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FACTORS INFLUENCING THE LEVEL OF ACCEPTANCE OF CODE OF GOOD NURSERY PRACTICE FOR OIL PALM NURSERIES (CoPN) AMONGST OIL PALM NURSERY OPERATORS

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Abstract: Oil palm nurseries play a significant role in producing good quality oil palm seedlings that contribute to higher Fresh Fruit Bunches (FFB) yield in oil palm plantations. To ensure the good quality of oil palm seedlings, the nursery should operate efficiently. The implementation of the Code of Good Nursery Practice for Oil Palm Nurseries (CoPN) starting from 2009 is an initiative by MPOB to ensure oil palm nursery operators produce good quality oil palm seedlings. In-line with national aspiration of having higher FFB yield, a study on factors influencing the acceptance of CoPN amongst oil palm nursery operators in Malaysia is deemed important. This study presents the result of a survey conducted throughout Malaysia in examining factors influencing the level of acceptance of CoPN amongst oil palm nursery operators. The study found that the acceptance level of CoPN was greatly influenced by the general perception amongst oil palm nursery operators towards CoPN and the satisfaction amongst oil palm nursery operators towards MPOB as certification body.

Keywords: FFB yield, CoPN, oil palm nursery operators, factors influencing, acceptance level.

Introduction

Oil palm, originally planted in Malaysia as ornamental plants, has become a commercial crop since 1917 (Naher *et al*., 2013). Oil palm then became an important crop in the early sixties after the government launched the diversification of agricultural crops to reduce dependency on rubber and cocoa (Nambiappan *et al*., 2018). Currently, oil palm is a major commodity crop of the country, with a planted area of 5.9 million hectares in 2019 (Parveez *et al*., 2020), making it the largest contributor to the country's Gross Domestic Product (GDP) for the agricultural sector (Hussein *et al*., 2017).

One of the major efforts for the sustenance of the industry is to increase the production of crude palm oil by increasing the productivity of the FFB in the plantation sector. The productivity of the oil palm plantation depends on numerous factors, in particular, the quality of the oil palm seedlings (Halimah *et al*., 2010), as it determines the oil palm yield (Salmiyanti *et al.*, 2014) and thus contribute to the success of an oil palm plantation (Herriansyah, 2001).

As early bearing and high yields in the field are mainly dependent on production of uniformly good and healthy seedlings from nursery (Pandiyaraj *et al*., 2017), and good nursery management would be significant for oil palm industry (Herriansyah, 2001). Special attention must be given from the seed production to the management of oil palm nurseries so as to ensure that only good quality seedlings are planted in the fields. The production of superior oil palm planting materials is fully dependent on attention to details at all stages in the nursery management and this entails following proven standards and procedures closely (Henriansyah & Tan, 2005). The aim of good oil palm nursery management is to provide materials of the

highest possible quality for new development areas and replanting (Ahmad *et al*., 2019). All nurseries should be maintained at the highest standard to ensure only healthy, vigorous and uniform palms are planted in the field (Ibrahim *et al*., 2010).

Realizing the importance of good quality planting materials and good agricultural practices in oil palm plantation, MPOB launched the MPOB Code of Good Practice (CoP) in 2007 (Bernama, 2017). The Code provides guidance for those involved in the oil palm industry. The objective of the CoP is to help the industry meet its obligations, ensure the safety and quality of food, and achieve palm oil sustainability. The Code contains the elements required to establish the needs of each set of activities and ensure that the process specified has complied with all requirements and meet the needs of the users.

There are seven CoPs that have been published along the palm oil supply chain. It covers the oil palm nurseries sector, estates and smallholders, palm oil mills, palm kernel mills, refineries and the bulking installation for the handling, transportation and storage of palm and palm kernel oil and their products.

The CoP for the nursery is the Code of Good Nursery Practice for Oil Palm Nurseries (CoPN) which was introduced in July 2012. It is a guideline for oil palm nursery operators in handling a nursery in producing good quality of oil palm seedlings. The CoPN provides guidelines to oil palm nursery operators in handling oil palm nursery. This Code of Practice covers the maintenance of oil palm nurseries starting from the receipt of the germinated seeds until the production of seedlings ready for field planting (MPOB, 2016). The mandatory oil palm nursery CoP could improve the efficiency of the nursery operators provided that sufficient knowledge on the operations of a nursery be well provided, especially to the new operators (Rahman *et al*., 2008).

There was a total of 840 oil palm nursery operators in 2020, of which Sabah has the largest number of oil palm nursery operators with 191 nurseries registered, representing 22.7% of the total number of oil palm nursery operators in Malaysia. It was then followed by Sarawak and Johor with the total nursery operators of 146 and 135 respectively (Table 1). Besides that, there were only 331 oil palm nurseries certified with

Table 1: No. of oil palm nursery operators by state in 2020

State	No. of Nursery	Percentage (%)
Sabah	191	22.7
Sarawak	146	17.4
Johor	135	16.1
Perak	106	12.6
Pahang	92	11.0
Kedah	42	5
Terengganu	32	3.8
Negeri Sembilan	27	3.2
Selangor	26	3.1
Kelantan	25	3.0
Melaka	13	1.6
Penang	5	0.6
Total	840	100

Source: MPOB, 2021

CoPN, representing 39.4% of the total number of oil palm nursery operators (Table 2).

Good oil palm planting materials will produce higher yield productivity for life span of 25 years or more and any shortcoming in the planting materials will be of long-term significance. Nursery care is therefore essential as it provides an opportunity to cull poor seedlings. The implementation of the CoPN is an initiative of MPOB consistent with its commitment towards producing oil palm with high yield fresh fruit bunch. In-line to ensure the good quality oil palm seedlings, this paper examines the factors influencing the level of acceptance of CoPN amongst oil palm nursery operators.

This paper is organised as follows. Section 2, describes the data and methodology used in this study. Section 3, describes the results and discussions. Conclusions and recommendations are drawn in Section 4.

Methodology

This study used primary data, collected by using a survey technique. The information was gathered through questionnaires sent by fax or email to the oil palm nursery operators. For the purpose of data collection, a structured questionnaire has been designed, divided into three (3) parts: Part A – Background of the nursery, Part B – Awareness on CoPN and Part C - The Perception towards CoPN.

The minimum sample size for this study was determined using the standard sample size determination for finite population (Keller, 2008; Berenson *et al*., 2014). This study was based on the oil palm nursery operators in 2019. According to MPOB (2020), there were 868 registered oil palm nursery operators in Malaysia in 2019. However, only 717 were active as of December 2019. Therefore, based on the active registered oil palm nursery operators, the minimum number of respondents to be collected for this study was 198 respondents. However, a total of 200 samples were collected.

Factor analysis was used to construct the new factors affecting the dependent variables. Bartlett's test of sphericity and the Kaiser-Meyer-Olkin measure of sampling adequacy are tests that were used to determine the factorability of the matrix as a whole. In this study, factor

Table 2: No. of oil palm nursery operators by state in 2020

State	No. of Nursery	Percentage (%)
Sarawak	72	21.8
Johor	64	19.3
Sabah	55	16.6
Perak	39	11.9
Pahang	36	10.9
Kedah	16	4.8
Terengganu	17	5.1
Negeri Sembilan	13	3.9
Kelantan	9	2.7
Selangor	5	1.5
Melaka	4	1.2
P. Pinang	1	0.3
Total	331	100

Source: MPOB, 2021

analysis was used to examine factors affecting oil palm nursery operators to possess the CoPN certificate. The factors were extracted when the eigenvalues were greater than 1. The first factor showed the highest percentage of variance explained when it was extracted.

Logistic regression was used to analyze relationships between a dichotomous dependent variable and metric or non-metric independent variable. Logistic regression combines the independent variables to estimate the probability that a particular event will occur. In this study, logistic regression analysis used to investigate the nature of associations between the nursery operators who possessed the CoPN certificate and perception towards the CoPN. The logistic regression analysis was analyzed using the aids of SPSS version 20.0. The logistic regression model is written as:

$$\text{Log}\left[\frac{\pi_t}{(1-\pi_t)}\right] = \beta_\circ + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots\ldots\ldots + \beta_n X_n$$

Where,

$\pi = P(\pi\,(y) = 1)$ = Probability of oil palm nursery operators possess CoPN certificate

X_1 = Factor 1, X_2 = Factor 2, X_3 = Factor 3, Xn = Factor N, β = coefficient of factor

Results and Discussion

Factor Analysis

The result shows that value of Bartlett's Test of Sphericity is significant at 99% of confidence level (Table 3). In addition, the Kaiser-Meyer-Olkin measure is 0.881 which surpasses the meritorious level of 0.8. Coakes and Ong (2011) suggest that if the Bartlett's Test of Sphericity is significant, and if the Kaiser-Meyer-Olkin measure is greater than 0.6, then factorability is assumed. Thus, based on the results, it is appropriate to proceed with Factor Analysis to examine the factors affecting oil palm nursery operators to possess the CoPN certificate.

Table 3: KMO and Bartlett's test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		**0.881**
Bartlett's Test of Sphericity	Approx. Chi-Square	1134.61
	Df	105
	Sig.	0.000

Table 4 shows the summary of multiple criteria used to determine the number of factors that could be extracted. The analysis shows that the Principal Components Analysis (PCA) could extract three components from a group of 15 indicators since the three eigenvalues under the Kaiser's criteria (i.e., between 4.773 and 2.395) exceeded the value of 1.00. The extracted components are 68.695%, which exceed 60% of the cumulative percentage of variance explained. Hence, this confirms the extraction of three components or factors from the 15 indicators. New name of the three (3) factors are:

- Factor 1: General perception amongst oil palm nursery operators towards CoPN

Table 4: Multiple criteria for factors to be extracted

Component Number	Initial Eigenvalue	Cumulative % Variance Explained	Decision
1	4.773	31.821	Accept to Extract
2	3.136	52.729	Accept to Extract
3	2.395	68.695	Accept to Extract

- Factor 2: Satisfaction amongst oil palm nursery operators towards MPOB as certification body
- Factor 3: Level of satisfaction amongst oil palm nursery operators towards CoPN's procedures

Table 5 shows the rotated factor matrix for the questionnaire. Following Tabachnick and Fidell (2001), variables with factor loadings of more than 0.45 were chosen in this study because loadings equal to 0.45 are considered average, whereas loadings 0.32 are considered less good. The factor loading was explained as follows:

(i) C1: CoPN was a good certification for oil palm nurseries

(ii) C2: CoPN was easy to understand and practical to the oil palm nursery operators

(iii) C3: CoPN goals were clearly understood

(iv) C4: CoPN was able to improve knowledge about nursery management

(v) C5: CoPN helped nursery operators manage nurseries more effectively

(vi) C6: CoPN improved the quality of oil palm seedlings

(vii) C7: CoPN reduced the abnormality rates in oil palm seedlings

(viii) C8: CoPN improved prospect of demand for oil palm seedlings

(ix) C9: MPOB officers had provided information on CoPN to oil palm nursery operators

(x) C10: MPOB officers provided information on the development of certification of CoPN to oil palm nursery operators

Table 5: Factor loadings associated with the acceptance level of CoPN factors and reliability analysis

	Component		
	1 General perception amongst oil palm nursery operators towards CoPN	2 Satisfaction amongst oil palm nursery operators towards MPOB as certification body	3 Level of satisfaction amongst oil palm nursery operators towards CoPN's Procedures
C1	0.739		
C2	0.549		
C3	0.698		
C4	0.737		
C5	0.828		
C6	0.812		
C7	0.727		
C8	0.726		
	Cronbach's alpha = 0.934		
C9		0.812	
C10		0.857	
C11		0.771	
		Cronbach's alpha = 0.898	
C12			0.758
C13			0.761
C14			0.799
C15			0.672
			Cronbach's alpha = 0.756

(xi) C11: Time frame for obtaining CoPN certificate was appropriate

(xii) C12: Complication level involving procedures for obtaining CoPN certificates

(xiii) C13: The effectiveness of CoPN is still in doubt

(xiv) C14: Negative information as a deterrent for CoPN application

(xv) C15: High application fees for CoPN is burdensome

Based on the pattern of indicators grouping, general perception amongst oil palm nursery operators towards CoPN, satisfaction amongst oil palm nursery operators towards MPOB as certification body and level of satisfaction amongst oil palm nursery operators towards CoPN's Procedures were treated as three components. After performing Varimax Rotation Method with Kaiser Normalization, the loading values for each indicator of the general perception amongst oil palm nursery operators towards CoPN comprised eight (8) items (C1, C2, C3, C4, C5, C6, C7, C8) with factor loadings ranging from 0.549 to 0.828. It shows the highest loading (0.828) was C5 (CoPN helped nursery operators manage nurseries more effectively) and the lowest loading (0.549) was C2 (CoPN was easy to understand and practical to the oil palm nursery operators).

The item's description of satisfaction amongst the oil palm nursery operators towards MPOB as a certification body comprised three items (C9, C10 and C11) with loadings ranging from 0.771 to 0.857. The results show the highest loading (0.857) was C9. MPOB officers had provided information on CoPN to oil palm nursery operators and the lowest loading value (0.771) was C11 (Time frame for obtaining CoPN certificate was appropriate).

Meanwhile, the loading values for the level of satisfaction amongst the oil palm nursery operators towards CoPN's procedures comprised four items with factor loadings ranging from 0.672 to 0.799. It shows the highest loading value (0.799) was C14 (Negative information as a deterrent for CoPN application) and the lowest value (0.672) was C15 (High application fees for CoPN is burdensome).

In terms of reliability of the grouped indicators, Cronbach's alpha reliability analysis results of general perception amongst oil palm nursery operators towards CoPN (0.934), satisfaction amongst oil palm nursery operators towards MPOB as certification body (0.898) and level of satisfaction amongst oil palm nursery operators towards CoPN's Procedures (0.756) indicate that all indicators for the three groups meet the minimum cut-off value of 0.70. Hence, it can be concluded that, all the indicators were valid and consistently evaluating the variables. Therefore, after performing the factor analysis, this study proceeds with binary logistic regression analysis to examine the factors influencing the level of acceptance of CoPN amongst oil palm nursery operators.

Binary Logistic Regression Analysis

The dependent variable was the indication of whether the oil palm nursery operators possess CoPN certificate or otherwise. The oil palm nursery operators who possess CoPN certificate was coded as 1 while those who do not possess CoPN certificate was coded as 0. The independent variables were the three factors derived from the factor analysis which were (i) general perception amongst oil palm nursery operators towards CoPN, (ii) satisfaction amongst oil palm nursery operators towards MPOB as a certification body and (iii) level of satisfaction amongst oil palm nursery operators towards CoPN's procedures.

Table 6 shows the cross tabulation of the predicted response categories with observed (actual) response categories. The classification accuracy rate computed by SPSS was 80.5% which was more than the benchmark of 25% above the proportional by chance accuracy criteria of 65.0%. Thus, it suggests that the independent variables could be categorised as useful predictors in distinguishing survey respondents who possess the CoPN certificate from respondents who do not possess the CoPN certificate.

Table 6: Classification accuracy rate

Observed		Predicted		
		CoPN		Percentage Correct
		No	Yes	
CoPN	No	31	18	63.3
	Yes	6	68	91.9
Overall Percentage				80.5

Table 7 shows the summary of test statistics for logistic regression. Based on the result, the statistically significant chi-square for the omnibus test of model coefficients suggests that collectively, the explanatory variables included in this analysis are useful predictors for distinguishing between whether the oil palm nursery operators possess CoPN certificate or not. The chi-square value is 60.655 with 3 degrees of freedom with corresponding small significance *p-value* less than 0.000. This led to the conclusion that the model is significant.

Table 7: Summary of test statistics for logistic regression

Tests	Statistics
Omnibus (p-value)	60.655 (0.000)
-2Loglikelihood,	104.743
R-square	0.389
Hosmer and Lemeshow (p-value)	9.454 (0.305)

The value of Cox & Snell Pseudo R-Square provides the indication of the amount of variation in the outcome variable which is explained by the model. Thus, the higher the R-square value, the better the model is. With the pseudo- R-square of 0.389, the variation in the oil palm nursery operators who possess CoPN certificate was sufficiently explained by the general perception amongst oil palm nursery operators towards CoPN, satisfaction amongst oil palm nursery operators towards MPOB as a certification body and the level of satisfaction amongst the oil palm nursery operators towards CoPN's procedures.

To strengthen the above argument, Hosmer and Lemeshow Test was conducted to test the fitness of the model. The test indicates that the model is a fit, since the p-value is greater than 0.05 (p-value = 0.305), therefore the logistic regression model fits the data well.

From Table 8, the general perception amongst oil palm nursery operators towards CoPN and satisfaction amongst oil palm nursery operators towards MPOB as a certification body shows a significant contribution to the probability of oil palm nursery operators to possess the CoPN certificate, while the level of satisfaction amongst oil palm nursery operators towards CoPN's procedures is found not to have significant contribution towards the possession of the CoPN amongst nursery operators. This result is consistent with the finding of the descriptive analysis that shows respondents have a high degree of agreement that CoPN would improve their quality of agricultural practices besides having a high regard towards MPOB as a certification body for CoPN. Meanwhile, from the descriptive statistics it is found that nursery operators are having mixed perceptions towards CoPN's procedures in which they are satisfied with the fee and are not influenced by the negative propaganda towards CoPN. However, they perceive CoPN procedure as complicated and are not convinced that CoPN is effective in improving their business. These mixed perceptions could possibly contribute to its insignificance as a factor on the level of satisfaction amongst oil palm nursery operators towards CoPN's procedures.

Table 8: Summary of logistic regression results and odds ratio

		B	S.E.	Wald	Df	Sig.	Exp(B)
Step 1[a]	General perception amongst oil palm nursery operators towards CoPN	1.761	0.749	5.530	1	0.019	5.817
	Satisfaction amongst oil palm nursery operators towards MPOB as certification body	2.291	0.705	10.544	1	0.001	9.882
	Constant	-15.773	3.200	24.300	1	0.000	0.000

a. Variable(s) entered in step 1: General perception amongst oil palm nursery operators towards CoPN, Satisfaction amongst oil palm nursery operators towards MPOB as certification body

The final model regression equation was:

$$\text{Log}\left[\frac{\pi_t}{(1-\pi_t)}\right] = \beta_\circ + \beta_1 X_1 + \beta_2 X_2$$

$$\text{Log}\left[\frac{\pi_t}{(1-\pi_t)}\right] = -15.773 + 1.761 X_1 + 2.291 X_2$$

Where,

$\pi = P(\pi(y)= 1)$ = Probability of oil palm nursery possess CoPN certificate

β_0 = Intercept

β_1 = Coefficient of factor general perception amongst oil palm nursery operators towards CoPN

β_2 = Coefficient of factor satisfaction amongst oil palm nursery operators towards MPOB as certification body

X_1 = Factor general perception amongst oil palm nursery operators towards CoPN

X_2 = Factor satisfaction amongst oil palm nursery operators towards MPOB as certification body

Exp (B) for the general perception amongst oil palm nursery operators towards CoPN is 5.817 and Exp (B) for the satisfaction amongst oil palm nursery operators towards MPOB as certification body is 9.882. The model indicates that for every one-unit scale increase in the general perception amongst the oil palm nursery operators towards CoPN and satisfaction amongst oil palm nursery operators towards MPOB as a certification body, the likelihood of oil palm nursery operators to possess the CoPN certificate increases by 58.2% and 98.8% respectively.

Conclusion and Recommendations

This study focused mainly on factors influencing the level of acceptance of CoPN amongst oil palm nursery operators in Malaysia. This study found that the perception towards CoPN certificate can be classified into three (3) factors, namely (i) General perception amongst oil palm nursery operators towards CoPN, (ii) Satisfaction amongst oil palm nursery operators towards MPOB as a certification body and (iii) Level of satisfaction amongst oil palm nursery operators towards CoPN's procedures. The Logistic Regression Analysis indicates that factors influencing the level of acceptance of CoPN amongst oil palm nursery operators were general perception amongst oil palm nursery operators towards CoPN and satisfaction amongst oil palm nursery operators towards MPOB as a certification body. Thus, it can be concluded that oil palm nursery operators have a good perception towards the goal of CoPN,

the practicality of its requirements and its ability to improve knowledge on nursery management. Besides that, the role of MPOB as a certification body was satisfactory, especially those related to the dissemination of information and the development of CoPN as well as the time frame for obtaining CoPN certificates. Even though the perception towards CoPN amongst nursery operators is good, the number of oil palm nursery certified under CoPN is still low potentially due to the low satisfaction on the procedures for obtaining CoPN certificates which are perceived as complicated. In addition, nursery operators are found to be comfortable with their way of managing the nursery which makes them reluctant to follow standard operating procedures under CoPN as they doubt on the effectiveness of CoPN in improving their business. Therefore, it is important for MPOB to simplify and improve the procedure of obtaining CoPN certificate as well as to shift their paradigm towards how CoPN could not only improve the nursery practices but also could benefit their business at large.

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