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Original Research Article

Relationship of Location, Infrastructure, and Transportation of Productive Malaysia Cocoa Farmers (PMCF) towards Work Performance in Sarawak, Malaysia

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Abstract: Malaysian cocoa production has relied on cocoa farmers since 2006 because they were the primary holders (81.4%) of the cocoa cultivation area. As for Sarawak, 100% of cocoa production was from cocoa farmers. Sarawak used to produce 21,200 metric tons of dried cocoa beans in 1990. The government also has spent more on training and fertilizer for cocoa farmers to increase PMCF productivity. However, the production keeps gradually decreasing yearly. In 2021, Sarawak only produced 59 metric tons of dried cocoa beans, and the productivity decreased by 10% to 0.19 metric/ton/ha/year compared to 2019 productivity. Driven by the Iceberg Model, the objectives of this preliminary study are to determine i) the location, infrastructure and transportation towards work performance levels, ii) the relationship between location, infrastructure and transportation with work performances, iii) the most important factors (IVs) that influence more toward work performances. A total of 35 respondents were involved in this purposive data collection, which is only 30% of the sample population of the preliminary study, which was 105 PMCF. The sampling strategy employed a random sample technique. These 35 respondents were selected, involving 3.6% of respondents for each zone population of Sarawak rural areas, namely the Northern, Middle, and Southern Coastal Zone. The data was processed using IBM SPSS version 25.0. The data were tested by employing Exploratory Factor Analysis (EFA), and subsequent analysis was performed utilizing descriptive, correlation, and regression techniques to address the study's objectives. The study found that all the variables showed moderate-level indicators. The variables that showed moderate and positive correlation were location and infrastructure. In contrast, location is the most significant contributing factor to PMCF's work performance in Sarawak.

Keywords: Work performance; location; infrastructure; transportation; cocoa

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1. Introduction

One of the essential global cash crops, especially for developing countries, and one of the major commodities for some developed countries is cocoa. Cocoa was brought for commercial planting in Malaysia in 1950 (Azhar & Lee, 2004; MCB, 2022). In Malaysia, cocoa is the third commodity crop. During the period below 2000, Malaysia produced around 247,000 tons in 1990. Unfortunately, the production started to decline drastically in 2011, which only went up to 10,000 metric tons; the production was only 4,605 metric tons. The Malaysian national yield in cocoa increased from 0.79 t/ha in 2004 to 1.3 t/ha in 2008 (Mohd Yusof *et al.*, 1998). However, productivity was also weakening, as Sulaiman et al.'s (2022) evaluation showed that just 0.19 t/ha of cocoa was produced in 2021.

In Sarawak, the development of cocoa cultivation and extension activities was implemented by the Department of Agriculture (DOA), researched by MARDI and marketed by FAMA up to 1997. However, under the Act of Parliament 343 (1998; 2021), all activities from upstream to downstream of the cocoa industry were under one roof of the respective agency, namely the Malaysian Cocoa Board (MCB). Therefore, MCB started monitoring all the cocoa industry activities, including the smallholders' development program. MCB has taken care of cocoa plantations in Sarawak since 1989.

Sarawak used to produce 21,200 metric tons of dried cocoa beans in 1990, and then it started to decrease gradually to 4,498 metric tons (1998), 1,413 metric tons (2008), and 151 metric tons (2018). Knowing the potential of cocoa development in a new area in Sarawak, the government has provided the budget for cocoa development regarding agricultural aid and training. Unfortunately, Sarawak cocoa production continuously decreased in 2021, which was only 59 metric tons. Surprisingly, the use of cocoa products, namely dried cocoa beans, cocoa powder and cocoa butter, in Sarawak keeps increasing, contributing RM53 million to Sarawak's revenue (DOS, 2016). Therefore, Sarawak still has much potential to explore in the cocoa industry. That is why the government via MCB implemented their game changer strategy in the 11th and 12th Malaysian Plan in Sarawak via Cocoa Cluster Development Program (MCB, 2016) with three significant scopes in Sarawak namely the development of Sarawak Cocoa Cluster Complex (SARA CC), Sarawak Commodity Agro-tourism and Sarawak Cocoa Cluster Cooperative (MCB, 2016) in order to strengthen and sustain the cocoa industry in Sarawak.

Therefore, there is an urgent need to determine the factors contributing to Sarawak PMCF work performance that will also affect the performance of the Sarawak cocoa industry. In line with the need, a preliminary study must be done before the actual data collection to get a valid and reliable study output. These articles, however, merely addressed the logistical factors of location, infrastructure, and transportation. Due to that, the objectives of this pilot study are to determine i) the location, infrastructure, transportation and work performance level, ii) the relationship between location, infrastructure and transportation with work performances of Sarawak PMCF, iii) the most factors (IVs) that influence toward work performances of Sarawak PMCF.

1.1. Literature Review

Cocoa farmers worldwide play a significant role in the global cocoa chain. This is because cocoa farmers contribute to the raw material sources for the cocoa industry supply chain. Cocoa farmers are also directly involved in ensuring the sustainability of raw cocoa material sources in quantity and quality (Anindita *et al.*, 2018). To enhance the roles of cocoa farmers in production and quality, they receive technical advisory services on cocoa crops and farm management based on the standard accreditation known as the Good Agriculture Practice (GAP) standard (Saputra *et al.*, 2019).

Several factors influence PMCF work performance, including location (Indah et al., 2021), infrastructure (Lass, 1985), and transportation (Chong & Tan, 1994). Usually, the location of the farms is far from the farmer's house, and this requires them to take time to travel to their farms. Besides, the location issue arises as the logistics struggle to bring out the yield. A good location helps the farmers do their farm routine efficiently (Indah *et al.*, 2021). For the infrastructure, usually, there is only basic infrastructure ready for the farms, and this becomes one of the reasons that can influence the PMCF work performance as they need to use an excellent infrastructure to ensure their daily routine on the farm is smoothly handled and thus give a high level of efficiency and productivity. According to Chen *et al.* (2021), farm workers' satisfaction, especially with the infrastructure, will lead to excellent work performance. This is because the farmers can do their daily routine smoothly with easy access to a good infrastructure. Infrastructure is also essential for the farmers to harvest their produce (Hidayatullah & Hii, 2000). Inadequate infrastructure will lead to low work performance among the farmers.

The delivery of agricultural products, either semi-product or end product, depends on various factors such as availability and types of transportation accommodation, environmental protection in regulatory regulation, delivery services to customers, and product quality and productivity (Zielinski, 2007). Transportation is also one of the factors that influence work performance. According to Chai (2014), Chai and Zhou (2014),

transportation transfers the yield to the station and brings the farmers and workers to the farms. According to Rajabion (2019), transportation is one of the factors that can influence the farmers' work performance. This is because the farmers usually use transportation to transfer their fresh produce to ensure high-quality production.

In order to modernize the agriculture business, the world is transitioning to Industrial Revolution 4.0, which requires strong logistics in terms of location, infrastructure and transportation. However, most Sarawak PMCFs are in rural areas that lack infrastructure in terms of poor telecommunication, road, and transportation accessibility, which are very important for the cocoa supply chain, starting from the farm to the end user. As there was a scanty study of the work performance of cocoa farmers in Sarawak, this preliminary study aims to determine the relationship between location, infrastructure, and transportation towards Sarawak PMCF's work performance framework, as shown in Figure 1.

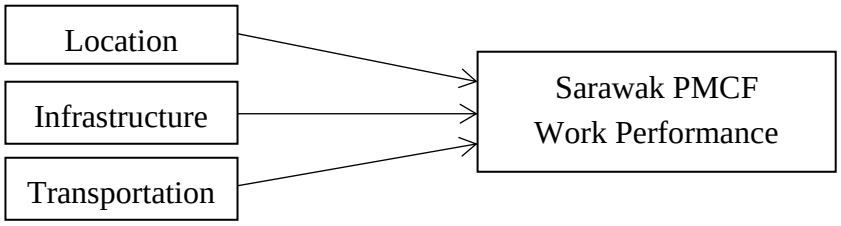

Figure 1. A Framework of the Preliminary Study on the Relationship between Location, Infrastructure and Transportation of Productive Malaysia Cocoa Farmers (PMCF) Towards Work Performance in Sarawak, Malaysia

2. Materials and Methods

2.1. Instrument Development

The instrument was adapted, adopted, developed from the previous study, and transformed into the Bahasa Malaysia language. A structured questionnaire that consists of close-ended and open-ended questions was constructed. The questionnaire used for this study comprised seven sections (Sections A, B, C, D, E, F, and G). Section A contained information on respondents' profiles, followed by Section B, which consisted of questions on respondents' cocoa farm profiles. Sections C and D are about evaluation that focused on the respondents' personality traits and evaluation that focused on farmers' knowledge of matured cocoa technologies. Section E consisted of an evaluation of logistics in farmers’ cocoa farms. The last section, Section F, consisted of an evaluation that focused on the work performance of farmers. For this study, the data were extracted from Section F.

The instrument has been validated by face-to-face validation from the committee for the content and structure of the item, expertise validation for the technical terms from the respective agencies, extension expert validation for the simple word chosen and also face-to-

face from the expert in extension education in terms of content, structured and instrument layout. The pre-test also has been done. The questionnaire was also prepared and arranged correctly to avoid the respondents' misunderstanding and confusion while answering it. The questionnaire was designed with relevant questions, which enabled data collection and information needed to achieve this pilot study's objectives.

2.2. Method

The actual preliminary study was done randomly for selected 105 respondents for PMCF in Malaysia (Sulaiman et al., 2022), which are thirty-five for each region, namely Sarawak (35), Sabah (35) and Peninsular Malaysia (35). This article's data has been extracted from the pilot study data for Productive Malaysian Cocoa Farmers (PMCF) and narrowed down to purposive sampling in Sarawak as a context, only focusing on logistic variables instead of the original four variables. The random sampling respondents involving thirty-five (35) PMCF are from rural areas of Sarawak in the Northern, Middle and Southern Coastal Zone, as shown in Figure 2. The distribution for each sample was 3.6 % of respondents from each zone population. The preliminary study was conducted face-to-face in order to collect the data.

Reliability analysis using Cronbach's Alpha was also carried out for each scale in this study. Four (4) types of analysis were used to analyse the data for this study, including Descriptive, Correlation and Multiple Regression analysis. Statistical Package for the Social Sciences (SPSS) 25.0 version analyses were used to perform these three analyses.

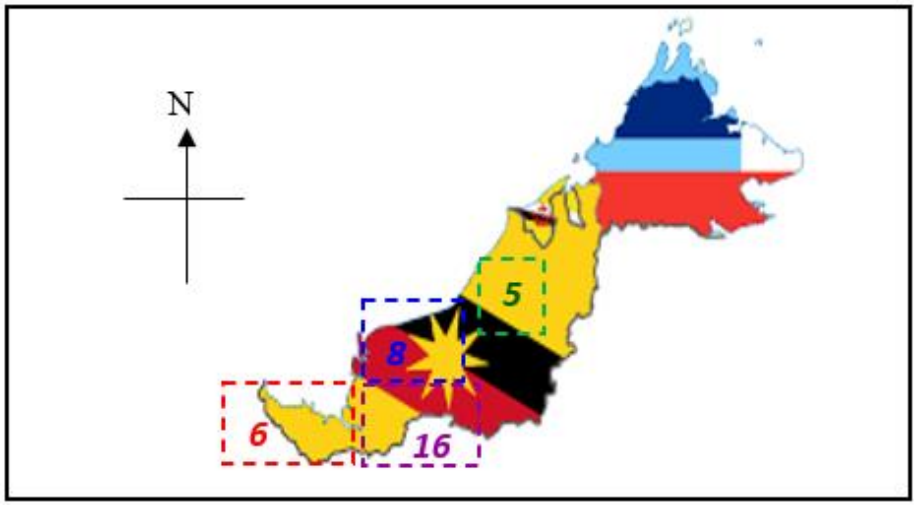

Figure 2. Location tabulation of sampling

3. Results

This section presents the pilot study findings based on the pilot study objectives.

3.1. Demographic and Farm Profile

Descriptive analysis is used to show the frequencies of demographic and farm profiles of the Sarawak PMCF from this pilot study, as shown in Table 1. The results of the descriptive analysis revealed that 68.6% of the respondents were from the Southern Zone in Sarawak, which is from the Padawan, Serian and Samarahan areas. Most respondents were from ageing PMCF categories of 97.1%, only 2.9% were youth farmers, and 51.6% were full-time cocoa Sarawak PMCF. Their farm distance from their home also revealed that 85.7% were only below 30 kilometres away. This study also revealed that 88.6% of Sarawak PMCF has Telco communication accommodation. Most of them have various types of roads to their cocoa farm, where 48.6% have to go through tar roads, 28.6% gravel roads, 37.1% soil roads, 37.1% hilly roads and 8.6% rivers. From the result, we can see that the average frequency of extension agent visits was once in 3-4 months, which was 54.3%. Surprisingly, the result also revealed that 8.6% of Sarawak PMCF never met the extension agent almost a year until the pilot study. This pilot study also revealed that 51.4% of Sarawak PMCF earned more than RM 1,000 monthly, while 48.6% earned income below RM 1,000 from cocoa crops.

Table 1. Demographic and Farm Profile Frequencies

Variables	**Frequency (*n* = 35)**	**Percentage (%)**
Zones		
Southern	24	68.6
Inland	6	17.1
Middle	5	14.3
Northern	-	-
Age		
< 41 (youth farmers)	1	2.9
>41 (ageing farmers)	34	97.1
Focus of Work		
Full-time farmers	17	48.6
Part-time farmers	18	51.4
Farm distance from home (kilometres)		
<10	10	28.6
≥10 < 20	11	31.4
≥ 20 < 30	9	25.7
≥ 30	5	14.3
Monthly Income		
< RM1,000	17	48.6
> RM1,000	18	51.4

Variables	Frequency (*n* = 35)	Percentage (%)
Communication Access		
Yes	31	88.6
No	4	11.4
Road Infrastructure to the Farm		
Tar	17	48.6
Gravel	10	28.6
Topsoil	13	37.1
Hilly	13	37.1
River	3	8.6
Average Frequency Extension Agent Visit		
Every week		
Every month	1	2.9
3-4 month	12	34.3
Six month	19	54.3
One year	-	-
Never in a year	-	-
	3	8.6

3.2. Reliability Test

The reliability test for this instrument was run for the whole pilot study data, which involved 105 PMCF respondents and Sarawak PMCF respondents. From the analysis result, Cronbach's Alpha coefficient revealed that the value for all variables except transportation was more than 0.7. In a previous study by Sulaiman (2022), the result for the Cronbach's Alpha value for the Malaysia PMCF pilot study revealed that work performance = 0.778, location = 0.898, and infrastructure = 0.919. However, The Cronbach's Alpha coefficient results for transportation = 0.679. For the Sarawak PMCF pilot study, the result of Cronbach's Alfa was work performance = 0.778, location = 0.898 and infrastructure = 0.919. The results of reliability statistics analysis for this study instrument and this article are presented in Table 2 below.

Table 2. Cronbach's Alpha for Preliminary Study Data Collection

Variables	Cronbach's Alfa *(n=105)*	KMO *(n=105)*	Cronbach's Alfa *(n=35)*	KMO
Work performance	0.804	0.727	0.778	0.496
Location	0.872	0.833	0.898	0.771
Infrastructure	0.896	0.837	0.919	0.732
Transportation	0.579	0.523	0.679	0.530

3.2. Descriptive Analysis for Variables Level

From descriptive analysis, three levels are used to indicate the level of independent and dependent variables. As shown in Table 3, the descriptive analysis of this study found that all the variables showed moderate-level indicators. The results showed that one level (moderate) is revealed in Location (Mean±SD = 4.331±.639), Infrastructure (Mean±SD = 3.921±.622) and Transportation (Mean±SD =3.559±.674). The moderate level (Mean±SD =3.109±.519) was also found in PMCF works performances. Three levels were used as indicators: low for values between range 1-2.699, moderate for values between range 2.67-4.339, and high for values between range 4.34-6.00.

Table 3. Level of work performance, location, infrastructure and transportation

Variables	Mean	Standard Deviation	Levels
Work performance	3.109	0.519	Moderate
Location	4.331	0.639	Moderate
Infrastructure	3.921	0.622	Moderate
Transportation	3.559	0.674	Moderate

3.3. Correlation Analysis for Relationship Between Independent and Dependent Variable

The result of relationships between independent variables, namely Location, Infrastructure, and Transportation, with the dependent variable, namely Work Performance among Sarawak PMCF, was produced after conducting correlation analysis, shown in Table 5. The results of correlation analysis revealed moderate and negligible positive relationships between all the variables or sub-variables and PMCF work performance. Work performance was moderately positively related to all the variables: Location (r=0.654, p=0.000) and infrastructure (r=0.524, p=0.000). Based on the results shown in Table 4 and Rule of Thumb by Mukaka (2012) in Table 3, the variables that had a strong relationship with the work performance are Location due to the value of Pearson's r being close to 1.

Table 4. Rule of thumb for interpreting the size of correlation

Size of correlation	Correlation relationship level
0.90 to 1.00 / (-0.90 to -1.00)	Very high positive (negative) correlation
0.70 to 0.90 / (-0.70 to -0.90)	High positive (negative) correlation
0.50 to 0.70 / (-0.50 to -0.70)	Moderate positive (negative) correlation
0.30 to 0.50 / (-0.30 to -0.50)	Low positive (negative) correlation
0.00 to 0.30 / (-0.00 to -0.30)	Negligible positive (negative) correlation

Source: Mukaka (2012)

Table 5. Correlation analysis

	X_1	X_2	X_3	**Y**	**Level**
X_1	1	0.687**	0.101	**0.654****	Moderate positive correlation
X_2		1	0.290	**0.524****	Moderate positive correlation
X_3			1	**0.283**	Negligible positive correlation
Y				**1**	

** Correlation is significant at the 0.01 level (2-tailed).

X_1=Location, X_2=Infrastructure, X_3=Transportation, Y=Work Performance

3.4. Regression Analysis

As shown in Table 6, multiple regression analysis produced the value of *R*=0.691. This R-value indicated a strong relationship. The finding also found that *R* Square = 0.477. From the B value, the result revealed that only one variable contributed significantly to Sarawak PMCF work performance, namely location, as their $p<0.05$. The location also has the highest Beta value=0.484.

Table 6. Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate	df	F
.691[a]	0.477	0.426	0.39324	31	9.417

Table 7. Estimated coefficient for work performance model

	Unstandardized Coefficients		t	Sig.
	B	Std. Error		
(Constant)	0.267	0.560	0.477	0.637
Location	0.484	0.147	3.299	0.002
Infrastructure	0.045	0.157	0.288	0.775
Transportation	0.160	0.106	1.511	0.141

4. Discussions

4.1. Reliability Test

For this study, a reliability test was done using Cronbach's Alfa and KMO test, as shown in Table 1. As shown in Table 1, all the variables showed better data in the reliability test by Cronbach's Alfa, which means the entire item was good to proceed with. However, the data from the KMO test has shown that the result is miserable for item transportation and work performance. Therefore, some items must be deleted, especially those shown below the .50 value. As a result, for 105 respondents KMO's was >0.7, the actual data collection can

be proceeded by maintaining the item that has the KMO's value >0.7 even though KMO's result for Sarawak PMCF work performance (n=35, KMO=0.496). However, the items need to be reviewed since both results for KMO's transportation variable (n=105 and n=35) are < 0.7.

4.2. Descriptive Analysis

Sulaiman *et al.* (2022) found in their study about Youth PMCF in Malaysia that the level of location, infrastructure, transportation and work performance were moderate. This finding supported this study, in which the independent variables, namely location, infrastructure and transportation, also indicate a moderate level of Sarawak PMCF work performance. Other than that, the study by Descriptive analysis showed that the majority of farmers used human porterage as a means of transport to move their agricultural produce from farm to home. In addition, findings showed that ownership of intermediate means of transport influenced agricultural productivity.

4.3. Correlation Analysis

4.3.1. Relationship between Location and Sarawak PMCF work performance

Adequate logistics in terms of infrastructure accommodation play a significant role in providing easy access for an extension agent in order to transfer the technologies to the target group, which is farmers which can contribute to the community development (Asayehegn *et al.*, 2012; Mwangi & Kariuki, 2015). Similar to a previous study finding in other agricultural work performance research from other countries and by Sulaiman et al. (2022), this study finding also revealed that location has a moderate and positive relationship with Sarawak PMCF work performance.

4.3.2. Relationship between Infrastructure and Sarawak PMCF work performance

Referring to Table 4, the relationship between infrastructure and Sarawak PMCF work performance indicates moderate and positive levels (r=0.524; p<.01), contradicting with Youth PMCF results in a previous study (r=.816, p=.000) which revealed solid and positive correlation (Sulaiman *et al.*, 2022). This finding is supported by a study by Fadzim *et al.* (2016; 2017), which showed that to change the attitude of smallholders in Hilir Perak that can contribute to increasing their cocoa firms, conducive conditions for training must be provided. Edeme *et al.* (2020) revealed that their study in African countries found that the selected form of infrastructure, such as transport infrastructure, which is road, information and communication technology availability and utilities like electricity, has a close relationship with farm productivity.

4.3.3. Relationship between Transportation and Sarawak PMCF work performance

Ajiboye (2014) and Iderawumi *et al.* (2021) reported that a transportation type is the method farmers use to carry their cocoa farm yield to the market and vice versa. Directly, the availability of transportation can enhance the farmer's quality of life and link the market, creating a market for agricultural produce and contributing to the efficiency and profitability of farms. Other than that, transportation can also help farmers explore other facilities than not in their area by moving to the nearest village or town with unavailable facilities due to geographical issues. Undoubtedly, most places suddenly had transportation access, becoming a new area for economic development for the local community. This scenario indirectly pushed the farmers to work harder to produce their farm products or semi-finished products as their sources of income. Therefore, waste management in terms of time, farm, and mobility waste can be reduced indirectly, and quality improvement has been achieved. This indirectly brings to the changing of their social quality of life. Surprisingly, Edeme *et al.*'s (2020) study revealed that transport was negatively related to agricultural performance, contradicting his previous finding. However, this study finding revealed that the relationship between transportation and Sarawak PMCF was revealed as a negligible positive relationship (r=0.283, p<.01), which contradicted the Youth PMCF finding in Sulaiman *et al*. (2022) previous article, which was a strong and positive correlation (r=.705, p=.000). This study finding also supported by MCB's report (2016) and Sarawak Cocoa Plant Economic Analysis Report (2019).

4.4. Regression Analysis

The result showed that the Regression analysis model is a relatively good predictor for the outcome. One predictor explains about 47.1% of the variation in PMCF's work performances as the Adj. R Square value was 0.477. The regression analysis results of this pilot study revealed that the model was a significant predictor of Sarawak PMCF Work Performance, F (3,31)=9.417, p=0.000. While only location variables contributed significantly to the model (B=0.484, p=0.002), Infrastructure and Transportation did not, which are (B=0.045, p=0.775) and (B=0.160, p=0.141).

The equation model for the regression model is:

$$Y=a+bX1+bX2\ldots\ldots+e \quad (1)$$

Where;
Y=Work Performance
X_1 = Location
X_2=Infrastructure
X_3=Transportation

Therefore, this finding was:

$$\text{Work Performance} = 26.7 + (.484\ \text{location}) + (.0045\ \text{Infrastructure}) + (0.160\ \text{Transportation}) \quad (2)$$

In line with past findings, results from Tamene and Megento (2017) revealed that distance to market was one of the essential factors that influenced the agricultural productivity of smallholder farmers. This is because the distance means how far they can reach the market, how far they can reach the nearest road, and how far or how easy they can visit the nearest town for any supply chain of their farm activities. However, this distance also became more practical if the road infrastructure was in good condition, making the journey distance not too tricky. Besides that, the distance also becomes worth it if the needed infrastructure and facilities can work well and be accessed (Tamene & Megento, 2017). Asayehegn *et al.* (2012) also support this finding that the lack of infrastructure also contributes to the effectiveness of extension agent work performance, which can affect the farmers' work performance. They also mentioned that the availability of suitable and practical transportation also really needs to contribute to all the distance and infrastructure. There is no point if the distance is near, the road access is good, but there are no vehicles, either personal or public transportation provided.

Contradicting this study's finding, Nnadi *et al.* (2012) and Tamene and Megento (2017) found that transportation contributes to the extension agent work performance and farm productivity, which is not similar to this finding. Tamene and Megento (2017) found that access to rural areas in Horro Guduru Wollega Zone, Western Ethiopia, affects farmers farm productivity.

However, the study on Youth PMCF also revealed that only the location variable has a significant influence on work performance (B=-0.424, p=.019), with a significant level of p<0.05 (Sulaiman *et al.*, 2022). For this study, the significance level of location influence on work performance of Sarawak PMCF was revealed (B=0.484, p=0.002), which was slightly higher.

5. Conclusions

In conclusion, this preliminary study in Sarawak revealed that all variables, namely work performance, location, and infrastructure, indicate moderate levels. A significant moderate positive correlation existed between location and infrastructure variables with the Sarawak PMCF's work performance. However, only the location significantly contributes to Sarawak PMCF's work performance. This study also suggests that future studies with a similar framework must be done on another region for comparison. This is because we already found that different results were produced with different settings of respondent context. The agencies must investigate the factors influencing their target group work performance to plan the narrative planning specific to the targeted area and groups.

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Conflicts of Interest: The authors declare there is no conflict of interest.

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