

Social Media Usage and Social Capital as Determinants of Oil Palm Integration Practices Among Smallholders in East Malaysia

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ABSTRACT

Social media plays an increasingly important role in expanding social networks, which may influence the development of social capital among rural communities. This study investigates the relationship between social capital, social media usage, and the adoption of integration practices among oil palm smallholders in East Malaysia. A survey of 194 smallholders revealed that those with higher education levels had significantly higher bonding social capital ($p < 0.05$). Additionally, smallholders who had used WhatsApp for five years or more exhibited significantly higher levels of both bonding and bridging social capital ($p < 0.05$). The study found a significant association between bridging social capital and integration practices, particularly non-agricultural activities, but no significant link with bonding social capital. Logistic regression showed that smallholders with higher bridging social capital were more likely to engage in non-agricultural integration practices (OR = 5.64, 95% CI = 2.30–13.83, $p < 0.001$). These findings suggest that targeted efforts to enhance social media literacy could strengthen social capital and diversify the economic activities of smallholders. Expanding future research to cover a broader geographical area with varying internet accessibility is recommended.

Keywords: agricultural integration, oil palm smallholders, social capital, social media, Sarawak

INTRODUCTION

The internet and social media have significantly transformed global communication, connecting individuals worldwide, including those in rural and remote areas. Smartphones remain crucial in bridging the digital divide, facilitating widespread use across both younger and older generations [1]. As of 2024, there are approximately 5.45 billion internet users globally, representing 67.1% of the world's population. Social media users now total 5.17 billion, accounting for 63.7% of the global population [2]. In Malaysia, social media penetration has reached 83.1% of the population, reflecting high adoption rates for platforms such as WhatsApp (90.7%), Facebook (84.9%), and Instagram (77.0%) [3]. The COVID-19 pandemic accelerated this trend, and social media penetration continues to rise. Malaysians spend an average of over six hours per day on the internet, further emphasizing the importance of digital platforms in everyday life [4].

Malaysia is the world's second-largest palm oil producer after Indonesia, contributing to over 80% of global palm oil production. Approximately 77% of Malaysia's agricultural land, or 15% of its total land area, is dedicated to oil palm plantations, covering about 5.85 million hectares. Oil palm cultivation was introduced in rural areas as a poverty reduction measure. Malaysia has around 650,000 oil palm smallholders, accounting for 16.7% of the country's oil palm plantation area [5]. These oil palm smallholders often face challenges, such as volatile commodity prices and difficulty maintaining their plantations. The Malaysian government is aware of the threats most oil palm smallholders face. Diversification of income sources through agricultural integration is considered one of the most effective ways to reduce income uncertainty, particularly among the poor [6]. Agricultural integration involves combining different crops, livestock, or both within a farming system. In this study, oil palm integration refers to the practice of combining oil palm cultivation with other agricultural or non-agricultural economic activities, such as retail businesses and food stalls [7] [8] [9].

Agricultural integration continues to show significant potential for improving both the yields and incomes of oil palm smallholders. By diversifying their activities, smallholders can mitigate risks associated with volatile global palm oil prices and stabilize their agricultural and economic activities [6]. A recent study highlights the effectiveness of integrating livestock, such as cattle, with oil palm plantations, which not only diversifies income but also improves farm sustainability [10]. Moreover, oil palm smallholders are increasingly engaging in non-agricultural activities such as retail and handicrafts to further stabilize income streams [11]. These integrated practices act as a buffer during periods of low palm oil prices or when environmental challenges such as floods and droughts reduce yields. Oil palm integration has yielded significant benefits for smallholders, as evidenced by a study by Zaimah [9], which reported increased income among smallholders in Johor and Sabah following oil palm integration practices.

Effective social networks, or social capital, are crucial in improving the success of agricultural integration among smallholders [12] [13]. Social networks enable smallholders to access information, share experiences, and interact more efficiently with agricultural development officers, enhancing their adoption of new farming techniques and business strategies. These

networks foster innovation and help smallholders create new business opportunities, especially through the exchange of information on market access and improved agricultural practices. However, rural farmers, particularly those in remote areas, face challenges in building such networks due to geographic isolation and limited access to infrastructure and technology. Recent studies emphasize that participation in social networks significantly enhances smallholders' ability to adopt climate-smart agricultural practices, manage risks, and improve productivity [14]. In contrast, urban dwellers benefit from denser populations and greater access to resources, enabling them to build broader and more diverse social networks [11] [15]. Consequently, rural farmers often struggle to access essential social services, such as roads, healthcare, and markets, which further limits their ability to capitalize on social capital.

BACKGROUND

The Influence of Social Media in the Formation of Social Capital

The increasing accessibility of the internet and the availability of affordable smartphones have greatly influenced how social media contributes to the formation of social capital. With over 5.17 billion social media users globally in 2024, these platforms provide a digital space that fosters extensive global connectivity and strengthens social networks [16]. Social media technologies enable users to create diverse relationships and form online communities with ease, further expanding their social networks [17].

Social media's ability to maintain existing social networks and facilitate constant communication plays a pivotal role in the development of social capital, which encompasses trust, social networks, and norms. As Putnam [18] described, social capital comprises the social networks that individuals own, providing them with access to various benefits. Social capital can be divided into two types: bonding and bridging. Bonding social capital represents strong ties, such as those within families or close-knit communities, which offer emotional support. In contrast, bridging social capital involves weaker ties that expose individuals to new information and broader perspectives but offer less emotional support.

Numerous studies have highlighted the role of social media in fostering bridging social capital, given its capacity to connect users to diverse networks [19]. However, the relationship between social media usage and bonding social capital has been less explored [20]. In Malaysia, existing research has primarily focused on students and urban populations, leaving a gap in understanding the impact of social media on bonding and bridging social capital among smallholder farmers. This study seeks to fill that gap by exploring how different types of social media usage influence the formation of social capital among oil palm smallholders, offering valuable insights into the role of social media in enhancing social networks within rural farming communities.

The Relationship Between Oil Palm Integration, Social Media, and Social Capital

Agricultural integration plays a crucial role in supporting smallholders by providing them with opportunities to diversify income streams and improve sustainability. Integration is essential not only for overcoming challenges like fluctuating commodity prices but also for expanding access to information and resources that enhance agricultural productivity [10][9]. Studies have consistently shown that social networks strengthen agricultural integration by offering valuable connections to markets and agricultural innovations [12] [13]. However, rural smallholders often face limited access to these extensive networks due to their geographic

isolation, which constrains their interactions to close family members and friends [21]. Recent advancements in social media offer new opportunities to overcome these limitations. Social media platforms, with their ability to expand and sustain both bonding and bridging social capital, have become increasingly important in rural areas [22]. Social media literacy, in particular, enhances these platforms' effectiveness, enabling smallholders to make informed decisions and reduce reliance on traditional intermediaries [23]. Furthermore, smallholders who effectively use social media benefit from greater market access, knowledge-sharing, and the potential to diversify their agricultural practices by integrating oil palm cultivation with non-agricultural activities, such as retail or food businesses.

This study aims to fill existing gaps by investigating the association between social media usage, social capital formation, and agricultural integration among oil palm smallholders. It seeks to examine how social media literacy impacts both bonding and bridging social capital and contributes to more effective integration practices within this context.

METHODS

This study was conducted in Bintulu, Sarawak, Malaysia, a key industrial city known for its rich natural resources, including oil, gas, and timber. Bintulu covers an area of approximately 12,313 square kilometres and has a population of approximately 250,000 people. It is home to significant natural gas reserves, with an estimated 42.3 trillion cubic feet located offshore, positioning Bintulu as a major hub in Malaysia's energy sector.

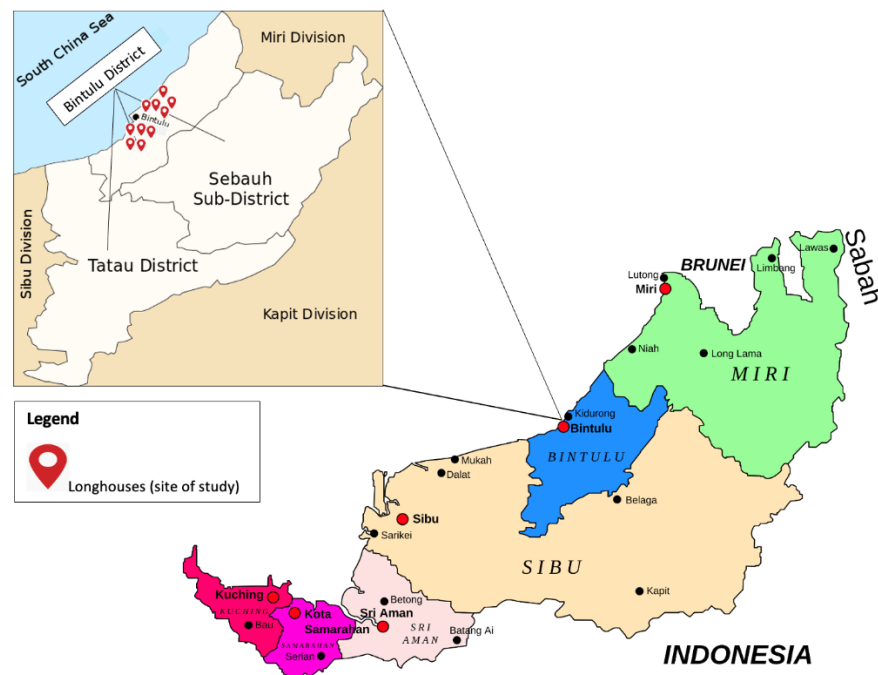


Figure 1: Map of Sarawak showing the site of study with insert showing Bintulu District.

Data collection for this study was conducted in longhouses located within the Bintulu district, chosen due to the high concentration of smallholders residing there. According to the Malaysian Palm Oil Board (MPOB), there are 1,639 independent oil palm smallholders in the Bintulu district. Longhouses in areas with better internet coverage, primarily near Bintulu city, were

prioritized for the study. Internet coverage in Bintulu has improved significantly, with 4G network coverage reaching 52.34% as of mid-2024 [24].

This study was conducted using a survey approach. Based on Krejcie and Morgan [25], the sample size required for this study is 310 respondents. Using the random sampling method, 35 smallholders were selected from each longhouse to participate in the survey. A total of 350 questionnaires were distributed; however, only 194 completed questionnaires were successfully collected. Figure 2 is an overview of the process of data collection.

The researcher obtained approval from the Malaysian Palm Oil Board (MPOB) in Bintulu to conduct the study within longhouse communities. This collaboration ensured that the survey questionnaires were culturally appropriate, with translations provided in the Sarawak Malay language to better accommodate respondents' preferences. Data collection was facilitated by two local enumerators familiar with the community, which improved participation and data accuracy. The questionnaire gathered detailed information on respondents' demographics, social media usage, and levels of social media literacy, which specifically focused on respondents' ability to access and utilize social media for communication and agricultural integration practices. The design and validation of the questionnaire were previously published [23]. Reliability analysis using Cronbach's alpha yielded a value of 0.845, indicating a high level of internal consistency and reliability.

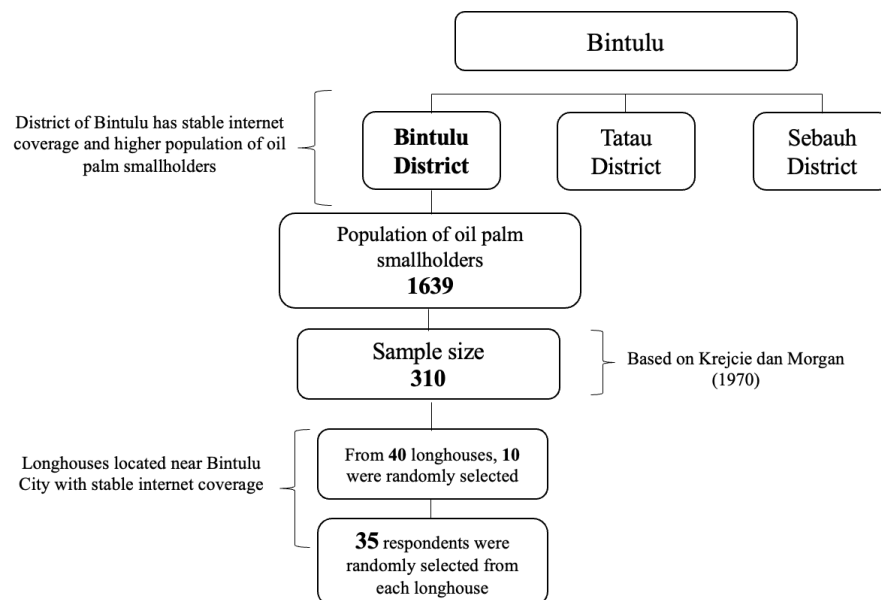


Figure 2: Flow chart of the process of data collection.

Data were analyzed using both descriptive and inferential statistics. An independent t-test was employed to compare the level of social capital among oil palm smallholders based on gender. A one-way ANOVA test was used to analyze differences in social capital based on age groups and educational levels. Additionally, logistic regression analysis was conducted to identify the factors influencing the adoption of agricultural integration practices. Statistical significance was set at $p < 0.05$, with the models demonstrating strong predictive power for the variables analyzed.

Measurement of Social Capital

Social capital is a complex concept that lacks a universally accepted definition, with various researchers using different indicators and methods to measure it. In this study, social capital was measured using a questionnaire adapted from [20], modified to reflect the context of oil palm smallholders. The questionnaire was translated into Malay to ensure cultural relevance and comprehension. It was divided into two sections: the first focused on bonding social capital with eight items, and the second on bridging social capital with ten items. Each item was rated on a 5-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

An example of an item measuring bonding social capital is: *"There are some people in my WhatsApp network whom I trust to help me solve my problems"*. For bridging social capital, an example is: *"I support agricultural agencies and community activities through WhatsApp."*

These items reflect the strong ties associated with bonding capital and the broader, more diverse connections of bridging capital, which are essential for accessing resources and information in the rural agricultural sector.

RESULTS

Background of Respondents

The demographic profile of the respondents was analyzed to provide insight into the background of oil palm smallholders participating in this study. A total of 194 smallholders were randomly selected. Of these, 89.2% were male, while female smallholders made up 10.8%. The age distribution showed that 55% of respondents were aged 50 years and above, 33% were between 41–50 years, and 16% were aged 31–40. A significant proportion of the participants were married (84.5 percent), and the majority identified as Iban ethnicity (90.7 percent). In terms of education, the majority of respondents (51%) had completed secondary school, while 31.4% had only primary education. About 10.8% had no formal education, 5.2% held a diploma, and 1.5% had a degree. The distribution of monthly income showed that 41.2% earned between RM1,000 and RM2,000, 32.5% earned between RM2,001 and RM3,000, and only 3.1% earned more than RM5,000 per month. The summarized demographic information is presented in Table 1.

Table 1: Demographic Characteristics of Oil Palm Smallholders in Bintulu, Sarawak

Respondents' profile	Frequency (n)	Percentage (%)
Gender		
Male	173	89.2
Female	21	10.8
Age (years)		
31- 40	31	16
41-50	64	33
Above 50	99	55
Marital Status		
Single	15	7.7
Married	164	84.5
Widow	11	5.7
Divorced	4	2.1
Ethnicity		

Malay	3	1.5
Iban	176	90.7
Melanau	4	2.1
Bidayuh	3	1.5
Kayan	4	2.1
Kenyah	1	0.5
Chinese	3	1.5
Education level		
No schooling	21	10.8
Primary school	61	31.4
Secondary school	99	51.0
Diploma	10	5.2
Degree	3	1.5
Monthly income (*RM)		
Less than RM1000	21	10.8
RM1000 – RM2000	80	41.2
RM2001 – RM3000	63	32.5
RM3001 – RM4000	24	12.4
RM5000 and above	6	3.1

*RM: Malaysian currency RM1 = USD 0.22

Bonding and Bridging Social Capital

The measurement of bonding and bridging social capital was based on respondents' agreement with statements regarding their interactions through social media, adapted from the instrument developed by Ellison [26]. The level of bonding social capital was categorized based on a cut-off point derived from the mean score of 24.99. Respondents with scores above 24.99 were classified as having a high level of bonding social capital, while those scoring below this threshold were categorized as having a low level. For bridging social capital, a cut-off point of 35.19 was used, with scores exceeding this value indicating a high level of bridging social capital and scores below 35.19 representing a low level. These cut-off points were calculated based on the mean values for both bonding and bridging social capital, as shown in Table 2.

Table 2: Descriptive statistics for bonding social capital and bridging social capital

	n	Minimum	Maximum	Mean	Standard deviation
Bonding Social Capital	194	8	40	24.99	6.05
Bridging Social Capital	194	18	50	35.19	6.51

Analysis of Bonding and Bridging Social Capital by Gender:

An independent t-test was conducted to compare the levels of bonding and bridging social capital between male and female smallholders. The results indicated that male smallholders had a marginally lower mean score for bonding social capital compared to their female counterparts. Conversely, male smallholders exhibited slightly higher mean scores for bridging social capital than females (Table 3). However, these differences in both bonding and bridging social capital between genders were not statistically significant ($p > 0.05$). These findings suggest that while there are slight variations in social capital levels by gender, they are not substantial enough to indicate a statistically meaningful difference.

Table 3: Comparison of bonding and bridging social capital based on gender

Gender	n	Mean	Standard deviation	t	Sig. (p)
<i>Bonding social capital</i>					
Male	173	24.97	6.31	-0.16	0.88
Female	21	25.19	3.17		
<i>Bridging social capital</i>					
Male	173	35.30	6.64	0.67	0.50
Female	21	34.29	5.27		

Analysis of Bonding and Bridging Social Capital by Age:

Table 4 presents the results of a one-way ANOVA, which was conducted to assess differences in bonding and bridging social capital across various age categories among smallholders. Smallholders aged 31-40 years exhibited the highest mean scores for both bonding (mean = 26.90) and bridging social capital (mean = 38.77). In contrast, those aged 41-50 years had the lowest bonding social capital (mean = 23.44), while smallholders aged above 50 years had the lowest level of bridging social capital (mean = 33.75). These differences across age groups were statistically significant ($p < 0.05$). A post-hoc analysis using Duncan's multiple range test revealed significant differences in bonding social capital between smallholders aged 31-40 years and those aged 41-50 years ($p < 0.05$). However, no significant difference was observed between the 31-40 years and the above 50 years age groups ($p > 0.05$). For bridging social capital, the post-hoc test indicated statistically significant differences between smallholders aged 31-40 years and those aged 41-50 years, as well as between the 31-40 years group and those above 50 years ($p < 0.05$).

Table 4: Comparison of bonding and bridging social capital based on age group

Age group	n	Mean	Standard deviation	F	df	Sig. (p)
<i>Bonding social capital</i>						
31- 40 years	31	26.90 ^a	5.00	4.02	2	0.02
41-50 years	64	23.44 ^b	6.81			
Above 50 years	99	25.40 ^{ab}	5.62			
<i>Bonding social capital</i>						
31- 40 years	31	38.77 ^a	6.92	7.85	2	0.001
41-50 years	64	35.69 ^b	6.84			
Above 50 years	99	33.75 ^b	5.68			

Different letters indicate significant differences at the $p < 0.05$ level.

Analysis of Bonding and Bridging Social Capital by Education Level:

A one-way ANOVA was conducted to evaluate the differences in bonding and bridging social capital across different education levels among oil palm smallholders. The analysis revealed that smallholders with higher education levels demonstrated significantly higher levels of both bonding and bridging social capital (Table 5).

Specifically, post-hoc analysis using Duncan's multiple range test indicated that smallholders with diplomas had significantly higher levels of social capital compared to those without formal education and those with only primary education ($p < 0.05$). However, no significant differences were observed between smallholders with diplomas and those with secondary education ($p > 0.05$). These findings suggest that higher education is associated with an

increase in both bonding and bridging social capital, although the effects plateau beyond the secondary education level.

Table 5: Comparison of bonding and bridging social capital based on education level

Education level	n	Mean	Standard Deviation	F	df	Sig. (p)
<i>Bonding social capital</i>						
No schooling	21	23.71 ^a	6.19	2.82	4	0.026
Primary school	61	23.21 ^a	6.53			
Secondary school	99	26.13 ^b	5.78			
Diploma	10	26.90 ^b	2.64			
Degree	3	26.33 ^b	0.58			
<i>Bridging social capital</i>						
No schooling	21	30.86 ^a	5.79	6.95	4	< 0.001
Primary school	61	33.43 ^a	5.44			
Secondary school	99	36.80 ^{ab}	6.59			
Diploma	10	39.70 ^b	6.13			
Degree	3	33.67 ^a	6.35			

Different letters indicate significant differences at the $p < 0.05$ level.

Analysis of Bonding and Bridging Social Capital by Duration of WhatsApp Usage:

A one-way ANOVA was performed to assess the relationship between the duration of WhatsApp usage as a social media platform and the levels of bonding and bridging social capital among oil palm smallholders. The results indicated that bonding social capital significantly varied according to the length of time smallholders had been using WhatsApp ($F = 4.96$, $df = 5$) (Table 6). Smallholders who had been using WhatsApp for five or more years exhibited the highest level of bonding social capital, with a mean score of 26.34. The findings suggest a positive correlation between the duration of WhatsApp usage and bonding social capital, where longer usage is associated with higher levels of bonding social capital ($p < 0.05$). Post-hoc analysis using Duncan's multiple range test revealed significant differences in bonding social capital between smallholders who had never used WhatsApp and those who had used it ($p < 0.05$).

Similarly, for bridging social capital, the highest levels were observed among smallholders with five or more years of WhatsApp usage (mean = 38.38), while the lowest levels were found among those who had never used the platform ($F = 11.66$, $df = 5$). This difference was statistically significant at $p < 0.001$, further demonstrating that prolonged use of WhatsApp is linked to higher bridging social capital among smallholders.

Table 6: Comparison of bonding and bridging social capital based on duration of WhatsApp usage

Duration of WhatsApp usage	n	Mean	Standard Deviation	F	df	Sig. (p)
<i>Bonding social capital</i>						
Never	7	15.71 ^a	4.07	4.96	5	< 0.001
1 year	14	24.29 ^b	5.05			
2 years	65	24.15 ^b	5.65			
3 years	7	25.14 ^b	1.46			
4 years	22	26.00 ^b	6.91			
5 years and above	79	26.34 ^b	5.93			
<i>Bridging social capital</i>						

Never	7	27.00 ^a	3.37	11.66	5	< 0.001
1 year	14	32.00 ^b	4.62			
2 years	65	33.05 ^b	5.72			
3 years	7	30.00 ^{ab}	3.02			
4 years	22	36.36 ^c	6.13			
5 years and above	79	38.38 ^c	6.21			

Different letters indicate significant differences at the $p < 0.05$ level.

Analysis of Bonding Social Capital and Bridging Social Capital with The Number of Friends on Social Media:

A one-way ANOVA was conducted to examine the relationship between the number of friends on the social media platform WhatsApp and levels of bonding and bridging social capital among smallholders. The analysis revealed a significant difference in bridging social capital based on the number of friends, with smallholders who had between 100 to 200 friends reporting the highest levels of bridging social capital ($F = 11.46$, $df = 4$, $p < 0.05$) (Table 7). However, the number of friends did not have a significant impact on bonding social capital, as no statistically significant differences were observed in this area ($p > 0.05$). These findings suggest that a larger network of social media connections enhances bridging social capital, while bonding social capital remains unaffected by the size of one's social media network.

Table 7: Comparison of bonding social capital and bridging social capital based on the number of friends on WhatsApp

Number of friends on WhatsApp	n	Mean	Standard Deviation	F	df	Sig. (p)
<i>Bonding social capital</i>						
Never	7	22.29	10.99	2.24	4	0.066
10-50 friends	86	23.95	5.09			
50-100 friends	77	25.65	6.20			
100-200 friends	16	27.25	6.92			
200-300 friends	8	27.75	4.74			
<i>Bridging social capital</i>						
Never	7	35.14 ^a	2.19	11.46	4	< 0.001
10-50 friends	86	32.12 ^a	4.74			
50-100 friends	77	37.58 ^b	7.61			
100-200 friends	16	39.75 ^b	1.53			
200-300 friends	8	36.13 ^a	5.25			

Different letters indicate significant differences at the $p < 0.05$ level.

Analysis of Bonding Social Capital and Bridging Social Capital with The Type of Integration Practice:

A comparison of bonding and bridging social capital levels based on the type of integration practice employed by smallholders was conducted. The results indicated no statistically significant differences in either bonding or bridging social capital across different integration practices ($p > 0.05$) (Table 8). These findings suggest that the type of integration practice, whether agricultural or non-agricultural, does not have a measurable impact on the levels of social capital among smallholders.

Table 8: Comparison of bonding social capital and bridging social capital based on the type of integration practice

Type of integration	n	Mean	Standard deviation	F	df	Sig. (p)
<i>Bonding social capital</i>						
None	27	24.93	5.46	2.53	3	0.06
Crops	129	24.40	6.40			
Livestock	8	29.50	5.90			
Livestock and crops	30	26.43	4.22			
<i>Bridging social capital</i>						
None	27	32.48	4.00	2.07	3	0.11
Crops	129	35.64	7.00			
Livestock	8	37.25	7.15			
Livestock and crops	30	35.13	5.46			

Association between Bonding and Bridging Social Capital with Oil Palm Integration:

A chi-square test of independence was conducted to examine the association between bonding and bridging social capital and oil palm integration practices among smallholders. The analysis revealed a significant association between bridging social capital and oil palm integration ($p < 0.05$), indicating that smallholders with higher levels of bridging social capital were more likely to engage in oil palm integration. However, no significant association was found between bonding social capital and oil palm integration ($p > 0.05$) (Table 9). These findings suggest that while strong, close-knit relationships (bonding social capital) do not influence integration practices, broader, more diverse networks (bridging social capital) play a critical role in facilitating oil palm integration.

Table 9: Chi-square test of independence of association between level of bonding and bridging social capital and oil palm integration

	Oil Palm Integration						
	No		Yes				
	n	(%)	n	(%)	χ^2	df	Sig. (p)
<i>Bonding social capital</i>							
Low level	16	59.3	75	44.9	1.92	1	0.166
High level	11	40.7	92	55.1			
<i>Bridging social capital</i>							
Low level	19	70.4	82	49.1	4.21	1	0.04
High level	8	29.6	85	50.9			

Association between Bonding and Bridging Social Capital with Non-Agricultural Integration Practice:

A chi-square test of independence was conducted to assess the association between bonding and bridging social capital and non-agricultural integration practices among smallholders. The analysis revealed significant associations for both bonding and bridging social capital ($p < 0.05$) (Table 10). Smallholders with higher levels of bonding and bridging social capital were significantly more likely to engage in non-agricultural integration practices compared to those with lower levels of social capital. These results suggest that both close-knit networks (bonding) and broader, diverse connections (bridging) play crucial roles in supporting smallholders' engagement in non-agricultural economic activities.

Table 10: Chi-square test of independence of association between level of bonding and bridging social capital and non-agricultural integration

	Non-agricultural integration						
	No		Yes				
	n	(%)	n	(%)	χ^2	df	Sig. (p)
<i>Bonding social capital</i>							
Low level	76	51.7	15	31.9	5.59	1	0.018
High level	71	48.3	32	68.1			
<i>Bridging social capital</i>							
Low level	91	61.9	10	21.3	23.55	1	< 0.001
High level	56	38.1	37	78.7			

Factors Influencing the Adoption of Agricultural Integration Practices:

Logistic regression was conducted to examine the influence of factors such as age, education level, and bonding and bridging social capital on oil palm integration and non-agricultural integration practices. In the first analysis, the dependent variable was whether the smallholders practiced oil palm integration, while the independent variables included age, education level, and levels of bonding and bridging social capital. The summary of this logistic regression analysis is presented in Table 11.

The results indicated that bridging social capital was the strongest predictor of oil palm integration, with a coefficient value of $B = 0.55$. The $\text{Exp}(B)$ value of 1.73 suggests that the odds of practicing agricultural integration increase with higher levels of bridging social capital, although this relationship was not statistically significant.

In the second analysis, presented in Table 12, the dependent variable was whether smallholders engaged in non-agricultural integration practices. The results show that bridging social capital again emerged as the strongest predictor, with a coefficient of $B = 1.73$ and an $\text{Exp}(B)$ value of 5.64, indicating that smallholders with higher bridging social capital were significantly more likely to engage in non-agricultural integration practices ($p < 0.001$).

These findings highlight the importance of social capital, particularly bridging social capital, in influencing both agricultural and non-agricultural integration practices. Notably, the effects of age and education level were no longer significant when social capital was accounted for in the logistic regression model. This suggests that social capital plays a critical role in shaping integration practices among oil palm smallholders, potentially outweighing traditional demographic factors.

Table 11: Logistic regression analysis to identify factors that influence the practice of agricultural integration

Variables	B	SE	Wald	df	Sig.	Exp(B)	95% CI for Exp(B)	
							Lower	Upper
Age	-0.566	0.358	2.497	1	0.114	0.568	0.281	1.146
Level of education	0.402	0.272	2.183	1	0.140	1.494	0.877	2.545
Bonding social capital	0.106	0.501	0.045	1	0.832	1.112	0.416	2.970
Bridging social capital	0.546	0.538	1.031	1	0.310	1.726	0.602	4.953
Constant	1.337	1.350	0.981	1	0.322	3.809		

Table 12: Logistic regression analysis to identify factors that influence non-agricultural integration

Variables	B	SE	Wald	df	Sig.	Exp(B)	95% CI for Exp(B)	
							Lower	Upper
Age	0.033	0.239	0.019	1	0.891	1.033	0.647	1.651
Level of education	0.464	0.248	3.499	1	0.061	1.590	0.978	2.584
Bonding social capital	-0.155	0.434	0.128	1	0.721	0.856	0.366	2.005
Bridging social capital	1.729	0.458	14.271	1	<0.001	5.637	2.298	13.828
Constant	-4.965	1.187	17.490	1	<0.001	0.007		

DISCUSSION

The results of this study provide important insights into the role of bonding and bridging social capital among oil palm smallholders in East Malaysia. The findings indicate that 47% of smallholders possess a high level of bonding social capital, while 52% exhibit low levels. Notably, smallholders with higher education levels, particularly those holding diplomas, demonstrated the highest levels of bonding social capital. Additionally, the duration of social media usage, specifically WhatsApp, was found to significantly influence both bonding and bridging social capital. Smallholders who had been using WhatsApp for five years or more showed significantly higher levels of both forms of social capital.

In terms of integration practices, the results revealed a significant association between bridging social capital and non-agricultural integration practices, such as running small businesses or providing services beyond agricultural activities. This suggests that smallholders with more diverse social networks (bridging social capital) are better positioned to diversify their income streams beyond traditional agriculture. In contrast, no significant relationship was found between bonding social capital and agricultural integration practices. This supports Putnam's [19] distinction between bonding and bridging social capital, where bonding social capital primarily benefits close-knit groups in achieving collective goals, while bridging social capital offers access to external resources and opportunities through more diverse, heterogeneous networks.

The association between social media use and social capital formation is well-established in previous literature. Ellison [27] were among the first to demonstrate a strong relationship between Facebook use and both bonding and bridging social capital. In line with their findings, this study shows that social media platforms like WhatsApp can serve as critical tools for building and maintaining social capital among smallholders. Furthermore, Lee et al. [28] emphasized the differential roles of various Facebook features in fostering bonding and bridging social capital, which echoes the importance of social media literacy highlighted in this study. Smallholders who effectively use WhatsApp for communication and networking are better positioned to leverage their social capital for non-agricultural integration practices.

While there is extensive research on the benefits of social capital in agriculture, studies focusing specifically on the interplay between social media usage, social capital, and agricultural integration practices are still limited. However, past studies have consistently shown that social capital plays a pivotal role in enhancing agricultural productivity. For instance, Poli [29] demonstrated that higher levels of social capital, particularly in the form of information sharing, significantly improved agricultural efficiency among smallholders in India. Similarly, Saint Ville

[30] found that social capital facilitated knowledge flow and community innovation in rural farming communities, with "farmer friends" and agricultural officers serving as key sources of new agricultural knowledge.

Cofre-Bravo [31] further highlighted the dual role of bonding and bridging social capital in supporting smallholder farmers. Their study in Chile showed that bonding social capital, through close relationships with family and peers, provided emotional and financial support, while bridging social capital, through connections with agricultural advisors and companies, facilitated access to new technologies and farm advisory services. These findings align with the results of this study, where smallholders with higher levels of bridging social capital were more likely to engage in non-agricultural integration, benefiting from a broader range of external resources and opportunities.

CONCLUSIONS

This study provides critical insights into the role of social capital, particularly bridging social capital, in shaping non-agricultural integration practices among oil palm smallholders in East Malaysia. The findings demonstrate that smallholders with higher levels of bridging social capital are more likely to diversify their income streams through non-agricultural activities such as retail businesses and services. This highlights the importance of broad social networks, which offer access to external resources, knowledge, and opportunities that facilitate economic diversification and resilience.

Social media plays a pivotal role in enhancing both bonding and bridging social capital, with platforms such as WhatsApp acting as key facilitators for expanding social networks. Smallholders who have used social media for longer periods are more likely to have stronger social capital, underscoring the importance of promoting social media literacy to enhance integration practices. The results also align with previous studies that emphasize the role of digital platforms in building social capital, which in turn fosters economic innovation and sustainability in agricultural contexts.

Despite the valuable contributions of this study, certain limitations must be acknowledged. The sample, drawn predominantly from longhouse occupants in Bintulu, may not fully represent the diversity of smallholders across Malaysia. Furthermore, the study focused on areas with better internet coverage, which may have influenced the findings related to social media usage. Future research should aim to include a broader geographic scope and a more heterogeneous sample to provide a comprehensive understanding of the relationship between social capital, social media, and oil palm integration.

Moreover, this study only measured smallholders' ability to access and communicate through social media as indicators of social capital, without addressing their capacity to analyze and evaluate information. Expanding future studies to include these cognitive dimensions of social capital could offer deeper insights into how smallholders utilize social media to improve their agricultural practices.

This study adds to the growing body of literature on the intersection of social capital and agriculture by demonstrating the significant influence of bridging social capital, enhanced through social media, on non-agricultural integration practices. The findings underscore the

need for policy interventions aimed at improving social media literacy and expanding social networks to support the economic diversification and sustainability of smallholders. Future research should continue to explore the mechanisms through which social capital and digital technologies drive agricultural innovation and resilience among smallholder communities.

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