compared to female smallholders. Furthermore, the differences in the level of FFB production by male and female smallholders was significant ($P= 0.000$) with mean production of 0.47 Mt/ha per month for male and 0.40 Mt/ha per month for females. This difference was statistically significant implying that the male smallholders have higher average FFB production compared to their female counterpart.

Given the significant difference in the socio-economic factors between female and male smallholder, this study therefore infers from the result in Table 2 that these factors could further be improved to support more efficient and competitive production by the female smallholders. This will also help female smallholders to enjoy equal opportunities in the sector and excel in the oil palm business thus, contributing to SDG 5 (gender equality).

Distribution of Oil Palm Smallholders in Sabah base on RSPO membership (SDGs 12, 13 and 15)

There are three SDGs that are related to the environmental sustainability; SDG 12 (responsible production and consumption), SDG 13 (climate action), and SDG 15 (management and preservation of natural resources and biodiversity). The externalities of oil palm production on natural forest environment are recognised as vital issues to consider in order to ensure that the growth of the oil palm industry do not occur at the expense of the environment. Therefore, various organisations have taken up the responsibility of ensuring sustainable practices in the industry. These global and regional organisations (RSPO and MSPO) alongside extension services are committed to ensure sustainable practices in oil palm production, first through training and monitoring of practices across the value chain. These organisations are thus, integral to the achievement of the three environment related SDGs.

Overall, the growth and development of small producer agriculture systems are vital for meeting the poverty, nutrition, social and environmental goals. However, small producers are faced with significant challenges and constraints, characterised by poor access to production factors and agricultural commodity markets.

Determining the differences in Socio-economics Factors between Sabah and Johor

To better understand the differences in the socioeconomic profiles of smallholders in Sabah and Johor, the study made a comparison of selected socio-economic factors between smallholders in Sabah and Johor using the independent sample T-test and the results is as shown in Table 3.

Table 3
T-test result for socio economic profile of smallholders in Sabah and Johor

Socio-Economic Factors	Sabah (N=	Johor (N=	t-test for Equality of Means		
	500)	327)	T	df	P-value
Smallholder Type	1.676	1.483	5.632	825	0.000***
Education level	3.604	2.945	5.01	825	0.000***
Experience (Year)	3.604	2.945	9.965	825	0.000***
Other Income	1.238	1.125	2.678	825	0.008***
Guidance from TUNAS	1.686	1.997	-12.045	825	0.000***
RSPO Member	1.980	1.997	-2.082	825	0.038**
Oil palm income	1015.80	1760.29	6.259	825	0.000***
Monthly FFB Production Mt/ha	0.41	0.51	6.52	393	0.000***

The result in Table 3 revealed that all the socio-economic factors were statistically different across both states. The value of the socio-economics factors between smallholders in Sabah and Johor were all statistically significant given the P value of < 0.05 . The differences in the number of organised smallholders types between Sabah and Johor was significant ($P= 0.000$). This implies the Johor smallholders have more number of organised smallholders than Sabah. Also, the differences in the level of education by smallholders in Sabah and Johor was significant ($P= 0.000$). This implies the Johor smallholders have higher education compared to Sabah smallholders. Similarly, there is a significant difference between the years of experience

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in oil palm between the two states ($P= 0.000$). This implies that generally the smallholders in Johor have higher years of experience in oil palm production compared to Sabah.

Whereas, the differences in the level of income earned from oil palm production by Sabah and Johor smallholders was again significant ($P= 0.000$) with mean income of RM1015.8 for Sabah and RM1760.29 for Johor. This implies the Johor smallholders earn higher monthly income compared to Sabah smallholders. Furthermore, the differences in the level of FFB production by smallholders in Sabah and Johor was significant ($P= 0.000$) with mean production of 0.41 Mt/ha per month for Sabah and 0.51 Mt/ha per month for Johor. This difference was statistically significant implying that the smallholders in Johor have higher average FFB production compared to their Sabah counterpart.

Table 4

Correlation Analysis between Socio-economic Factors of Oil Palm Smallholders

	Farm location	TUNAS guidance	Oil palm income	FFB Production
Farm location	1			
TUNAS guidance	.276**			
Oil-palm income	.063*	.084**		
FFB Production	.284**	.098*	.739**	
Education	-.155**	-.131**	-0.02	-0.04

** Significant at 1%, * Significant at 5%

According the results in Table 4, the correlations values between socio-economic characteristics of smallholders (Farm location, TUNAS guidance, Oil-palm income, FFB Production and Education) varies strongly. The linear association between the production of oil palm and education was weak ($r=0.155$), although it is significant. This implies despite the importance of education in oil palm production, the knowledge has to be related to oil palm management. Also the association between FFB production and farm location (Sabah and Johor) was significant although weakly related ($r=0.284$). Whereas, the relationship between income and FFB production was found to be very strong ($r=0.742$). This is expected since oil palm was the major source of income for the smallholders, thus oil palm production could be considered strongly contribute to SDG1 (No poverty). Considering that TUNAS provides education related to oil palm production to the smallholders, the relationship was stronger than ($r=0.276$) compared to conventional education.

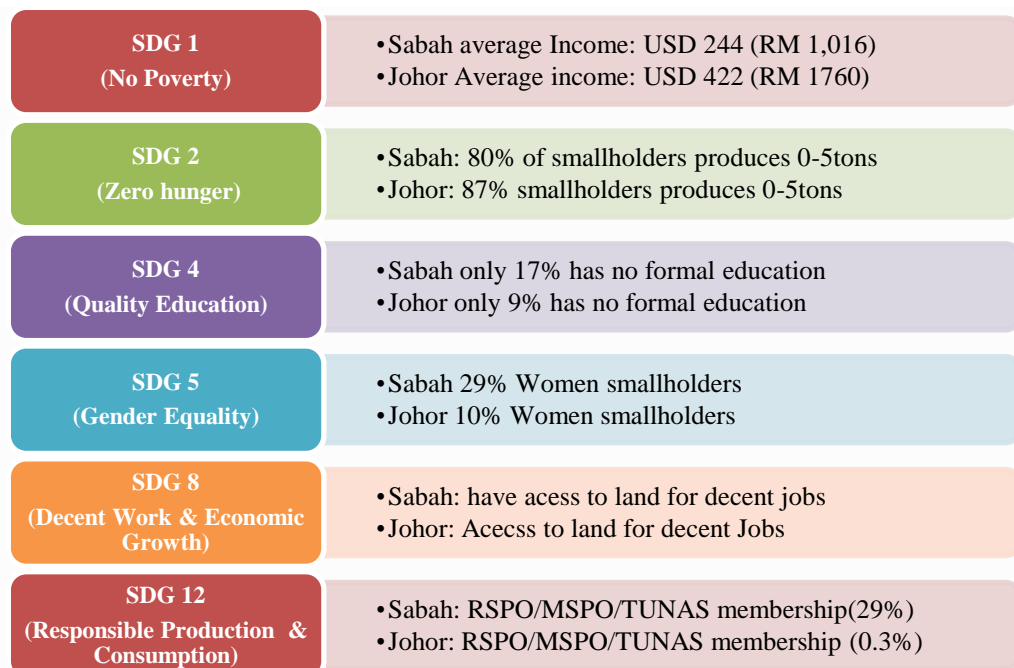


Figure 7: Framework for SDGs Interlinkages

5. Conclusion And Recommendations

Considering the significance of oil palm as food and the level of income achieved by smallholders in the oil palm industry, the study has clearly shown that oil palm production contributes to SDGs in the studied location. Findings from comparison of the contributions to SDGs by oil palm Smallholders in Sabah and Johor have further shown that: For SDG 2; Sabah has achieved more considering the percentage of oil palm smallholder with FFB production of 5.1 to 10 tons. In terms of SDG 1, Johor has a stronger contribution as shown by the higher average monthly income (USD 422 or RM 1,760) and lower percentage of just 0.3% of smallholders earning below poverty line from oil palm production. Although, in the case of SDG 1 (target 1.4), Sabah is considered as to be better considering that it has more distribution of smallholders with larger land area as compared to Johor. For SDG 4 (target 4.1 and 4.4), Johor is considered as a better contributor given the lower number of Smallholders that never attended school (8.9%) and access to TUNAS respectively.

Therefore, the study provides some recommendations as follows: first to target improved production through encouraging smallholder investment in new technologies, improving coverage or expanding access to extension services by organizations such as TUNAS can further educate farmers on better and sustainable use of land and consequently increase their income and livelihood. The membership of the MSPO and RSPO could be encouraged to ensure sustainable practices among the Malaysian smallholders.

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