EMPOWERING EXTENSION AGENTS FOR SUSTAINABLE COCOA DEVELOPMENT: INSIGHTS INTO TECHNOLOGY TRANSFER AND HUMAN RESOURCE CHALLENGES

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ABSTRACT – *Extension agents play a crucial role in facilitating technology transfer and human resource development, ensuring that cocoa farmers and stakeholders acquire the necessary knowledge and skills for sustainable agricultural advancement. Their effectiveness directly influences the adoption of agricultural innovations and the overall resilience of cocoa farming communities. This study assesses the work performance of extension agents in technology transfer and human resource development within the cocoa sector, identifying key competencies that influence their effectiveness. Understanding these factors is essential for strengthening extension services and enhancing agricultural outreach programs tailored to cocoa production. The study employed an explanatory sequential mixed-methods design. In the quantitative phase, a structured survey evaluated extension agents' competencies, including technical skills, technology delivery skills, technology evaluation skills, leadership, decision-making skills, and social skills. Statistical analysis was conducted to determine the significance of these competencies in predicting work performance. The qualitative phase involved in-depth interviews with selected extension agents, offering contextual insights into their experiences, challenges, and perspectives. The quantitative analysis revealed that while technical skills were essential, technology delivery skills, technology evaluation skills, and social skills were not significant predictors of work performance. However, qualitative findings highlighted that training and leadership played a more influential role in extension effectiveness. The study underscores the need for targeted training programs and policy interventions to enhance extension agents' competencies, particularly in stakeholder engagement and adaptive communication. These findings contribute to refining agricultural extension models, fostering sustainable cocoa development, and improving resilience within cocoa farming communities.*

Keywords: Technology transfer, human resource development, extension agents' work performance, agricultural extension, capacity building

INTRODUCTION

Agricultural extension services play a crucial role in facilitating technology transfer and human resource development within the agricultural sector. These services act as conduits, linking scientific research to practical applications, thereby enhancing farmers' productivity and sustainability (Anderson & Feder, 2007; Davis & Sulaiman, 2014). Traditionally, agricultural extension has been understood as the dissemination of information and technical inputs to farmers. However, contemporary perspectives recognize its broader role in human resource development, emphasizing the enhancement of farmers' decision-making capabilities, leadership skills, and organizational competencies (Rivera & Alex, 2004; Swanson & Rajalahti, 2010). This dual function is essential for empowering farmers, fostering resilience, and enabling adaptation to evolving agricultural challenges.

The effectiveness of technology transfer is intricately linked to the competencies of extension agents. These agents must exhibit not only technical proficiency but also exceptional communication and facilitation skills to ensure effective knowledge dissemination and adoption among farmers (Beattie, 2021; Flanagan *et al*., 2023). In the context of cocoa production, particularly in Malaysia, extension agents play a critical role in guiding farmers toward adopting improved agricultural practices. Despite support from institutions such as the Malaysian Cocoa Board (MCB), smallholder cocoa farmers often experience low productivity, averaging less than 0.5 tonnes per hectare annually, compared to the targeted 1.5 tonnes per hectare (MCB Annual Report, 2023). This

significant productivity gap underscores the necessity to assess and enhance the performance of extension agents in delivering agricultural knowledge and supporting farmers' development.

The Malaysian cocoa industry has faced significant challenges in achieving targeted productivity levels. Smallholder cocoa farmers have reported yields of less than 0.5 tonnes per hectare per year, falling significantly short of the anticipated 1.5 tonnes per hectare per year (Malaysian Cocoa Board, 2023; Hassan *et al.,* 2021). This substantial productivity gap of over 50% persists despite efforts by the MCB to provide various forms of assistance, including the introduction of new technologies and the deployment of extension agents (Malaysian Cocoa Board, 2023; Olagunju *et al*., 2019). Additionally, research has shown that the limited adoption of agricultural innovations and weak extension support contribute to persistent productivity challenges in the cocoa sector (Aneani *et al*., 2018).

The effectiveness of extension agents is pivotal in bridging this productivity gap, as their competencies in technology transfer (ToT) and human resource development (HRD) are critical determinants of their work performance and, consequently, the productivity of the farmers they support (Olagunju *et al*., 2019; Motolani *et al*., 2017). Key skills identified as essential for extension agents include technical skills, technology delivery skills, technology evaluation skills, leadership skills, decision-making skills, and social skills (Aregaw *et al*., 2023; Hassan *et al.,* 2021 Olagunju *et al*., 2019). Additionally, studies indicate that extension agents need continuous capacity-building programs to enhance their skills and effectiveness in addressing farmers' needs (Kumari & Khanduri, 2019).

This study aims to assess how these competencies affect the work performance of extension agents within the MCB, particularly focusing on East Malaysia. By employing a mixed-methods approach, the research seeks to provide a comprehensive understanding of the relationship between extension agents' skills and their effectiveness in enhancing cocoa productivity among smallholders. The primary objective of this study is to evaluate the relationship between the transfer of technology and human resource development with work performance among extension agents in the Malaysian Cocoa Board, focusing specifically on East Malaysia.

The study aims to achieve the following specific objectives:
1. To assess the level of extension agents' competencies in ToT and HRD in relation to their work performance among productive cocoa smallholders in East Malaysia (Sabah and Sarawak).
2. To evaluate the relationship between ToT and HRD with work performance among extension agents.
3. To identify the most significant factors contributing to the work performance of extension agents.

Furthermore, the purpose of this study is to explore the perspectives of the Extension Services Department within MCB regarding the findings from the quantitative phase. To gain deeper insights into the ToT and HRD processes, this study also seeks to examine the challenges faced by the Extension Services Department that contribute to low work performance among extension agents. A qualitative methodology is employed to investigate these challenges, considering the critical role of MCB in addressing productivity issues in the Malaysian cocoa industry.

This study aims to answer the following research questions:

1. What are the responses of the Extension Services Department at MCB regarding the findings from the quantitative phase? Do they validate or challenge these findings?
2. What are the key challenges faced by the Extension Services Department that contribute to low work performance among extension agents? Are there additional factors influencing work performance?

The success of agricultural extension services is largely dependent on the competency of extension agents and the organizational culture fostered by leadership within the institution. Leadership competencies, including skills, knowledge, and strategic abilities, play a crucial role in enhancing technology transfer and human resource development among extension agents, which in turn contributes to improved work performance (Soebbing et al., 2015). The beliefs, values, and decision-making approaches of leaders directly influence an organization's strategic direction, extension service effectiveness, and the overall performance of agricultural initiatives.

Ssekakubo *et al.* (2014) examined the impact of leadership competencies on organizational performance, emphasizing that enhanced leadership skills contribute to improved employee performance, which strengthens extension service delivery. In the context of agricultural extension, effective leadership is essential to ensure the successful transfer of technology, capacity building of extension agents, and adoption of best agricultural practices. Recent studies further underscore the need for continuous competency development among extension professionals to address the evolving challenges in technology dissemination and sustainable agricultural practices (Becerra-Encinales *et al*., 2024).

The sustainability of smallholder cocoa production in Malaysia depends on the efficiency of technology transfer and continuous professional development of extension agents. To achieve this, organizations such as the MCB must invest in structured training and development (T&D) programs to equip extension agents with the necessary skills for effective technology dissemination, decision-making, and leadership in farm management (Edralin, 2004; Lynton & Pareek, 2000; Vemic, 2007). Training and development initiatives are critical in enhancing work performance, as they equip extension agents with up-to-date knowledge on modern farming techniques, cocoa production innovations, and climate-resilient agricultural practices (Palu & Padhi, 2003). Research has consistently demonstrated that investments in T&D improve extension service effectiveness and ultimately contribute to the productivity of smallholder farmers (Goldstein & Ford, 2002; Mgendi *et al*., 2021). Recent findings indicate that the ability of extension agents to transfer technology effectively is directly correlated with their technical skills, leadership abilities, and organizational support structures (Abd Halim *et al*., 2022; Hassan *et al*., 2021).

Moreover, effective capacity-building programs not only enhance extension agents' current job performance but also prepare them for future challenges in agricultural development and technology adoption (Katou & Budhwar, 2006; McNamara, 2008; Parce & Robinson, 2009). The transfer of knowledge and skills through structured competency development frameworks strengthens the extension system's resilience, adaptability, and long-term sustainability in the cocoa industry. As Malaysia aims to increase cocoa productivity through extension-led interventions, prioritizing continuous learning and professional development will be critical in ensuring extension agents are well-equipped to support smallholder farmers in adopting improved technologies and sustainable farming practices.

The theoretical framework serves as the foundation for understanding the key constructs of this study and their interrelationships. This research examines the relationship between extension agents' competencies, technology transfer, human resource development, and work performance within the Malaysian Cocoa Board in East Malaysia. By integrating relevant theories, this study seeks to explain how specific competencies contribute to the effectiveness of technology dissemination and overall organizational performance. Emerging concepts from existing theories provide insights into the essential skills required for extension agents to facilitate knowledge transfer and support the cocoa farming community.

A study by Mustafa *et al*., (2017) examined the work performance of extension agents in the Malaysian Cocoa Board, focusing on West Malaysia. The research adopted a quantitative approach and identified six key competencies influencing extension agents' work performance: technical skill, technology delivery skill, technology evaluation skill, leadership skill, decision-making support skill, and social skill. These competencies are fundamental in ensuring the successful transfer of agricultural knowledge and innovations to farmers. However, the study was geographically limited to West Malaysia, leaving a gap in understanding the work performance of extension agents in Sabah and Sarawak, where the majority of Malaysia's cocoa production is concentrated. Given the distinct agricultural and socio-economic challenges faced by extension agents in these regions, this study expands the scope to examine the role of extension agents in East Malaysia. By doing so, it aims to provide a more comprehensive understanding of how extension agents' competencies influence technology dissemination and human resource development in the cocoa industry (Abd Halim *et al.,* 2022; Olagunju *et al*., 2021).

The Iceberg Model by Spencer and Spencer (1993), is a useful framework for understanding competency development among extension agents. This model posits that observable skills and knowledge form only a small portion of an individual's competency, while deeper traits such as motivation, values, and personality play a more significant role in determining work performance. The model categorizes competencies into two levels: visible competencies, such as technical skills and knowledge, which are easier to assess and develop through training, and hidden competencies, such as attitudes, emotional intelligence, and intrinsic motivation, which significantly influence long-term success. In the context of extension agents in the Malaysian Cocoa Board, while technical expertise is essential, their soft skills, leadership abilities, and motivation are equally critical in enhancing technology transfer and farmer engagement. Understanding both explicit (visible) and implicit (hidden) competencies is necessary for designing effective training programs that improve extension agents' work performance (Landini, 2021).

Additionally, Organizational Behavior Theory provides insights into how individual behavior, group dynamics, and organizational structures impact work performance. Organizational behavior is a field of study that investigates the effect of individuals, teams, and structures on behavior within an organization, with the ultimate goal of enhancing organizational effectiveness (Ivancevich *et al*., 1990). In this study, organizational behavior theory is used to examine how leadership styles, management practices, and institutional support influence the extension

agents' ability to transfer technology and enhance work performance. Key principles relevant to this study include leadership and motivation, which emphasize the role of supervisors in fostering engagement and productivity among extension agents (Usadolo, 2020). Additionally, group dynamics and communication play a crucial role in knowledge sharing, teamwork, and collaboration, which are essential for ensuring the successful transfer of technology to cocoa farmers (Hillary *et al.*, 2021; Novirani *et al*., 2023). Moreover, the structural efficiency of an organization, including its policies, resource allocation, and training programs, determines the overall effectiveness of extension services and their impact on agricultural productivity (Maulu *et al*., 2021; Okorie *et al.,* 2024).

The relevance of these theoretical perspectives to the Malaysian cocoa industry is significant. The Malaysian cocoa sector faces challenges in technology adoption, productivity enhancement, and human resource development. Despite various government initiatives, training programs, and extension services, cocoa productivity remains below the expected levels. The targeted productivity for cocoa cultivation is 1.5 tonnes per hectare per year, yet current yields remain below 0.5 tonnes per hectare per year (Malaysian Cocoa Board, 2023). Extension agents play a critical role in addressing this gap by facilitating technology transfer, providing technical support, and strengthening farmers' decision-making capabilities. By incorporating both models and agricultural extension frameworks, this study aims to identify the key factors that contribute to extension agents' work performance and provide practical recommendations for improving extension services in the Malaysian Cocoa Board.

In conclusion, this study aims to develop a holistic understanding of extension agents' work performance in East Malaysia. It contributes to academic literature by bridging the gap in research on extension services in the cocoa sector and provides practical implications for policymakers, extension organizations, and training institutions.

MATERIALS AND METHODS

To address the research questions of this study, a mixed-methods research design was adopted. Specifically, an explanatory sequential design was employed, modeled after Borg's (2007) study and aligned with Creswell's (2012) framework. This research design is characterized by the initial collection and analysis of quantitative data, followed by the collection and analysis of qualitative data. The explanatory sequential design is particularly suitable for investigating relatively unexplored topics (Babbie, 1990; Creswell, 2012), as it allows for the efficient collection of standardized data while also providing deeper insights into participants' perspectives. This approach ensures a comprehensive understanding of the phenomenon under study by integrating numerical data with rich qualitative narratives.

Integration in mixed-methods research involves intentionally combining quantitative and qualitative approaches to enhance the overall understanding of the research topic (Bryman, 2006; Caracelli & Greene, 1997; Creamer, 2018; Fetters, Curry, & Creswell, 2013; Greene, 2007; O'Cathain, Murphy, & Nicholl, 2007, 2010; Yin, 2006). In this study, the mixed-methods approach was implemented to cross-validate findings from the quantitative phase. The first phase involved collecting and analyzing quantitative data, which informed the subsequent phase. In the second phase, qualitative data were collected through interviews to further explore and contextualize the quantitative findings. The data from both phases were collected and analyzed independently before being integrated to identify convergences and divergences between the two sets of findings.

At the design level, integration plays a crucial role in shaping the research process, influencing decisions about data collection, analysis, and interpretation. The integration of data at multiple levels ultimately enhances the validity and reliability of research inferences (Creswell & Plano Clark, 2011; Ivankova, 2014; Teddlie & Tashakkori, 2009). This study highlights the value of the sequential explanatory mixed-methods approach, as it enables rigorous quantitative analysis while simultaneously capturing the richness of qualitative insights, including participants' experiences, perspectives, and histories (Creswell & Plano Clark, 2011; Teddlie & Tashakkori, 2009). This methodological approach strengthens the study's ability to provide a comprehensive and nuanced understanding of the research phenomenon.

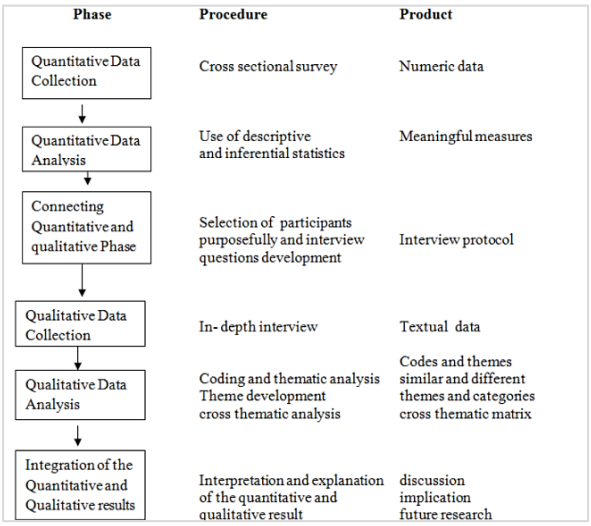

Figure 1: Research Design by Creswell (2011)

Figure 1 illustrates the research design adopted in this study, which follows a Sequential Explanatory Design. This two-phase approach begins with the collection and analysis of quantitative data, followed by the collection and analysis of qualitative data. The primary purpose of this design is to use qualitative findings to further explain, elaborate, and provide deeper insights into the results obtained from the quantitative phase. For instance, a survey may be conducted to gather quantitative data from a larger group of participants. Subsequently, a subset of these participants may be selected for in-depth interviews to explore and clarify their survey responses, offering a more comprehensive understanding of the research findings.

Quantitative Analysis

Population and Sampling

The target population for this study comprises all productive cocoa farmers in East Malaysia who have been actively engaged in extension activities facilitated by extension agents from the MCBfor a minimum of five years. The total number of productive cocoa farmers in East Malaysia is 1,360. The Krejcie and Morgan (1970) table was used to determine an appropriate sample size, resulting in a required sample of 297 respondents.

This study employs a geographical stratified sampling method, as East Malaysia is divided into two regions: Sabah and Sarawak. Sabah has 1,095 productive cocoa farmers, while Sarawak has 265, bringing the total to 1,360 farmers. The population was divided into homogeneous strata, grouping individual farmers based on zoning clusters and their level of productivity. A simple random sampling technique was then applied to select respondents from each stratum. The list of productive cocoa farmers for each region was obtained from the Malaysian Cocoa Board. Using the Krejcie and Morgan table, a total of 315 productive cocoa farmers were selected to account for potential non-responses. Ultimately, all 315 questionnaires were distributed and collected, exceeding the required sample size of 297, ensuring the robustness and reliability of the study findings.

Instrument Development

This study utilizes an established questionnaire as the instrument to collect data from the respondents. The original questionnaire was initially developed by Mustafa et al., (2017). The questionnaire consists of four sections: demographic profile, transfer of technology (ToT) skills, human resource development (HRD), and work performance. A six-point Likert scale (1 = strongly disagree to 6 = strongly agree) was used to measure respondents' perceptions of ToT and HRD competencies in cocoa extension.

Table 1: Questionnaire Design and Description

Section	Topic	Description	Type of Questionnaire
A	Farmers and Farm Profile	Gender, age, education level, farm size, etc.	Closed-ended
B	Transfer of Technology	Technical skill, technology delivery, evaluation skills	Likert scale
C	Human Resource Development	Leadership, decision-making, and social skills	Likert scale
D	Work Performance	Extension agents' performance	Likert scale

Data Collection

The data collection process was carefully structured to ensure accuracy, minimize bias, and facilitate better comprehension among respondents. Extension agents from the MCB were selected to assist in administering

the questionnaire. Since these agents had prior engagement with cocoa farmers, they were well-equipped to facilitate communication and ensure respondents understood the survey. However, to reduce potential bias, extension agents were assigned to areas outside their usual zones of responsibility.

Data collection was conducted through face-to-face interviews in respondents' respective villages. Interviews were scheduled at convenient times, typically in the early morning or late evening, to accommodate farmers' availability. Each session lasted approximately one hour, ensuring detailed responses while maintaining engagement.

Data Analysis

SPSS Statistics 23.0 was used for data analysis. A descriptive analysis of respondents' profiles was conducted using mean, frequency, and percentage values. ToT, HRD, and work performance levels were described using categorical mean values (low, moderate, and high). Pearson's correlation coefficients were used to analyze relationships among ToT, HRD, and work performance. Multiple regression analysis was conducted to verify key contributing factors influencing work performance.

Qualitative Analysis

Population and Sampling

Purposive sampling was used to recruit information-rich cases for qualitative analysis. The sample included regional officers, unit leaders, and extension agents (n=20) from Sarawak and Sabah. Participants were selected based on their expertise in cocoa extension activities.

Data Collection and Analysis

Interviews and focus group discussions were conducted between February 2018 and May 2018. Sessions were recorded for transcription and thematic analysis. Data analysis involved coding, categorization, and pattern identification, consistent with Creswell (2007) and Merriam (2009). Thematic analysis helped to triangulate findings from the quantitative phase, providing deeper insights into the challenges of technology transfer and human resource development.

RESULTS AND DISCUSSIONS

Level of ToT and HRD with Work Performance

The summary of technology transfer and human resource development in relation to work performance (Table 2) categorizes the levels into three groups: low, moderate, and high. The Likert scale used for the respondents consists of six levels, with the categories subdivided as follows: 1-2.669 for low, 2.67-4.339 for moderate, and 4.34-6 for high.

Table 2: Summary on Level of ToT, HRD and work performance of extension agents

Variables	Levels	Mean	SD
Work performance	High	5.244	0.879
Technical skill	High	5.318	0.827
Technology delivery skill	High	5.323	0.854
Technology evaluation skill	High	5.191	0.852
Leadership skill	High	5.281	0.891
Decision-making skill	High	5.238	0.816
Social skill	High	5.05	1.047

The results indicate that extension agents at the Malaysian Cocoa Board (East Malaysia) demonstrate a high level across all variables, including technical skills, technology delivery skills, technology evaluation skills, leadership skills, decision-making skills, and social skills. This high level of proficiency is reflected in their strong work performance, which presents an opportunity for improved productivity.

To effectively disseminate new agricultural technologies, extension agents must possess advanced technical skills that enable them to serve as credible exemplars for farmers. Farmers are more inclined to adopt technologies that demonstrably enhance their productivity. Therefore, it is imperative for extension agents to remain abreast of emerging technologies and continually refine their technical competencies to facilitate the effective transfer of agricultural innovations (Arowosegbe *et al*., 2024).

The efficacy of extension services is profoundly influenced by the knowledge and competence of extension officers in disseminating agricultural innovations. However, challenges such as a shortage of skilled extension agents often impede the effective delivery of these services (Becerra-Encinales *et al*., 2024). Continuous professional development, particularly in technical knowledge and communication, is essential to enhance the delivery of agricultural innovations. Moreover, effective technology transfer should prioritize peer support

mechanisms over reliance on external research that may not align with farmers' specific needs (Olumba, 2014; Prajapati *et al*., 2025).

Training in research and evaluation has been identified as a critical area for extension agents, as these competencies directly influence their ability to assess and improve extension programs. Extension workers often prioritize advancing their research and evaluation skills to better connect research findings with practical outcomes (Adamsone-Fiskovica & Grivins, 2022). This underscores the necessity for comprehensive training programs aimed at enhancing the analytical skills of extension agents, particularly in evaluating the effectiveness of technology transfer initiatives. As Al Zahrani *et al*. (2017) noted, extension agents' competencies in research and evaluation are crucial for successful program implementation.

Leadership is another pivotal skill for extension agents, playing a fundamental role in community development and the facilitation of technology adoption. Effective leadership enables extension agents to guide farmers and foster collective action within farming communities. Extension agents must be skilled at understanding their leadership needs and applying leadership skills to benefit the communities they serve (Andenoro *et al*., 2013). Anderson (2013) asserts, "leadership is the most important ingredient to building a strong community." By employing robust leadership practices, extension agents can drive community engagement and promote sustainable agricultural practices among farmers.

Decision-making plays a significant role in the adoption of agricultural technologies, as frequent contact with extension agents has been shown to positively influence farmers' decision-making processes. Regular follow-up visits by extension agents enable farmers to make informed decisions regarding the adoption of new technologies, which is essential for improving productivity and sustainability (Kalogiannidis & Syndoukas, 2024; Nettle *et al*., 2022; Okori *et al.,* 2022). Access to timely and relevant information equips farmers with the necessary tools to make decisions that can lead to enhanced agricultural productivity and resilience.

Furthermore, social interaction between extension agents and farmers is vital in building trust and encouraging the acceptance of new technologies. Effective interpersonal skills, such as motivation, empathy, and active listening, are essential for extension agents to foster strong relationships with farmers. Such interactions help build trust, a critical factor in the adoption of new agricultural technologies (Lakai *et al.,* 2014). Extension agents who develop their social skills are better positioned to understand the needs of farmers and support them in overcoming challenges.

Correlation analysis

In correlation analysis, ToT and HRD when associated in group with respondent's work performance, both are found have a positive and moderate relationship with each having a value of r = 0.673 and 0.654 (Table 3).

Table 3: Relationship of TOT, HRD and extension agents' work performance

		X1	X2	Y
X1	Transfer of Technology	1	.714**	.673**
X2	Human Resource Development		1	.654**
Y	Work Performance			1

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

This underscores the need for extension agents to possess the requisite skills to efficiently and effectively enhance the capability and potential of farmers. The findings align with Mustafa et al., (2017), who confirmed a strong and positive relationship between leadership skills, social skills, technical skills, technology delivery skills, technology evaluation skills, and the work performance of agricultural extension agents. These skills are essential for extension agents to fulfill their role in building the capacity of farmers and promoting agricultural growth.

Moreover, each extension method employed has distinct characteristics, features, and properties (Baig & Aldosari, 2013). These methods vary in terms of their acceptance and effectiveness among different client groups. However, it is crucial that extension agents are proficient in a broad range of technologies to ensure that they can cater to diverse farmer needs. As highlighted by Anandajayasekeram *et al*. (2008), one of the key challenges facing agricultural extension is the insufficient preparation of extension staff, who are often not well-equipped with the necessary skills for optimal performance. Therefore, it is vital for extension agents to continuously improve their skills, update their working knowledge, and cultivate innovative approaches that can address the growing complexities in agricultural demands. This will help reduce poverty, alleviate pressures on the agricultural sector, and enhance overall productivity (Ibrahim *et al*., 2023; Antwi-Agyei & Stringer, 2021).

Additionally, the need for skill development among extension agents is further supported by recent studies that emphasize the importance of continuous professional development. According to Ibrahim *et al*. (2023), agricultural extension services are more

effective when agents are well-trained in both technical and soft skills, such as communication and leadership. This is crucial in ensuring that extension services remain relevant and responsive to the evolving needs of farmers, particularly in the face of climate change, technological advancements, and market challenges (Antwi-Agyei & Stringer, 2021).

Regression analysis

The regression analysis identified variables that significantly influence work performance. Three variables showed significant differences ($\alpha < 0.05$), namely technical skill ($\alpha = .000$), leadership skill ($\alpha = .015$), and decision-making skill ($\alpha = .000$) (Table 4). The analysis also highlighted the most influential components of extension agents' work performance. Among these, decision-making skill exhibited the largest Beta value (0.319), making it the strongest predictor of work performance compared to other skills. This finding emphasizes the critical role of extension agents in helping farmers make informed decisions, such as determining the optimal time for pruning or the appropriate amount of fertilizer needed for crops. Agricultural extension services are designed to enhance farmers' knowledge and skills regarding farming practices while fostering positive attitudes toward agricultural innovations.

Table 4: Estimated coefficient for work performance model

	B	Std. Error	Beta		
Constant	.752	.235		3.202	.002
Technical Skill (ToT)	.270	.069	.249	3.890	.000
Technology Delivery Skill (ToT)	.074	.071	.074	1.051	.294
Technology Evaluation Skill (ToT)	-.047	.058	-.046	-.813	.417
Leadership Skill (HRD)	.146	.059	.150	2.455	.015
Decision Making Skill (HRD)	.321	.070	.319	4.560	.000
Social Skill (HRD)	.090	.052	.104	1.726	.085

$R = 0.754$, $R^2 = 0.568$, Adjusted $R^2 = 0.559$, Std. Error of the Estimate = 0.445

The second-highest Beta value is for technical skills, with a value of 0.249, followed by leadership skills, which have a Beta value of 0.150. Other skills exhibit Beta values that are too small to contribute significantly to the work performance model. These findings indicate that decision-making skills, technical skills, and leadership skills collectively account for approximately 56% of the extension agents' work performance, as reflected by the adjusted R^2 value.

The adjusted R^2 value of 56% suggests that decision-making, technical skills, and leadership skills explain a substantial portion of the variance in work performance. However, approximately 44% of the variance is attributed to other factors not included in this model. This observation prompted the second phase of the study, which was qualitative in nature. Following the quantitative analysis, the findings were presented to the Department of Extension, Malaysian Cocoa Board, and interviews were conducted after a thorough explanation of the results. The qualitative findings were subsequently organized and presented in tables based on the key subject areas.

The results of this study align with previous research, confirming that technology transfer skills and human resource development skills significantly contribute to work performance at the 5% significance level (Thach *et al.,* 2008; Rezaie *et al.,* 2008; Al-Zahrani *et al.,* 2016; Motolani *et al*., 2017).

Training

Training emerged as a crucial theme from the data obtained through the Extension Services Department. The findings of this study revealed gaps in the training programs provided to extension agents, specifically highlighting that many key training elements were lacking. Respondents reported that training was initially conducted only once, upon joining the Malaysian Cocoa Board, and primarily focused on basic administrative tasks such as filing. This led to the identification of two sub-themes within the broader theme of training:

Training for Unit Leaders

During the interviews, it was noted that unit leaders from both Sabah and Sarawak have not received any training related to ToT and HRD skills reflected in this study. Despite the critical role of training in improving work performance, financial constraints have prevented these unit leaders from attending relevant training programs.

One unit leader expressed the necessity of training for enhancing extension agents' capabilities, stating:

"I do not deny the support from top management, but in terms of our need for training, it is essential for all extension agents to receive proper training. The success of the industry is highly dependent on ToT, which directly influences cocoa production and expansion. This matter should be prioritized by the Cocoa Board."

(Unit leader 1)

Furthermore, the same unit leader shared frustration regarding the lack of action on training requests:

"In writing, there is no mention of the training requirements during meetings. As subordinates, we can only request training in the Annual Work Targets, but we do not know if anyone reviews these requests because we have never received any feedback."

(Unit leader 1)

The absence of training in these areas negatively affects their work efficiency. With the proper training, unit leaders could manage workloads and handle challenges more effectively. Thus, training is a key factor in enhancing the leadership capabilities of unit leaders and improving their effectiveness in managing extension agents.

Training for Extension Agents

Training for Extension Agents in Sabah

The interview data from extension agents in Sabah highlighted the importance of training as a means of ensuring that extension agents can meet the evolving demands of their roles. Continuous training is essential in a rapidly advancing world. However, despite submitting requests for training in the Annual Work Targets, extension agents reported that no training has been provided since 2014. One extension agent shared:

"Every year, we request training as part of the Annual Work Targets, especially for new technology. I proposed a training program on the latest technology, but since 2014, we have not received any response. Another request we made was for training on delivery techniques, but we are unsure if it will be approved."

(Extension agent 1)

This demonstrates that, while extension agents are proactive in requesting training, the lack of response has hindered their professional development. Given the importance of staying current with advancements in cocoa technology, regular and relevant training is essential.

Training for Extension Agents in Sarawak

Extension agents in Sarawak supported the findings from the quantitative phase of the research and shared their experiences regarding the challenges they faced. Many of them reported learning about cocoa technology during their initial training and from senior colleagues. However, this training was conducted over five years ago, and the technological advancements in cocoa production have far surpassed the knowledge they received at that time. One extension agent explained the difficulties faced when dealing with farmers without an agricultural background:

"I used my experience as a salesman to convince farmers to start planting cocoa. I learned cocoa technology from colleagues and seniors, as well as from the basic training. Sometimes, I also learn from the farmers themselves because they have extensive experience and face unique challenges in cocoa cultivation."

(Extension agent 2)

This highlights the necessity of providing continuous training to staff, particularly when they are dealing with rapidly changing technologies. Regular training ensures that all extension agents are equipped with up-to-date knowledge and are capable of effectively supporting farmers in implementing new practices.

Leadership

Leadership – Support from Top Management

Effective leadership goes beyond supervision, encompassing various forms of support: physical, emotional, intellectual, professional, and financial. Leaders must ensure that staff and volunteers receive proper training, encouragement, recognition, and consistent supervision. They also need to provide the necessary tools and resources for their team to succeed in their roles.

Support from top management plays a vital role in the organization's success. Leaders should understand what motivates their staff and tailor their strategies to foster strong relationships. Motivation varies among individuals, and leaders must identify these motivators to develop strategies that effectively engage their team. However, the findings from interviews suggest a lack of adequate support from top management. One regional officer stated:

"There's a gap in the system, where lower levels are not adequately supported. For example, when we request training, our requests are consistently rejected. I'm not sure if the rejection is budget-related, though the budget is available. It could be a mindset issue, as the ToT aspect is often overlooked."

(Regional Officer 1)

From the researcher's perspective, this lack of support from top management aligns with the lower work performance observed among extension agents. Without proper support, staff can become demotivated, resulting in decreased work efficiency.

Leadership – Support from Middle to Lower Management

While top management has been less supportive, middle management plays a significant role in supporting lower-level staff. One regional officer explained:

"I'll continue to take care of my staff, even if their performance is not optimal. They are doing their jobs to the best of their ability."

(Regional Officer 1)

While extension agents have not received necessary training, this lack of development is largely out of their control. One unit leader remarked:

"I can't blame my staff for lacking skills when they haven't been approved for the training they need."

(Unit Leader 1)

Middle management is aware of the challenges faced by their team and recognizes their responsibility to support them. Leaders must take action to address these challenges, providing the guidance and resources needed to improve performance in the field. Clear roles and responsibilities are essential for overcoming the barriers faced by extension agents.

Leadership – Support from Extension Agents to Farmers

Extension agents are striving to develop leadership skills both within themselves and in the farmers they work with. They play a pivotal role in helping farmers adopt new technologies and manage their farms more effectively. Through their guidance, extension agents foster leadership among farmers, encouraging them to take on leadership roles within their communities.

One extension agent shared their approach:

"First, I focus on building a relationship with the farmers. Once we have a stronger connection, it becomes easier to introduce new technologies and ideas."

(Extension Agent 5)

This approach highlights the importance of an extension agent's background and experience, as they rely on past knowledge to foster trust and effective technology transfer.

Another extension agent noted the challenge of motivating farmers:

"Cocoa is a secondary crop for many of our farmers, who also grow black pepper and palm. Sometimes it's difficult to keep them engaged in cocoa cultivation. As an extension agent, it's my job to convince them to remain focused on cocoa farming."

(Extension Agent 6)

Extension agents understand their role as leaders, not only in guiding farmers but also in helping them develop their own leadership capabilities. By involving farmers in community groups, extension agents create opportunities for farmers to build leadership skills. This, in turn, contributes to their personal growth and strengthens their ability to manage agricultural activities. The effective transfer of technology plays a key role in enhancing both the farmers' leadership potential and overall human resource development.

CONCLUSIONS

This study has provided valuable insights into the challenges faced by extension agents in technology transfer and human resource development within the Malaysian cocoa sector. The absence of low and moderate competency levels in ToT and HRD highlights an opportunity for significant improvement in service delivery and work performance. The findings suggest that enhancing extension agents' perspectives and skills in these areas can lead to better job performance and increased farm productivity. However, without adequate training and management support, extension agents may struggle to perform effectively.

The study has uncovered the realities of extension work in two regions of East Malaysia, identifying key barriers to effective ToT and HRD. A critical issue is the lack of participatory extension approaches, with many extension agents operating without the necessary training to effectively disseminate technology. Ideally, they should receive comprehensive training before being assigned to their respective regions.

Furthermore, the study revealed that the number of extension agents is insufficient relative to the large number of farmers and vast coverage areas. As a result, farmers receive only occasional support, limiting the impact of extension services. Another significant barrier is the lack of leadership support at various management levels. The rejection of requested training opportunities for extension agents further weakens their ability to perform optimally. Additional challenges identified include pricing issues, logistical constraints, and disparities in the educational background of extension agents.

Given these findings, it is imperative for the Malaysian Cocoa Board to address the constraints that hinder the effectiveness of peasant agriculture. Immediate priorities include expanding access to appropriate and improved technologies by providing targeted training that aligns with the specific needs of extension agents. Recognizing the diverse working conditions across different regions, a tailored rather than a 'one-size-fits-all' approach is necessary.

To ensure that agricultural extension significantly contributes to national and regional development, extension agents must be equipped with the necessary competencies. Strengthening the connection between extension agents and farmers requires hiring well-trained professionals with expertise in extension methodologies, communication, technical knowledge, marketing, and management. Additionally, regular in-service training programs should be implemented to continuously enhance the knowledge, skills, and attitudes of extension agents, enabling them to meet the evolving demands of the sector.

The extension system must also remain adaptable to emerging challenges, such as conducting adaptive research, engaging with diverse farmer groups, and developing relevant extension materials. Capacity building in both ToT and HRD is crucial for extension agents to effectively transfer technology to farmers, particularly in the cocoa sector. Finally, strong leadership within the Malaysian Cocoa Board is essential for ensuring the success of extension initiatives. As the core of the organization, MCB's leadership must demonstrate credibility, commitment, and unwavering support for its workforce. A leadership approach that prioritizes capacity-building, resource allocation, and strategic decision-making will ultimately empower extension agents to drive sustainable cocoa development in Malaysia.

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