

Impact of Agricultural Extension Services on Cacao Yield Improvement in Monkayo, Davao DE ORO: Policy Framework for Strengthening the Local Cacao Industry

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ABSTRACT

This Study Assesses the Impact of Agricultural Extension Services on Cacao Yield Improvement in Monkayo, Davao de Oro, Philippines, Using a Quantitative Descriptive Research Design. It Examined Extension Interventions Across Four Dimensions: Cacao Production, Environmental Management, Social Dynamics, and Marketing Support. Findings Reveal that Farmers Perceive a Moderate Impact of Extension Services in All Areas. Production Interventions Moderately Improved Yield, Plant Protection, and Post-Harvest Practices, While Environmental, Social, and Marketing Initiatives Moderately Enhanced Soil Fertility, Climate Adaptation, Networking, Group Management, Income Generation, and Market Access. A Strong Positive Correlation ($R = 0.747$, $P < 0.001$) Indicates that Consistent, High-Quality Extension Support Significantly Contributes to Productivity Improvement. However, Survey Responses Revealed that Past Training Activities, Field Demonstrations, and Technical Visits Were Not Institutionalized, Resulting in One-Time Interventions that Failed to Build Lasting Capacity. This Discontinuity Weakened Farmer Organizations, Reduced Participation, and Limited Coordination with Government Programs. Many Farmers Abandoned Cacao, Replaced It with Other Crops, or Cut Down Existing Trees Due to the Lack of Updated Practices, Production Support, and Market Information. Previously Distributed Processing Equipment Also Deteriorated, Halting Fermentation, Drying, and Processing Initiatives that Once Provided Income. Based on These Findings, Policy Recommendations Include Enacting a Municipal Ordinance to Institutionalize Continuous Cacao Extension Services, Establishing a Municipal Cacao Farmers' Federation to Unify Associations, and Developing a Unified Municipal Cacao Development Roadmap. These Measures Aim to Sustain Cacao Production, Address Farmers' Shared Challenges, Enhance Capacity, Restore Value-Adding Activities, and Build a Resilient, Market-Ready Cacao Sector.

Keywords: Agricultural Extension Services, Cacao Production, Yield Improvement, Farmer Development, Agricultural Policy, Sustainable Farming, Monkayo, Davao de Oro

INTRODUCTION

Background of the Study

Cacao, scientifically known as *Theobroma cacao*, is a high-value perennial crop widely recognized for its economic importance, particularly among smallholder farmers in developing countries (Admin, 2019; Villason & Olguera, 2020). As global demand for chocolate continues to rise, improving cacao production and productivity has become increasingly important (Cacao Industry Strategic Science and Technology Plans, 2024). Globally, cocoa production reached approximately 6 million tons in 2022, with West African countries dominating the market, although price volatility continues to affect farmers' income and stability (Bispo et al., 2025; Asiedu, 2024).

In the Philippines, cacao was introduced during the Spanish colonial period and has since become an emerging agricultural commodity, with Mindanao serving as the primary production area due to its favorable climate and

soil conditions (Isip, 2022; Gonzales et al., 2024). Despite government initiatives to promote cacao farming, challenges such as low productivity, limited access to technology, and inadequate farmer knowledge persist (Agsalud, 2023). These issues are evident in municipalities like Monkayo, Davao de Oro, where cacao farming is a major source of livelihood for smallholder farmers.

Agricultural extension services help address these challenges by providing technical assistance, training, and access to farm inputs, thereby improving productivity and the adoption of modern farming practices (Aniagyei et al., 2024). In Monkayo, various programs and interventions have been implemented through government and partner agencies to enhance cacao production and post-harvest processing. However, cacao yields in the area remain below potential due to factors such as pests, diseases, and limited technical knowledge among farmers.

Given these conditions, there is a need to assess the effectiveness of agricultural extension services in improving cacao yield in Monkayo. This study aims to evaluate the impact of these services on farmers' productivity and identify areas for improvement.

In this study, cacao yield improvement is measured based on farmers' perceived changes in productivity, including improvements in production practices and post-harvest outcomes, rather than direct measurement of yield per hectare. This approach is adopted due to the variability in farm records and the reliance on self-reported data among smallholder farmers, which is more practical and accessible in the study area. The findings will serve as a basis for strengthening extension programs, guiding policy development, and enhancing sustainable cacao production in the municipality.

Theoretical Lens

This study on cacao yield improvement in Monkayo, Davao de Oro is anchored on Everett Rogers' (1962) Diffusion of Innovation (DOI) Theory. The DOI framework explains how agricultural innovations, such as improved cacao varieties and sustainable farming practices, are adopted and implemented by farmers. It categorizes farmers into adopter groups, innovators, early adopters, early majority, late majority, and laggards, and examines how perceived attributes of innovations, including relative advantage, compatibility, complexity, trialability, and observability, influence the rate of adoption.

This framework provides a structured basis for analyzing how agricultural extension services facilitate the dissemination of innovations and support the development of recommendations to enhance productivity and promote sustainable cacao farming in the locality.

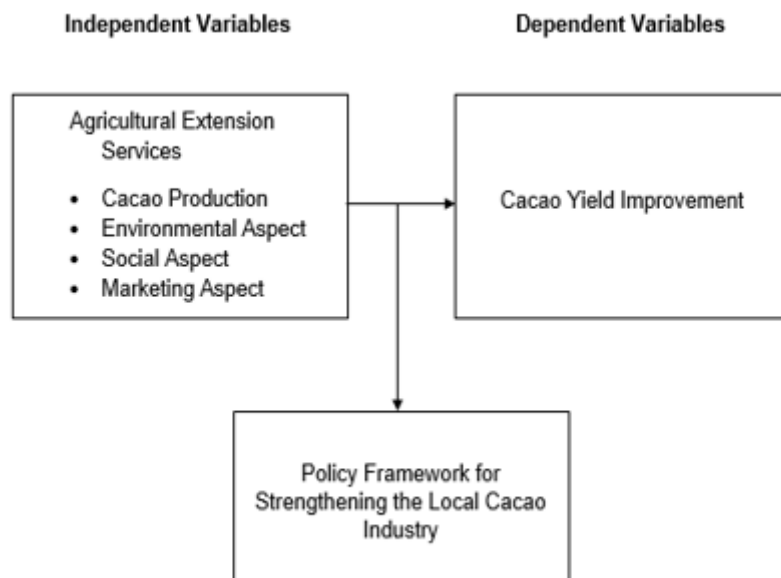
Conceptual Framework

This study is anchored on a conceptual framework that illustrates the relationship between Agricultural Extension Services and Cacao Yield Improvement in Monkayo, Davao de Oro. It identifies key factors such as cacao production techniques, environmental sustainability, social dynamics within farming communities, and effective marketing strategies, which influence farmers' adoption of innovations and farming practices.

Production techniques can improve yields, sustainable practices protect the environment, social engagement facilitates knowledge sharing, and marketing incentives encourage enhanced productivity. This framework examines how these factors collectively contribute to improving cacao yields and supporting sustainable local agriculture.

Figure 1 illustrates how Agricultural Extension Services impact cacao yield improvement and inform a policy framework aimed at strengthening the local cacao industry. The model provides guidance for research and interventions to optimize cacao cultivation, promote sustainability, and enhance farmer livelihoods in Monkayo, Davao de Oro.

Figure 1: Conceptual Framework of the Study



Research Objectives

The overall objective of this study is to gain a deeper understanding of the impact of agricultural extension services on cacao yield improvement in Monkayo, Davao de Oro, and to serve as a basis for developing a policy framework aimed at strengthening the local cacao industry. Specifically, this study seeks to evaluate how extension services contribute to enhancing cacao production, environmental sustainability, social development, and market access among farmers.

This study will be conducted to provide relevant information on the effectiveness of agricultural extension services in improving cacao yield and supporting farmers’ productivity. It also aims to examine the relationship between extension interventions and yield outcomes, as well as to generate insights that may guide local policymakers and stakeholders in improving extension programs for the cacao sector.

Specifically, the study intends to achieve the following objectives:

1. To determine the demographic profile of cacao farmers in Monkayo, Davao de Oro, in terms of:
 - 1.1 Age;
 - 1.2 Gender;
 - 1.3 Educational Attainment
 - 1.4 Farmers’ Level of Income; and
 - 1.5 Membership in Organization;
2. To assess the impact of agricultural extension services on cacao yield improvement in Monkayo, Davao de Oro, in terms of:
 - 2.1 Cacao Production;
 - 2.2 Environmental Aspects;
 - 2.3 Social Impact; and

2.4 Marketing Impact

3. To determine the relationship between agricultural extension services and cacao yield improvement in Monkayo, Davao de Oro.

METHODOLOGY

Research Design

This study will use a quantitative research design, specifically a descriptive-correlational approach, to examine the impact of agricultural extension services on cacao yield improvement in Monkayo, Davao de Oro. This design aims to determine and analyze the relationship between the extent of agricultural extension services received by farmers and their corresponding cacao yield outcomes.

A descriptive-correlational study is conducted to describe the characteristics of respondents and examine the relationship between variables without manipulating them. In this study, the descriptive component will present the demographic and socio-economic profile of cacao farmers, while the correlational aspect will assess the association between agricultural extension services and cacao yield improvement. This design is widely used in agricultural and social research to evaluate how different factors are related and influence outcomes.

This research design is expected to provide valuable insights into several key areas. It will offer a clear understanding of the farmers' profiles, the level of access to and utilization of agricultural extension services, and the current status of cacao production in the municipality. Moreover, it will identify the relationship between extension services and yield improvement, highlighting areas where interventions are effective or need enhancement. The findings will serve as a basis for improving extension programs, guiding policy formulation, and developing strategies to enhance cacao productivity and farmer well-being in Monkayo, Davao de Oro.

Population and Sample Size

Through the cooperation of the Office of the Municipal Agriculturist (OMAg) of Monkayo and local farmer associations, the research respondents were identified and selected for this study. The respondents consisted of active cacao farmers in Monkayo, Davao de Oro, who were assessed based on specific inclusion criteria set by the researcher.

The study utilized a purposive sampling technique, a non-probability sampling method where participants are selected based on defined characteristics relevant to the research objectives (Kassiani, 2022). The population of the study includes cacao farmers who are: (1) active and registered in Monkayo, (2) recipients of agricultural extension services, and (3) within the age range of 20 to 65 years old. This ensured the inclusion of farmers with sufficient experience and direct involvement in cacao production, allowing for reliable and meaningful data.

Farmers who do not cultivate cacao, have not received any agricultural extension services, or are no longer active in farming, were excluded from the study. This sampling approach enables the researcher to gather focused insights on the impact of agricultural extension services on cacao yield improvement, ensuring that the data collected are relevant and aligned with the objectives of the study.

Research Instrument

This study will utilize a modified questionnaire adapted from Shangshon et al. (2023), titled Impact of Agricultural Extension Services on Cereal Production among Rural Farmers in Bhutan. The instrument was distributed as printed survey papers to ensure accessibility for cacao farmers in Monkayo, Davao de Oro.

The questionnaire consists of three parts: Part I gathers demographic information, including age, gender, education, farming experience, and farm size. Part II assesses farmers' participation in agricultural extension services, such as workshops, trainings, and use of program resources, using a 5-point Likert scale from "Strongly Disagree" to "Strongly Agree." Part III evaluates the perceived impact of these services on cacao yield, including improvements in farming practices and production outcomes, also using a 5-point Likert scale.

To ensure content validity, the modified questionnaire was reviewed and evaluated by subject matter experts, including the research adviser and professionals in agricultural extension. Their feedback was incorporated to refine the clarity, relevance, and appropriateness of the items.

Together, this structured instrument provides quantitative data to analyze the relationship between agricultural extension participation and cacao yield improvement, supporting recommendations for enhancing local extension programs.

Data Collection Procedure

This study used primary data collected from cacao farmers in Monkayo, Davao de Oro. The list of potential respondents was coordinated through the Office of the Municipal Agriculturist (OMAg) and local farmer associations. Necessary approvals were obtained from the MonCAST Research Office, the instructor, adviser, and dean, as well as formal permission from OMAg to conduct the study.

Validated printed questionnaires were distributed to the selected farmers, and the researchers personally collected the completed forms to ensure completeness and accuracy. The respondents' demographic profiles, participation in agricultural extension services, and perceived impact on cacao yield were presented using descriptive statistics. Responses were analyzed using Frequency and Percentage, Mean and Median, and Pearson's *r* correlation, while a Likert scale was employed to interpret levels of participation and impact. The findings and recommendations were based on this statistical analysis, ensuring the reliability and validity of the study.

Statistical Treatment

The study will employ descriptive and correlational statistical treatments to analyze the data collected from the questionnaires. Descriptive statistics, including frequency counts, percentages, mean, and median, will be used to summarize the demographic profile of the cacao farmers, their level of participation in agricultural extension services, and their cacao yield outcomes.

Additionally, Pearson's correlation coefficient (*r*) will be used to examine the relationship between farmers' participation in agricultural extension services and cacao yield improvement. This analysis will determine the strength and direction of the association between extension service involvement and yield outcomes, providing insights into the effectiveness of these programs in enhancing cacao production in Monkayo.

Responses from the Likert-scale items were aggregated by computing the weighted mean for each indicator and dimension. The overall mean scores were interpreted using the following scale:

Table 1. Parametric Description Limits on Impacts of Extension Service Program on Cacao Production Yield Improvement

Rating Scale	Parameter Limit	Level	Interpretation
5	4.21-5.0	Very High	The Yield Improvement is Very High.
4	3.41-4.2	High	The Yield Improvement is High.
3	2.61-3.4	Moderate	The Yield Improvement is Moderate.
2	1.81-2.6	Low	The Yield Improvement is Low.
1	1.0-1.8	Very Low	The Yield Improvement is Very Low.

RESULTS AND DISCUSSIONS

This chapter presents and discusses the results of the study on the impact of agricultural extension services on cacao yield improvement in Monkayo, Davao de Oro. The findings were gathered through survey questionnaires distributed to selected cacao farmers, and data were analyzed using accepted statistical tools and principles.

The presentation of results includes descriptive and correlational analyses, displayed through tables and charts. The discussion is organized into categories such as the demographic profile of respondents, participation in agricultural extension activities, and the observed impact on cacao yield. These results highlight patterns, trends, and relationships among variables, illustrating how involvement in extension services is associated with improvements in cacao production.

The findings of this study provide concrete information for policymakers, agricultural agencies, and local stakeholders. They serve as a foundation for strategic planning and decision-making aimed at strengthening the local cacao industry, enhancing the effectiveness of agricultural extension services, and supporting sustainable cacao production in Monkayo.

The Profile of the Respondents

The collected data illustrate the respondents' demographic profile, which has been classified into age, gender, educational attainment, level of income, and membership in agricultural or community organizations.

Table 2. Age of Respondents

Age Bracket	Frequency (n)	Percentage of Total (%)
20–24	6	3.70%
25–41	45	27.78%
42–61	78	48.15%
62–76	33	20.37%
Total	162	100.00%

The majority of respondents fall within the 42–61 age group (48.15%), followed by 25–41 years (27.78%), and 62–76 years (20.37%), while only 3.70% are aged 20–24. This indicates that cacao farming in Monkayo is largely managed by middle-aged individuals who likely possess substantial farming experience.

This pattern is consistent with agricultural studies showing that farming populations are often dominated by older or middle-aged individuals due to youth migration and limited interest in agriculture (Possú et al., 2021). The implication is that extension programs must consider age-related differences in learning preferences and technology adoption, particularly in encouraging youth participation.

Table 3. Gender of Respondents

Gender	Frequency (n)	Percentage of Total (%)
Female	98	60.49%
Male	64	39.51%
Total	162	100.00%

The findings reveal that female farmers (60.49%) outnumber male farmers (39.51%), indicating strong female participation in cacao production.

This aligns with existing literature emphasizing the increasing role of women in agriculture, particularly in smallholder systems (Visscher et al., 2024). Studies suggest that women actively participate in farm management

and extension activities; however, they may face constraints in access to resources. Thus, gender-responsive extension strategies remain important to ensure equitable access and participation.

Table 4. Educational Attainment of Respondents

Educational Attainment	Frequency (n)	Percentage (%)
No Formal Education	11	6.79 %
Elementary	37	22.84 %
High School	81	50.00 %
College	33	20.37 %
Total	162	100.00 %

Most respondents have completed high school (50.00%), followed by elementary (22.84%) and college education (20.37%), while 6.79% have no formal education.

This suggests that the majority of farmers possess basic educational backgrounds that may support understanding of extension materials. Similar findings in agricultural research indicate that education level is associated with better comprehension of recommended practices, although it does not automatically guarantee adoption (Iskandar et al., 2020).

Table 5. Farmers' Level of Income

Income Level	Frequency (n)	Percentage (%)
Poor	19	11.73
Low Income	74	45.68
Moderate Income	69	42.59
Total	162	100.00

The majority of farmers fall under low-income (45.68%) and moderate-income (42.59%) categories, with only 11.73% classified as poor.

These results are consistent with studies indicating that smallholder farmers often operate within limited financial capacity (Laura et al., 2023). This may influence their ability to adopt technologies promoted through extension services, as financial constraints can limit access to inputs and innovations.

Table 6. Membership Organization of Respondents

Organization Membership	Frequency (n)	Percentage (%)
Association	84	51.85
Cooperative	76	46.91
PCA	1	0.62
CBO	1	0.62
Total	162	100.00

Most respondents are members of associations (51.85%) and cooperatives (46.91%).

This finding aligns with literature suggesting that farmer organizations help facilitate access to extension services, training, and market linkages (Simelane et al., 2019). Membership in such groups is often associated with improved information sharing and collective learning among farmers.

Impact of Agricultural Extension Services in Monkayo, Davao de Oro, on the Cacao Yield Improvement

As highlighted in this study, the level and effectiveness of agricultural extension services provided to cacao farmers in Monkayo, Davao de Oro, have been a focus of considerable attention, particularly in understanding their influence on farm productivity. Key dimensions examined include cacao production practices, environmental management, social engagement, and marketing support. One important issue observed is the degree to which farmers adopt modern techniques promoted through these services, while another consideration is the impact of extension programs on improving cacao yield and overall farm performance.

Table 7. Cacao Production

Statements	Mean	SD	Level
Increase yield	2.75	0.94	Moderate
Improve plant protection	2.81	0.95	Moderate
Improve storage of cacao beans	2.86	0.95	Moderate
Improve cacao farming	3.04	0.98	Moderate
Overall Total	2.86	0.96	Moderate

The results indicate a moderate perceived impact of extension services on cacao production (overall mean = 2.86). Improvements in yield, plant protection, storage, and farming practices were all rated at a moderate level.

These findings are consistent with studies (Aniagyei et al., 2024) showing that extension services contribute to improved farming practices, although the level of impact may vary depending on the intensity, quality, and consistency of service delivery. The moderate ratings suggest that while farmers recognize benefits, there may still be gaps in implementation or accessibility.

Table 8. Environmental Aspects

Statements	Mean	SD	Level
Improve soil fertility for cacao	3.04	1.10	Moderate
Adoption of adaptation measures to climate change	2.81	0.98	Moderate
Adoption of mitigation measures for climate change	2.93	1.12	Moderate
Overall Total	2.93	1.07	Moderate

The environmental dimension also received a moderate rating (overall mean = 2.93), particularly in soil fertility improvement and climate adaptation practices. This aligns with existing research indicating that extension services can enhance awareness of sustainable practices. However, adoption levels may remain moderate due to constraints such as resource availability, climate risks, and limited technical support. This finding is supported by Valeria (2020), who emphasized that sustainable farming practices can improve environmental outcomes and productivity, although adoption often depends on farmers' access to resources and technical support.

Table 9. Social Impact

Statements	Mean	SD	Level
Improve networking among farmers	3.03	1.04	Moderate
Increase the number of farmers' groups in the community	3.15	1.10	Moderate

Improve farmers' group management	3.19	1.08	Moderate
Overall Total	3.12	1.07	Moderate

The social dimension recorded the highest mean (3.12), though still within the moderate level.

This suggests that extension services are associated with improved farmer networking, group formation, and organizational management. Similar findings in the literature highlight that extension programs often strengthen social capital among farmers, which can support knowledge sharing and collaboration. This is supported by Simelane et al. (2019), who found that extension initiatives and farmer organizations enhance collective action, knowledge-sharing, and farmer participation.

Table 10. Marketing Impact

Statements	Mean	SD	Level
Increase income	2.88	1.03	Moderate
Set a price for cacao beans	2.90	1.06	Moderate
Negotiate a price for cacao beans	2.93	1.06	Moderate
Find a market for cacao beans	2.98	1.10	Moderate
Total	2.92	1.06	Moderate

Marketing-related aspects were also rated as moderate (overall mean = 2.92), indicating that farmers perceive some support in income improvement, price-setting, negotiation, and market access.

Previous studies suggest that marketing support is often one of the weaker components of extension services, especially in developing regions. The moderate results in this study reflect similar challenges, such as limited market integration and price volatility. This is supported by Camillone et al. (2020), who noted that many extension programs focus more on production while giving less emphasis to marketing strategies, value addition, and market linkage development.

Relationships Between Agricultural Extension Services and Cacao Yield

Variables	r-square	r-value	p-value	Interpretation	Decision
Agricultural Extension Services	0.56	0.747	0.001	Strong Positive Correlation	Reject the Null Hypothesis
Cacao Yield					

The relationship between different dimensions of agricultural extension services and cacao yield improvement is an important area of analysis in this study. This section introduces the examination of how extension programs in cacao production, environmental management, social engagement, and marketing support are associated with changes in cacao yield. Understanding these relationships provides insight into which aspects of extension services most strongly affect farmers' productivity and serves as a basis for developing targeted strategies to improve cacao production in Monkayo, Davao de Oro.

Table 11. Relationships Between Agricultural Extension Services and Cacao Yield

The Pearson correlation analysis shows a strong positive relationship between agricultural extension services and cacao yield improvement ($r = 0.747, p < 0.001$).

This indicates that higher levels of participation in extension services are associated with higher reported yield improvement among farmers. The coefficient of determination ($r^2 = 0.56$) suggests that approximately 56% of the variation in perceived yield improvement is related to variation in extension service participation.

These findings are consistent with previous studies that report positive associations between extension services and agricultural productivity. This is supported by Aniagyei et al. (2024), who found that farmers who actively participate in extension programs tend to report improved farming practices and better productivity outcomes.

However, it is important to note that correlation does not imply causation. While the results show a strong relationship, they do not confirm that extension services directly cause yield improvement, as other factors, such as farm management practices, environmental conditions, and access to inputs, may also influence outcomes (Boansi et al., 2024).

CONCLUSIONS AND RECOMMENDATIONS

Cacao farmers in Monkayo, Davao de Oro, operate in a changing agricultural environment where productivity depends on both farm practices and access to support services. Successfully managing cacao farming requires adopting new techniques, addressing environmental challenges, engaging in community networks, and responding to market needs. Agricultural extension services provide farmers with the knowledge, skills, and resources needed to improve yields and maintain sustainable farm operations.

Conclusions

The findings of this study reveal that agricultural extension services have a moderate impact on cacao yield improvement among farmers in Monkayo, Davao de Oro. Interventions in production, environmental management, social engagement, and marketing collectively contributed to improving farming practices, although opportunities remain to further increase productivity.

Specifically, improvements in cultivation techniques, soil management, and climate adaptation measures moderately influenced cacao yields. Social interventions supported farmer networking, group management, and collective action, while marketing support aided farmers in pricing, income generation, and accessing markets, though these effects were also moderate.

Demographic and socio-economic factors, including age, education, income level, and membership in agricultural or community organizations, affected farmers' ability to adopt innovations and benefit from extension services. The positive and significant relationship between extension services and cacao yield underscores the importance of these programs in supporting farm productivity and addressing yield variability.

These findings highlight the complex interaction between extension support, farmer characteristics, and cacao productivity, emphasizing the need for targeted, context-specific strategies to strengthen extension programs and sustain improvements in the local cacao industry.

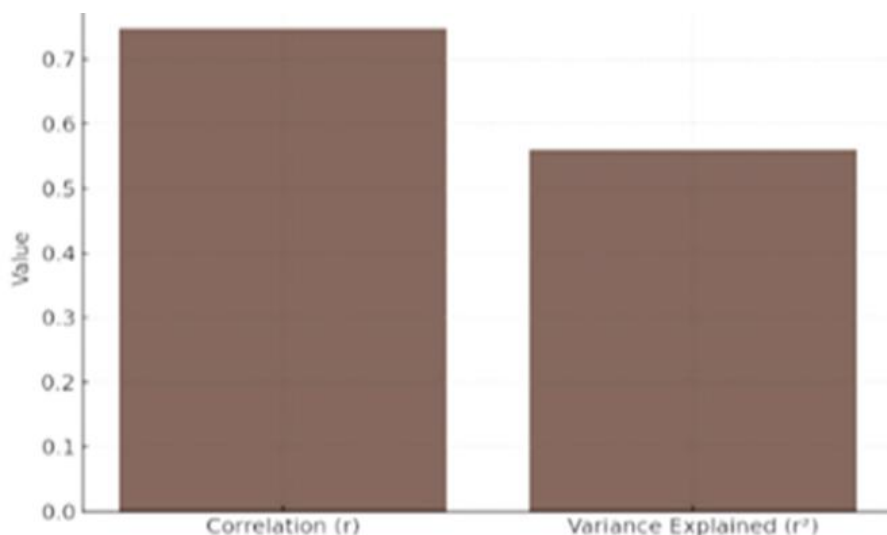


Figure 1. Relationship Between Extension Services and Cacao Productivity

Recommendations

Based on the findings and conclusions drawn, the following recommendations are offered:

1. Strengthen Production and Technical Capacity of Local Government Units (LGUs):

In coordination with the Department of Agriculture (DA) and partner organizations, it should institutionalize continuous cacao extension programs. This includes regular technical trainings, quarterly farm visits, monitoring activities, and the provision of updated production technologies, climate-resilient practices, and postharvest methods. Farmers should actively participate in these programs to adopt improved cultivation, pest management, soil fertility, and postharvest practices. Future studies may explore the long-term effects of sustained extension services on cacao productivity and farmer livelihoods.

2. Improve Organization and Social Capital

LGUs and cooperatives should establish a Municipal Cacao Farmers' Federation to unify all cacao associations and cooperatives in Monkayo. This federation would facilitate coordination with extension workers, government agencies, and the private sector. Farmers are encouraged to engage actively in the federation to strengthen networking, collective decision-making, and access to training and market opportunities. Future research could examine the effectiveness of such federations in improving organizational capacity and collaborative productivity.

3. Support Marketing and Value-Adding Activities

LGUs should ensure the rehabilitation, modernization, and maintenance of existing cacao processing facilities. This should be coupled with guidance on fair pricing, market access, and value chain integration. Farmers are encouraged to utilize these facilities and adopt recommended postharvest practices to improve bean quality and income generation. Future studies may investigate how improved processing and marketing support influence farmer profitability and sector sustainability.

4. Institutionalize Policies and Roadmap Development

These recommendations should be formalized through a municipal ordinance to guarantee continuous extension services, secure dedicated annual funding, and provide institutional backing for all cacao-related interventions. A unified municipal cacao development roadmap should be developed to integrate production, postharvest, marketing, and value chain strategies. The roadmap should include a monitoring system to track training outcomes, facility usage, and yield improvements.

5. Comprehensive Cacao Sector Development

By integrating ongoing technical support, strengthening organizations, establishing market connections, and securing policy support, Monkayo can develop a resilient cacao sector. This approach enhances farmers' skills, restores productivity, and aligns with sustainable development goals such as poverty reduction, food security, decent work, and rural economic growth.

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