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Design of *Rorak*-Based Farm Sanitation Extension for the Control of Cocoa Pod Borer in Biru-Biru District, Deli Serdang Regency

Shevyra Nazwa Sayyidinna, Mukhlis Yahya, Mukhtar Yusuf
Politeknik Pembangunan Pertanian Medan, Indonesia
shevyranazwa0906@gmail.com; mukhlisyahya03@gmail.com

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Abstract

Cocoa pod borer (CPB) infestation remains a major constraint on cocoa productivity in Biru-Biru District, Deli Serdang Regency. Limited farm sanitation, particularly the accumulation of discarded cocoa pod husks in plantations, may create conditions conducive to pest development and spread. This study aimed to develop and evaluate a *rorak*-based farm sanitation extension design by identifying the underlying problem, formulating extension objectives, determining target participants, assessing farmers' perceptions of the design's effectiveness, and measuring innovation adoption. The study employed an evaluative approach involving 38 cocoa farmers from Candi Rejo and Kuala Dekah villages. Data were collected through questionnaires and analysed using Likert-scale scoring. The extension design received an average effectiveness score of 83.7%, placing it in the very effective category. Furthermore, 17 farmers (44.74%) adopted the *rorak*-based sanitation innovation, exceeding the predetermined target of 16 adopters. These findings indicate that a systematically designed extension programme can promote farmer acceptance and adoption of *rorak*-based farm sanitation. The study contributes a context-specific extension model that can support farmer participation in CPB management and facilitate the adoption of improved sanitation practices in cocoa plantations.

Keywords: Agricultural Extension; Cocoa Pod Borer; Farm Sanitation; Innovation Adoption; *Rorak*

INTRODUCTION

Cocoa (*Theobroma cacao* L.) is one of Indonesia's strategic plantation commodities, contributing to the national economy through agricultural production, employment generation, farmers' income, and agricultural exports. In 2024, cocoa plantations covered approximately 1.37 million hectares and produced around 617.11 thousand tons of dry cocoa beans, with smallholder plantations accounting for the overwhelming majority of national production (Badan Pusat Statistik, 2024). This condition indicates that the sustainability of national cocoa production is strongly dependent on the capacity of smallholders to manage both their crops and plantation environments. North Sumatra is one of Indonesia's important cocoa-producing regions, with approximately 53,441 hectares of cocoa plantations and 38,475 tons of dry cocoa bean production in 2024 (Statistik Tanaman Perkebunan, 2024). Therefore, improving productivity at the regional level is essential for maintaining the contribution of cocoa to national agricultural production.

Deli Serdang Regency is one of the areas contributing to cocoa production in North Sumatra. The regency has approximately 2,666 hectares of cocoa plantations with a total production of about 2,072 tons, resulting in productivity of only around 0.7 tons per hectare (BPS Kabupaten Deli Serdang, 2025). This condition is particularly concerning because cocoa production has declined from approximately 3,814 tons in 2021 and 3,801 tons in 2022. Biru-Biru District has considerable potential for cocoa development, with approximately 252 hectares of cocoa plantations and production of 135 tons; however, its productivity remains at only about 0.5 tons per hectare (BPS Kabupaten Deli Serdang, 2025). The discrepancy between available plantation resources and actual production suggests that cocoa cultivation in the area continues to face technical and management constraints that need to be addressed through appropriate interventions.

One of the factors that may reduce cocoa productivity is pest infestation, particularly by the cocoa pod borer (CPB), *Conopomorpha cramerella* Snellen. CPB is considered an important cocoa pest because its larvae develop inside cocoa pods and damage the internal tissues and beans, consequently reducing both yield and bean quality (Suherlina et al., 2020). The severity of CPB infestation is influenced by several interacting factors, including environmental conditions, fruit availability, plant characteristics, and crop management practices. Microclimatic conditions within plantations may support pest development, while continuous availability of cocoa pods can provide a persistent food source for the pest population (Yudiansyah et al., 2021). In addition, plant age and genetic characteristics may affect the susceptibility of cocoa plants to CPB infestation (Soesilo et al., 2009).

The problem becomes more complex when plantation maintenance practices are not adequately implemented. Practices such as canopy pruning, regular harvesting, field sanitation, and removal of crop residues can influence the suitability of plantation environments for CPB development (Suherlina et al., 2020). Field conditions in Biru-Biru District indicate that post-harvest pod husks, pruning residues, and infested pods may remain unmanaged within cocoa-growing areas. Such residues can contribute to the persistence of pest populations and increase the risk of subsequent infestations. Poorly maintained cocoa plantations have been reported to experience CPB infestation rates as high as 72.8–81% (Yudiansyah et al., 2021). In contrast, integrated pest management practices have been associated with substantially lower infestation percentages and relatively low infestation intensity (Febriyanti et al., 2021).

These conditions indicate that improving plantation sanitation should not rely solely on information dissemination concerning CPB risks. Smallholders require practical innovations that connect sanitation principles with simple, affordable, and feasible field practices. Sanitation constitutes an important cultural control component intended to eliminate sources of pest development and disrupt pest life cycles (Wati, 2022). The management of plant residues is particularly important because untreated pods and other plant materials may create conditions that facilitate the continuation of pest development (Sadori et al., 2023). Consequently, an effective extension intervention should not merely increase farmers' knowledge but should also encourage behavioral changes that enable them to implement sanitation practices consistently and sustainably.

One potentially appropriate approach is the use of rorak as a facility for organic matter management and plantation sanitation. A rorak is a soil pit constructed within agricultural land to collect organic materials while simultaneously supporting soil and water conservation (Tarigan et al., 2024). Organic materials such as leaves, pruning residues, weeds, and cocoa pod husks can be placed inside the pits and allowed to decompose, thereby facilitating more systematic management of plantation residues (Asrizal et al., 2022). In the context of CPB management, infested cocoa pods and pod residues can be buried within rorak pits so that potential pest sources are removed from the plantation surface (Ndae et al., 2024). Beyond its sanitation function, rorak can also improve water infiltration and contribute to soil moisture conservation, particularly under conditions of limited rainfall (Direktorat Jenderal Perkebunan, 2022).

The research gap lies in the limited integration of rorak-based sanitation as a CPB management innovation into a systematic agricultural extension design specifically adapted to cocoa smallholders in Biru-Biru District. Previous studies have demonstrated the importance of plantation maintenance and integrated pest management in reducing CPB infestation (Febriyanti et al., 2021). Other studies have primarily discussed rorak as a technique for soil and water conservation and organic matter management (Tarigan et al., 2024). However, these perspectives have not been sufficiently integrated into an extension design that considers the specific characteristics, needs, and field conditions of cocoa smallholders in Biru-Biru. Furthermore, extension planning requires a clear identification of the gap between existing conditions and desired conditions before an intervention can be formulated appropriately (Darmawan et al., 2021). This creates a need for an approach that connects the technical problem of poor plantation sanitation with a structured and context-specific extension strategy.

This study is grounded in agricultural extension planning, which positions the identification of problems and target-group needs as fundamental stages in designing an intervention. Extension problems can be understood as discrepancies between actual farming conditions and the conditions expected according to technological recommendations or desired practices (Saputra et al., 2025). Agricultural extension, therefore, functions as a non-formal educational process that enables farmers to develop the knowledge, skills, and attitudes required to address farming problems more independently (Sadik & Syafruddin, 2024). The formulation of extension objectives in this study adopts the SMART principles—Specific, Measurable, Actionary, Realistic, and Time frame—to ensure that the expected changes are clearly defined and measurable. The ABCD framework—Audience, Behavior, Condition, and Degree—is also applied to specify the target group, expected behavioral change, conditions under which the behavior should occur, and the expected level of achievement.

The implementation of an extension program must also reflect the characteristics and learning needs of its target group. Appropriate target identification allows extension materials and approaches to be aligned with farmers' actual needs and increases the potential for innovation acceptance (Anwarudin et al., 2021). Discussion is employed to establish two-way communication through which farmers can exchange experiences and express problems encountered in their farming practices (Nurfa et al., 2024). A demonstration method is incorporated because direct observation of an innovation can improve farmers' understanding and confidence in applying a new practice (Atonis et al., 2021). Farm visits further allow extension workers to observe actual field conditions and provide more contextual technical guidance. These approaches correspond with the broader role of agricultural extension workers as information providers, facilitators, motivators, and advisors who support farmers in adopting appropriate agricultural innovations (Gunade & Sagita, 2024).

The novelty of this study lies in the integration of rorak-based plantation sanitation, SMART and ABCD objective-setting principles, and context-specific agricultural extension strategies for CPB management among cocoa smallholders in Biru-Biru District. Rather than positioning rorak solely as a soil and water conservation technique, this study conceptualizes it as a practical sanitation facility for managing cocoa residues and reducing potential sources of CPB development. The extension design further integrates the selection of materials, methods, media, activity volume, location, timing, and cost according to the characteristics and needs of the target farmers. The proposed materials cover CPB identification, the importance of plantation sanitation, and the procedures for constructing and utilizing rorak. Folders and flip charts are employed as supporting media to present information systematically and enable farmers to review key messages after the extension session (Priyono et al., 2024). Thus, the proposed intervention moves beyond technology introduction toward an integrated process of innovation acceptance and application.

Accordingly, this study focuses on designing an agricultural extension program based on rorak-supported plantation sanitation for CPB management in Biru-Biru District, Deli Serdang Regency. Specifically, the study aims to analyze the identification of the extension problem, formulate extension objectives and target groups, and develop an extension activity design covering materials, methods, media, activity volume, location, timing, and cost. The study also examines farmers' acceptance of the proposed extension design and identifies the number of farmers who subsequently implement rorak-based sanitation practices. Evaluation is essential because the effectiveness of an extension program should be assessed not only through the implementation of activities but also through behavioral changes and actual innovation adoption among the target group (Adhriana et al., 2025). Through this approach, the study is expected to provide a practical and context-specific extension design that supports improved plantation sanitation and CPB management in smallholder cocoa plantations in Biru-Biru District.

METHODS

This study employed an evaluative research design to assess the effectiveness of an agricultural extension plan promoting rorak-based farm sanitation as a strategy for controlling Cocoa Pod Borer (CPB) in Biru-Biru District, Deli Serdang Regency, North Sumatra, Indonesia. The evaluative approach was used to systematically collect, analyze, and assess information concerning the implementation of the extension program, particularly its effectiveness and aspects requiring improvement. The evaluation focused on seven components of the extension design: extension materials, methods, media, volume, location, timing, and cost. The study was conducted from March to May 2026 in Biru-Biru District, which was purposively selected based on its cocoa development potential and the occurrence of CPB infestation.

The research design consisted of problem identification, formulation of extension objectives, determination of target farmers, development of the extension plan, implementation, and evaluation. Problem identification employed the 5W1H approach to systematically examine the nature of the problem, affected actors, timing, location, causes, and proposed solution. Extension objectives were formulated using the SMART and ABCD principles in accordance with the Regulation of the Minister of Agriculture of the Republic of Indonesia Number 47/Permentan/SM.010/9/2016. The evaluation indicators comprised economic benefits, local compatibility, ease of application, availability of resources, risk and safety, and immediate applicability for extension materials; method suitability, discussion, demonstration, and farm visits for extension methods; folder and flip-chart materials for extension media; meeting frequency and reinforcement intensity for extension volume; accessibility and field suitability for location; timing and duration for scheduling; and affordability and efficiency for cost. These indicators served as the basis for assessing farmers' acceptance of the effectiveness of the proposed extension design.

Participants were selected through purposive sampling according to predetermined criteria: actively cultivating cocoa, belonging to an active farmer group, owning cocoa plants with a history or indication of CPB infestation, and having limited implementation of farm sanitation and rorak technology. The study involved 38 cocoa farmers, comprising 15 members of the Pendawa 1 Farmer Group in Candi Rejo Village and 23 members of the Maju Bersama Farmer Group in Kuala Dekah Village. Primary data were obtained through interviews and questionnaires, while secondary data were collected from Deli Serdang Regency in Figures 2025, the 2026 Extension Program of the Biru-Biru Agricultural Extension Center, and relevant agricultural extension regulations. The research instrument was a closed-ended questionnaire using a five-point Likert scale. Instrument validity was examined using the Pearson Product Moment correlation with 10 respondents at a 5% significance level, producing an r-table value of 0.632. Reliability was assessed using Cronbach's Alpha, with 0.600 established as the minimum threshold; all evaluated variables exceeded this threshold and were therefore considered reliable (Sugiyono, 2023).

Data were analyzed descriptively and quantitatively. Problem identification was analyzed using 5W1H, extension objectives using SMART and ABCD, and target characteristics and needs through descriptive analysis. Questionnaire responses were tabulated, scored, converted into percentages, and interpreted using effectiveness categories ranging from very ineffective to very effective across a 0–100% continuum (Riduwan, 2020). Adoption of the innovation was assessed through farm visits conducted one week after the extension activity. Farmers were classified as adopters if they had participated in the extension activity, constructed at least one rorak on their own farm within one week, and implemented the practice according to the material and demonstration provided.

RESULTS

The results show that the extension program was developed from an identified field problem concerning inadequate cacao farm sanitation and the continued accumulation of cacao pod residues, pest-infested pods, and pruning residues in cacao plantations. These conditions were considered to contribute to the persistence of cocoa pod borer (PBK; *Conopomorpha cramerella*) infestations because unmanaged organic residues may provide suitable sites for pest development. The identification process also revealed that limited farmer knowledge and awareness regarding the importance of farm sanitation and rorak-based residue management were major factors underlying the problem. Based on the 5W+1H analysis, the extension program was therefore directed toward introducing rorak-based farm sanitation as a practical approach to managing organic residues and supporting PBK control.

The extension program involved 38 cacao farmers from Pendawa I and Maju Bersama Farmer Groups in Biru-Biru District, Deli Serdang Regency. The target farmers were characterized predominantly by productive-age farmers, male farmers, senior-high-school graduates, smallholder-scale landholdings, and individual land ownership. Most respondents cultivated 0.4–0.6 ha of cacao land, while all respondents reported that the land they cultivated was privately owned. These characteristics were used as considerations in selecting extension methods, instructional media, implementation locations, and the practical approach used during the program.

The extension objectives were formulated using the SMART and ABCD approaches. The program was designed to encourage 16 of the 38 target farmers to implement rorak-based farm sanitation within one week after the extension activities. The extension design consisted of seven components: materials, methods, media, volume, location, timing, and cost. The materials focused on PBK identification, the importance of farm sanitation, the function of roraks, and procedures for constructing and utilizing roraks. The extension methods consisted of discussion, practical demonstration, and farm visits. Folder and flipchart media were used to support information delivery. The activity consisted of two meetings, conducted primarily at the farmer group leader's house and cacao field, beginning at 10:00 WIB. The total estimated implementation cost was Rp171,000.

Table 1. Acceptance of the Extension Program Design Components

Component	Percentage	Category
Materials	85.1%	Very effective
Methods	83.7%	Very effective
Media	83%	Very effective
Volume	82.7%	Very effective
Location	83.1%	Very effective
Timing	84.5%	Very effective
Cost	83.9%	Very effective
Total	83.7%	Very effective

Source: Compiled by the researcher (2026)

Table 1. Acceptance of the Extension Program Design Components shows that all seven components of the extension program design were evaluated within the “very effective” category, with scores ranging from 82.7% to 85.1%. The material component obtained the highest score (85.1%), indicating that the content was considered closely aligned

with the problems and needs of cacao farmers. The lowest score was recorded for the volume component (82.7%), although it remained within the same category. Overall, the extension design achieved a score of 83.7%, indicating a high level of acceptance of the proposed extension structure.

The evaluation of individual methods also showed consistently high scores. Discussion obtained 83.3%, practical demonstration 84.4%, and farm visit 83.4%. The practical demonstration recorded the highest score among the three methods, indicating that direct observation of rorak construction was strongly accepted by the respondents. The evaluation of media showed that the flipchart obtained 83.2% and the folder 82.8%. Meanwhile, the location component reached 83.1%, consisting of 82.2% for the farmer group leader's house and 83.6% for the farmer group leader's cacao field. Timing obtained 84.5%, whereas cost reached 83.9%.

Figure 1. Documentation

Figure 1. Documentation shows the implementation of the extension program through direct interaction with farmers and field-based learning activities. The documentation illustrates the sequence linking problem identification, explanation of the sanitation innovation, practical demonstration, and observation of application at the farm level.

Following the implementation of the extension program, an evaluation was conducted to determine the extent to which farmers adopted the introduced rorak-based farm sanitation innovation. The evaluation showed that 17 of the 38 target farmers had applied the innovation, while 21 farmers had not yet implemented it during the observation period. Thus, the adoption rate reached 44.74%. Although the proportion of adopters remained below half of the target group, the number of adopting farmers exceeded the predetermined target of 16 farmers, representing 106.25% achievement of the target, or 6.25% above the initial target.

Among the farmers who adopted the innovation, application was supported by productive working capacity, awareness of the production losses associated with PBK infestation, perceptions that the innovation was practical, and the availability of resources within the farm. Meanwhile, farmers who had not yet adopted the innovation reported several constraints, including physical limitations, particularly among older farmers, limited access to simple measuring equipment, insufficient time, the need to observe more tangible evidence of the innovation's benefits, established farming practices, and perceptions that the benefits of rorak application might not be immediately visible.

Overall, the findings demonstrate that the extension program achieved a very effective evaluation across all seven design components and encouraged adoption beyond the predetermined target. The results show that 17 farmers implemented rorak-based farm sanitation within the observation period, indicating an initial behavioral response to the extension program.

DISCUSSION

The findings demonstrate that the rorak-based farm sanitation extension program achieved an overall acceptance score of 83.7%, classified as very effective. More importantly, this result indicates a substantive alignment between the extension design and the actual conditions of cacao farmers in Biru-Biru District. The central issue identified in the study was not merely the presence of cocoa pod borer (PBK), but a discrepancy between farmers' existing farm-management practices and recommended sanitation practices intended to reduce potential sources of pest development. The extension program addressed this gap through an innovation that could be implemented with relatively simple techniques, locally available resources, and direct field practice. This problem-oriented approach is consistent with Seprama et al. (2023), who found that extension services based on farmers' needs tend to be more appropriate to field conditions than programs developed without sufficient consideration of farmers' needs and interests.

The material component obtained the highest evaluation score, at 85.1%. This finding suggests that the instructional content successfully connected PBK-related problems with farm sanitation practices and the utilization of roraks for organic-residue management. The material therefore had practical meaning because it did not merely introduce a technological concept but translated the innovation into actions that farmers could relate to their own farming conditions. This finding supports Anwarudin et al. (2021), who emphasized that extension materials aligned with farmers' needs are more readily understood and applied because they address problems directly encountered in farming activities. The present study extends this perspective by demonstrating that material relevance depends not only on informational content but also on the extent to which an innovation can be translated into feasible actions under farmers' actual field conditions.

The three extension methods showed consistently high evaluations, with discussion scoring 83.3%, practical demonstration 84.4%, and farm visits 83.4%. The relatively higher score for practical demonstration indicates the importance of concrete and observable learning when introducing a technical innovation such as rorak construction. Discussion provided a mechanism for connecting the innovation with farmers' prior experiences and concerns, while farm visits enabled the innovation to be examined within actual field conditions. Thus, the strength of the extension design appears to lie in the integration of communication, observation, practical learning, and field-based assistance rather than in reliance on a single method. This finding supports Bachtiar et al. (2025), who highlighted the value of participatory approaches in strengthening farmer engagement, and is consistent with Jemadu et al. (2024), who reported that extension becomes more effective when participants can observe and practice introduced technologies directly. Nurfa et al. (2024) similarly demonstrated the importance of two-way and multi-directional communication in strengthening farmer-group effectiveness. In the present study, these methods functioned as complementary mechanisms connecting knowledge acquisition with practical action.

The media component achieved 83.0%, with the flipchart receiving 83.2% and the folder 82.8%. The small difference between the two media suggests that their functions were complementary rather than competitive. The flipchart supported structured and visual explanation during extension sessions, whereas the folder provided farmers with a portable reference that could be revisited after the activity. This pattern reinforces the argument of Sirajuddin et al. (2021) that instructional media clarify information and stimulate learners' attention and capacity to process information. In the present study, however, media effectiveness should be understood as part of an integrated instructional system in which visual supports reinforced discussion, demonstration, and field observation rather than replacing these methods.

The high scores for timing, location, volume, and cost further indicate that extension effectiveness was influenced not only by instructional content but also by operational arrangements. Timing obtained 84.5%, location 83.1%, and cost 83.9%. Conducting activities at the farmer-group leader's residence and cacao field was particularly relevant because the introduced innovation involved a technical procedure that benefited from direct observation and practice. The field setting allowed farmers to relate instructional information to actual plantation conditions while maintaining convenient access to the learning site. This finding is consistent with Irdiana et al. (2024), who emphasized that supportive extension conditions can strengthen communication between extension agents and farmers. The cost evaluation also suggests that the innovation was perceived as relatively accessible because implementation could utilize existing farm resources. This finding is compatible with Maduwu et al. (2024), who emphasized the importance of efficient resource utilization in extension implementation.

The most consequential finding concerns actual innovation uptake. Seventeen farmers, or 44.74% of the target group, applied rorak-based sanitation, exceeding the initial target of 16 farmers. This achievement is important because it indicates that positive perceptions of the extension design were accompanied by observable behavioral change. Nevertheless, the fact that 55.26% of farmers had not yet implemented the innovation provides an equally important analytical insight. Positive reception does not necessarily translate immediately into complete adoption. Physical limitations among older farmers, insufficient time, limited access to simple measurement tools, the desire to observe tangible evidence of benefits, established farming habits, and perceptions of delayed benefits all emerged as practical barriers. Adoption should therefore be understood as a gradual process influenced by technological characteristics, individual circumstances, social learning, and opportunities for reinforcement. In this respect, the findings extend Akbar et al. (2025), who identified direct experience, extension activities, institutional support, field demonstrations, and farmer-group roles as factors associated with agricultural innovation adoption. The present evidence suggests that these factors can stimulate initial uptake, but individual and behavioral constraints may continue to delay broader adoption.

Theoretically, this study contributes to needs-based agricultural extension planning by demonstrating the value of constructing extension as an integrated chain linking problem identification, measurable objectives, target characteristics, instructional strategies, and adoption assessment. The use of SMART and ABCD principles strengthened the measurability of the extension objectives, while evaluation across seven design components provided a multidimensional assessment of both substantive and operational suitability. Practically, the findings suggest that extension agents should retain the combination of discussion, practical demonstration, and farm visits while strengthening follow-up support for farmers who remain non-adopters. Farmer groups can also serve as peer-learning environments in which successful early adopters demonstrate practical outcomes and reduce uncertainty among hesitant farmers. This recommendation is consistent with Syafruddin and Risal (2024), who emphasized the role of extension implementation quality in strengthening farmer capacity.

Several limitations should nevertheless be acknowledged. First, the study was conducted within two farmer groups involving 38 respondents, which limits the extent to which the findings can be generalized to the broader cacao-farming population. Second, the acceptance assessment relied primarily on Likert-scale responses, meaning that the results largely represent farmers' perceptions of extension effectiveness rather than long-term changes in knowledge, attitudes, or behavior. Third, innovation adoption was assessed over a relatively short period of one week following the extension activity; therefore, the study cannot establish whether adoption would persist or whether it would subsequently reduce PBK populations or improve cacao productivity and quality. Despite these limitations, the study provides empirical evidence that an extension design grounded in local problems, participatory learning, practical demonstration, and resource efficiency can encourage initial adoption of rorak-based farm sanitation. Its distinctive contribution lies in demonstrating not only that the extension design was highly accepted, but also that acceptance could be translated into adoption beyond the predetermined target while simultaneously revealing the practical barriers that must be addressed through continued extension support.

CONCLUSION

This study demonstrates that the primary challenge in managing cocoa pod borer (CPB) in Biru-Biru District, Deli Serdang Regency, is the limited adoption of rorak-based farm sanitation among cocoa growers. The extension design, formulated according to the target farmers' conditions, needs, and characteristics, was able to translate the identified field problem into measurable behavioral change. A total of 38 cocoa growers from Candi Rejo Village and Kuala Dekah Village were targeted, with an extension objective of encouraging at least 16 growers to adopt the innovation. The evaluation revealed that farmers' acceptance of the extension design reached 83.7%, indicating a very effective category. Adoption performance also exceeded the predetermined target, as 17 growers (44.74%) implemented rorak-based farm sanitation, while 21 growers (55.26%) had not yet adopted the innovation. These findings confirm that an extension design integrating appropriate content, methods, media, timing, location, cost, and activity intensity can facilitate the adoption of CPB management practices. Practically, the study contributes an extension planning approach that connects field-based problem identification with behavioral objectives and measurable adoption outcomes. Its key value lies in positioning rorak-based sanitation as an innovation promoted through a structured extension process rather than merely as a technological intervention. Further implementation should prioritize continued assistance for non-adopters through field demonstrations, farm visits, and farmer-to-farmer extension involving successful adopters. Future research should examine the sustainability of adoption, changes in CPB infestation intensity, and the subsequent effects on cocoa productivity and farmers' income over a longer observation period.

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