

Managerial and Governance Implications of Knowledge Gap and Attitude Convergence Among STD-B-Registered Independent Oil Palm Farmers in Seruyan

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Received: 04/04/2026 | Revised: 31/05/2026 | Accepted: 10/06/2026 | Published: 30/06/2026

Abstract: Institutional documentation such as the Plantation Business Registration Letter for Cultivation (STD-B) is often treated as a proxy for smallholder readiness to meet sustainability standards, yet administrative registration does not guarantee uniform managerial and cognitive readiness. This study examined whether independent oil palm farmers who shared identical administrative status differed in their understanding of, and attitude toward, STD-B and the Indonesian Sustainable Palm Oil (ISPO) certification system. A quantitative, comparative census was conducted among all 51 registered independent farmers in Halimaung Jaya Village (n = 18) and Mekar Indah Village (n = 33), Seruyan Regency, Central Kalimantan, using a five-point Likert questionnaire, interviews, observation, and documentation; data were analyzed using descriptive statistics and the Mann-Whitney U test. Farmers' average knowledge score was 3.33 in Halimaung Jaya and 3.52 in Mekar Indah, a statistically significant difference (U = 122.000; Z = -3.472; p < 0.001; r = 0.486). Attitude scores were 3.69 and 3.75, with no significant difference (U = 258.500; Z = -0.773; p = 0.440; r = 0.108). The findings revealed a genuine knowledge gap alongside a convergence of positive attitudes, suggesting that document-based governance requires complementary, village-specific knowledge-management strategies to build substantive institutional capacity.

Keywords: STD-B, independent oil palm farmers, knowledge gap, attitude convergence, sustainability governance

How to Cite: Bandrang, T. N., & Leihitu, D. D. J. (2026). Managerial and Governance Implications of Knowledge Gap and Attitude Convergence Among STD-B-Registered Independent Oil Palm Farmers in Seruyan. *Journal of Economics and Management*, 4(2), 640–652. <https://doi.org/10.70716/ecoma.v4i2.826>

INTRODUCTION

Independent smallholders - oil palm growers who are not bound to a nucleus estate through a plasma or partnership scheme - manage a substantial and steadily growing share of Indonesia's oil palm planted area, a footprint whose continued expansion carries significant economic, social, and environmental consequences at the landscape scale (Rulli et al., 2019; Rustiadi et al., 2023). However, independent smallholders persistently lag behind corporate and scheme smallholdings in productivity, legality, and certification uptake (de Vos, Suwarno, Slingerland, van der Meer, & Lucey, 2023). This gap is not merely technical; it is also a governance and management problem, because independent farmers operate outside the standard operating procedures, record-keeping systems, and institutional support that nucleus estates typically provide. As national policy increasingly ties market access, incentives, and land legalization to formal registration

and certification, understanding how independent farmers acquire, process, and act on regulatory information becomes a managerial and economic issue, not only an agronomic one.

Two regulatory instruments frame the current governance landscape for Indonesian oil palm smallholders. Presidential Regulation Number 16 of 2025 establishes the Indonesian Sustainable Palm Oil (ISPO) Certification System, while Regulation of the Minister of Agriculture Number 33 of 2025 sets out the principles, criteria, certification procedures, coaching, supervision, financing, sanctions, and incentives associated with ISPO. Running alongside the certification track is a separate administrative track: the Plantation Business Registration Letter for Cultivation (STD-B), whose issuance procedure was most recently updated through the Decree of the Director General of Plantations Number 37/Kpts/PI.400/03/2024. STD-B functions as an instrument for registering plantation businesses and is intended to serve as a data foundation for smallholder governance, rather than as a substitute for an ISPO certificate. In managerial terms, STD-B is a compliance and registration output - a governance "input" that creates the administrative preconditions under which knowledge-building and certification-readiness activities are supposed to follow.

The problem this study addresses is that administrative compliance and substantive readiness do not necessarily move together. Dharmawan, Mardiyaningsih, Rahmadian, Yulian, Komarudin, Pacheco, Ghazoul, and Amalia (2021) show that Indonesian oil palm smallholders face agrarian, structural, and socio-cultural constraints - including limited knowledge, information, technical capacity, and legal certainty - a pattern echoed in their companion study of oil palm expansion dynamics in East Kalimantan (Dharmawan, Mardiyaningsih, Komarudin, Ghazoul, Pacheco, & Rahmadian, 2020). Ogahara, Jespersen, Theilade, and Nielsen (2022), reviewing one hundred articles on smallholder palm oil sustainability, similarly conclude that certification schemes have delivered limited positive impact and that implementation and knowledge gaps remain central unresolved problems. Compliance-cost barriers documented elsewhere in Indonesia reinforce this picture: Apriani, Kim, Fisher, and Baral (2020) find that independent smallholders in Sumatra have only a limited understanding of RSPO costs and depend heavily on external facilitation; Hutabarat, Slingerland, Rietberg, and Dries (2018) show that certification costs and benefits are unevenly distributed; Schoneveld et al. (2019) demonstrate that compliance gaps are highly heterogeneous across smallholder types; and Glasbergen (2018) argues that certification instruments often fail to align with smallholders' everyday needs. From an institutional-economics perspective, Erdi et al. (2025), applying rational choice theory to ISPO adoption in Riau, find that certification pace reflects an interaction between instrumental rationality - land legality and cost - and surrounding social and bureaucratic structure, so that low adoption signals a governance failure rather than mere unwillingness; a parallel analysis in Malaysia by Rizal, Nordin, Hussin, and Hussin (2021) likewise finds that participation decisions extend well beyond rational cost-benefit calculation. Irawan et al. (2024) demonstrate, through action research with more than three thousand independent farmers in Central Kalimantan, that certification costs behave as a function of institutional scale, while de Vos, Suwarno, Slingerland, van der Meer, and Lucey (2021) show that certified independent smallholders already exhibit better management practices and yields than non-certified counterparts, a difference attributable more to pre-certification conditions than to certification itself. Taken together, this literature indicates that the economics and management of smallholder

compliance - not only farmers' individual willingness - shape whether registration translates into substantive capacity.

A parallel stream of research complicates the assumption that knowledge alone explains certification readiness. Reich and Musshoff (2025) report that Indonesian oil palm smallholders generally hold a positive attitude toward certification, and that plantation-management training measurably raises acceptance. Reich, Ölkens, Bonke, and Musshoff (2025) show that independent smallholders remain financially vulnerable to price shocks in ways that shape their capacity to invest in compliance, underlining that attitude cannot be separated from underlying economic constraints. Pratama, Pramana, Zamaya, and Kim (2026) distinguish cognitive readiness from behavioral intention, finding that farmers' intention to adopt certification and join farmer groups is a distinct driver of ISPO readiness, separate from structural constraints such as land legality. This distinction is consistent with the behavioral-economics observation that attitudes and intentions are necessary but not sufficient predictors of behavior (Ajzen, 1991), motivating this study's decision to measure knowledge and attitude as separable constructs. Complementary evidence comes from Nurliza (2025), whose framework integrating learning theory, diffusion of innovation, and social competence suggests that active adoption of certification-related information depends on social-competence factors distinct from formal documentation status.

Despite this evidence, a specific empirical gap remains: studies comparing understanding and attitude among independent oil palm smallholders who already share identical formal status - that is, who have all obtained STD-B - are scarce at the village level within a single regency. This matters managerially because two STD-B holders may have received different intensities of socialization, extension contact, and programmatic experience. Village-level heterogeneity of this kind is documented elsewhere: Nashr, Putri, Dharmawan, and Fauzi (2021) find sustainability determinants differing across typological zones within one regency; Lestari, Nurliza, and Oktoriana (2024) show that good-agricultural-practice skills vary in ways calling for locality-specific training; Raharja et al. (2020) find institutional strength differing markedly between Riau and Jambi despite similar regulatory exposure; and Amanah and Fatchiya (2018) report that extension-service effectiveness is contingent on local institutional context. If so, STD-B ownership is a weak proxy for the substantive readiness policy seeks to build, and strategies calibrated only to registration counts risk overstating implementation quality.

This study compares two fully STD-B-registered villages in Seruyan Regency, Central Kalimantan - Halimaung Jaya and Mekar Indah - jointly testing two propositions: that uniform administrative status does not imply uniform understanding, and that differences in understanding do not automatically translate into differences in attitude. If both hold, the study proposes a "knowledge gap - attitude convergence" frame for designing region-specific mentoring, rather than a one-size-fits-all extension model. The objectives are to: (1) describe farmers' knowledge and attitude levels toward STD-B in both villages; (2) compare knowledge scores between villages; (3) compare attitude scores between villages; and (4) formulate managerial and policy implications for strengthening STD-B socialization, training, and mentoring within sustainable plantation governance.

The specific contribution of this study is to compare independent oil palm farmers who hold an identical formal administrative status - STD-B registration - while separately measuring their substantive knowledge and their attitude toward the ISPO certification

system. Because administrative status is held constant by design, the observed difference in knowledge cannot be attributed to registration status itself; instead, it demonstrates that administrative compliance does not necessarily indicate homogeneous substantive readiness. By decomposing administrative status, cognitive knowledge, and behavioral attitude into three separately measurable layers - rather than treating farmer readiness as a single undifferentiated construct - this study extends previous smallholder-certification research and offers a replicable empirical approach for identifying where document-based governance instruments do, and do not, correspond to substantive readiness on the ground.

RESEARCH METHODS

Research design and location

This study used a quantitative, comparative design implemented through a survey and a census (Sugiyono, 2019), carried out in Halimaung Jaya Village and Mekar Indah Village, East Seruyan Hilir District, Seruyan Regency, Central Kalimantan Province - a regency whose plantation-based rural economy is documented in official regional statistics (Central Statistics Agency of Seruyan Regency, 2024) - using primary field data collected during 2025. The two villages were selected purposively on a single controlled criterion: both are home to independent oil palm farmers who have already obtained STD-B, allowing comparison while holding administrative status constant. Any measured difference in knowledge or attitude is therefore unlikely to be explained by formal registration status itself; plausible contributing factors may include the intensity of socialization, extension contact, or programmatic experience, although these variables were not directly measured and, given the study's cross-sectional design, cannot be tested for causal effect.

Population and respondents

The study population comprised all independent oil palm farmers registered with STD-B in the two villages. Because the population totaled only 51 farmers, a total sampling (census) technique was used rather than a probability sample. Respondents comprised 18 farmers from Halimaung Jaya (35.29%) and 33 from Mekar Indah (64.71%). Eligibility required that respondents be independent smallholders domiciled at the site, formally STD-B-registered, and willing to participate.

Table 1. Distribution of Research Respondents

Village	n	Percentage (%)
Halimaung Jaya	18	35.29
Mekar Indah	33	64.71
Total	51	100.00

Instruments and measurement

Data were collected using a structured questionnaire in two blocks, supplemented by interviews, field observation, and documentation for triangulation. The first block (15 items) measured knowledge/understanding of ISPO and STD-B; the second block (8 items) measured attitude toward STD-B. All items used a five-point Likert-type scale (1 = very low to 5 = very high), following conventional measurement-scale procedures (Riduwan, 2010). The knowledge block covered ISPO knowledge, certification expectations, perceived government role, socialization enthusiasm, understanding of

STD-B and its relationship to ISPO, program support, document-format understanding, environmental benefits, and knowledge of application procedures. The attitude block covered farmer-group involvement, post-socialization understanding, compliance with data-collection requirements, and support for sustainable practices, ISPO, and STD-B implementation. Content was reviewed against current STD-B/ISPO regulations prior to fieldwork; formal psychometric validation (e.g., confirmatory factor analysis) was not conducted, a limitation addressed in Section 4. All items were administered through structured face-to-face interviews in the local language to reduce measurement error given varying farmer literacy.

Scoring and categorization

Each respondent's total score per block was the sum of item scores. Following the standard class-width procedure for Likert-type data, the four-point range of the scale (5 - 1 = 4) was divided into five equal categories of 0.8 (Sugiyono, 2019), yielding the interval applied to item-level averages: 1.00-1.79 very small; 1.80-2.59 small; 2.60-3.39 neutral; 3.40-4.19 large; 4.20-5.00 very large. This procedure was applied identically to the knowledge/understanding block and the attitude block, so that the five descriptive categories carry the same quantitative meaning and are interpreted consistently for both constructs throughout the manuscript.

Analysis technique

Descriptive statistics (mean, median, SD, min-max) characterized each village's score distribution. Because scores derive from ordinal Likert responses across two independent groups, the non-parametric Mann-Whitney U test was used rather than an independent-samples t-test, which requires interval-level, normally distributed data. Significance was set at $p < 0.05$. Effect size was calculated as $r = |Z|/\sqrt{N}$, with r near 0.10, 0.30, and 0.50 interpreted as small, medium, and large effects, respectively.

Ethical considerations

This study followed standard ethical principles for social science research involving human respondents. All 51 farmers participated voluntarily; before each interview, enumerators explained the study's purpose, the voluntary nature of participation, the respondent's right to decline any question or withdraw at any point without consequence, and the confidentiality with which individual responses would be handled. We obtained and recorded oral informed consent before data collection, consistent with common practice for low-risk survey research among rural respondents with varying literacy levels, for whom written consent forms can be a barrier to genuine informed participation. No personally identifying information beyond village of residence is reported in this manuscript; all findings are presented as aggregated descriptive statistics or indicator-level averages, and no individual respondent can be identified from the results. The study involved minimal risk, as it addressed topics - STD-B registration and ISPO awareness - that are already routinely discussed in existing extension and socialization activities in the study area, and no sensitive financial, health, or legally incriminating information was solicited.

RESULTS AND DISCUSSION

Knowledge/understanding scores: description and comparison

Halimaung Jaya recorded a total knowledge/understanding score of 899 (18 respondents, 15 items; mean/item = 3.33), while Mekar Indah recorded 1,741 (33

respondents; mean/item = 3.52) - both in the "neutral-to-large" descriptive range, with Mekar Indah 0.19 points higher.

Table 2. Descriptive Statistics and Mann-Whitney U Test Results:
Knowledge/Understanding Block

Village	n	Total score	Mean/item	Median	Min- Max	Mean Rank
Halimaung Jaya	18	899	3.33	49.5	47- 55	16.28
Mekar Indah	33	1741	3.52	53.0	45- 59	31.30
Combined	51	2640	3.45	-	-	-

Note: Mann-Whitney U = 122.000; Z = -3.472; p < 0.001; effect size r = 0.486.

The Mann-Whitney test showed a statistically significant difference ($U = 122.000$; $Z = -3.472$; $p < 0.001$; mean rank 16.28 vs 31.30), with a moderate-to-large effect size ($r = 0.486$): the first hypothesis is supported. Indicator-level patterns (Table 3) show the gap is uneven: Mekar Indah scores higher on conceptual items - ISPO understanding, consequences of non-certification, the STD-B-ISPO relationship, and environmental benefits - while Halimaung Jaya scores markedly higher only on enthusiasm for attending socialization (4.06 vs 3.12), showing that willingness to attend and actual comprehension are distinct constructs.

Table 3. Average Score of Each Knowledge/Understanding Indicator

Indicator	Halimaung Jaya	Mekar Indah	MI-HJ Difference
Knowledge of ISPO	2.72	2.91	+0.19
Understanding of ISPO	2.33	2.97	+0.64
Hope for an ISPO-certified plantation	4.11	4.27	+0.16
Perceived role of government in ISPO socialization	3.78	3.85	+0.07
Enthusiasm for participating in ISPO socialization	4.06	3.12	-0.94
Understanding that ISPO certification is not done individually	2.72	2.70	-0.02
Perceived consequences of not having certification	2.78	3.73	+0.95
Perceived importance of STD-B	3.72	4.09	+0.37
Understanding of the STD-B-ISPO relationship	3.22	3.94	+0.72
Perceived government support for STD-B data collection	3.94	4.12	+0.18
Support for STD-B-related programs	3.94	3.88	-0.06
Support for the formation of farmer groups	3.17	3.09	-0.08
Understanding of the STD-B document format	4.11	3.97	-0.14
Perceived environmental benefits of STD-B	2.50	3.12	+0.62

Indicator	Halimaung Jaya	Mekar Indah	MI-HJ Difference
Knowledge of the STD-B application procedure	2.83	3.00	+0.17

This central finding indicates that document ownership is not an adequate proxy for substantive knowledge, even in a fully homogeneous registration population, consistent with Dharmawan et al. (2021), who identify knowledge, information, and capacity as barriers that do not resolve automatically upon registration, and with Ogahara et al. (2022), whose review across 100 studies identifies implementation and knowledge gaps as persistent and unresolved. Read through the institutional-economics lens of post-registration processes, the gap is consistent with the possibility that socialization intensity, mentoring contact, and information access operate as a distinct institutional layer independent of STD-B ownership itself; because these variables were not directly measured in this cross-sectional design, however, this interpretation should be treated as a plausible explanation rather than a demonstrated causal mechanism, consistent with Jelsma, Woittiez, Ollivier, and Dharmawan (2019), who show that actual good-agricultural-practice implementation varies among independent smallholders regardless of formal status, and Purwanto, Santoso, Jelsma, Widayati, Nugroho, and van Noordwijk (2020), who argue that forest-zone oil palm governance needs instruments tailored to farmers' actual practices rather than administrative categories alone.

Attitude scores: description and comparison

Total attitude scores were 532 in Halimaung Jaya (mean/item = 3.69) and 989 in Mekar Indah (mean/item = 3.75) - both within the "large" descriptive category, a difference of only 0.05.

Table 4. Descriptive Statistics and Mann-Whitney U Test Results: Attitude Block

Village	n	Total score	Mean/item	Median	Min-Max	Mean Rank
Halimaung Jaya	18	532	3.69	29.0	26-34	23.86
Mekar Indah	33	989	3.75	30.0	27-35	27.17
Combined	51	1521	3.73	-	-	-

Note: Mann-Whitney $U = 258.500$; $Z = -0.773$; $p = 0.440$; effect size $r = 0.108$.

The Mann-Whitney test found no significant difference ($U = 258.500$; $Z = -0.773$; $p = 0.440$; mean rank 23.86 vs 27.17; $r = 0.108$): the second hypothesis is not supported.

Table 5. Average Score of Each Attitude Indicator

Attitude indicator	Halimaung Jaya	Mekar Indah
Involvement in farmer groups	3.06	2.97
Experience/understanding after socialization	2.94	2.94
Compliance with data-collection requirements	4.28	4.30
Support for sustainable plantation practices	3.56	4.09
Support for ISPO	3.61	3.24
Support for STD-B implementation	4.33	4.27
Confidence that STD-B strengthens sustainability	3.83	3.97
Confidence that STD-B improves welfare	3.94	4.18

One indicator - farmer-group involvement (3.06 vs 2.97) - remains comparatively low in both villages relative to other attitude items (3.6- 4.3), a shared weak point with direct managerial relevance, since farmer groups are the institutional channel through which extension, mentoring, and collective-cost-reduction strategies (Irawan et al., 2024) are delivered. Economics literature on farmer-group institutions elsewhere reinforces this reading: Ahmed and Mesfin (2017) find cooperative membership measurably improves smallholder wellbeing, and Demont (2022) shows active group-based institutions strengthen households' capacity to cope with economic shocks - suggesting weak group involvement here is a missed managerial lever, not merely a participation shortfall. The knowledge gap-attitude convergence pattern itself is consistent with the behavioral-economics view that attitudes are shaped by more than cognitive knowledge alone (Ajzen, 1991): experience, social norms, and prior programmatic exposure can independently raise acceptance, as Reich and Musshoff (2025) similarly find for Indonesian smallholders generally, while Reich, Ölkens, Bonke, and Musshoff (2025) caution that a positive attitude does not by itself guarantee farmers' financial capacity to act on it.

STD-B as a governance foundation

Read together, these results show STD-B functions correctly as a data-collection and registration instrument but is not a proxy for the substantive readiness ISPO certification requires; the two instruments are designed to be complementary, not substitutable. Measuring implementation purely by document counts would render both villages identical - full registration - while masking the statistically significant knowledge gap and the shared farmer-group weakness. This is consistent with the de Vos et al. (2023) finding that pre-certification conditions vary considerably even before certification is pursued.

Managerial and policy implications

These findings support a differentiated extension approach: Halimaung Jaya's priority is conceptual (deepening understanding of the STD-B-ISPO relationship and certification consequences), while Mekar Indah's priority is procedural (converting already-high socialization attendance into stronger comprehension) and, for both villages, revitalizing farmer-group involvement as the channel for mentoring and collective cost-reduction of the kind demonstrated by Irawan et al. (2024) and, in a comparable agro-industrial setting, by Ruml et al. (2022), who show rural-development outcomes depend on the quality of institutional support smallholders receive after formal inclusion, not merely on inclusion itself. Practically, this implies baseline socialization to ensure every STD-B holder understands the document's function, thematic training that explicitly links STD-B to ISPO, farmer-group-based mentoring, and monitoring frameworks that track knowledge and attitude alongside document counts.

These recommendations can be organized into three sequential phases for local government and extension agencies to operationalize. In the short term (0-6 months), authorities could conduct a rapid knowledge-and-attitude audit of existing STD-B holders using an instrument similar to the one applied in this study, allowing scarce extension resources to be targeted at villages exhibiting the largest knowledge gaps rather than distributed uniformly across all registered farmers regardless of need; such an audit would be inexpensive to administer and could be incorporated into the routine STD-B verification visits that extension officers already conduct. In the medium term (6-18 months), village-specific thematic training modules could be piloted and evaluated: conceptual modules emphasizing the STD-B-ISPO relationship, certification

consequences, and environmental benefits for villages resembling Halimaung Jaya's profile, and procedural, engagement-focused modules that convert existing high attendance into stronger comprehension for villages resembling Mekar Indah's profile; evaluating these modules against pre- and post-training knowledge scores would also generate the direct, controlled evidence on socialization intensity and extension contact that the present cross-sectional design cannot itself provide. In the longer term (18 months and beyond), farmer-group revitalization efforts could be linked explicitly to the district-level institutional consolidation and cost-sharing mechanisms documented by Irawan et al. (2024) in the same province, so that strengthening farmer-group involvement simultaneously serves the knowledge-management objective identified in this study and lowers the eventual per-farmer cost of pursuing ISPO certification. Sequencing interventions in this way - audit, targeted training, institutional consolidation - would allow local government to treat STD-B registration data not merely as a static administrative record but as a living input into an adaptive, evidence-based extension strategy.

Theoretical implications

Theoretically, the Seruyan evidence decomposes three layers often treated as one undifferentiated construct of "farmer readiness": administrative status, cognitive knowledge, and behavioral attitude. Administrative status was, by design, identical across villages; knowledge differed significantly; attitude converged despite that difference. This "knowledge gap-attitude convergence" pattern extends the sustainability-standard implementation literature beyond administrative compliance alone toward institutional learning capacity and policy acceptance, offering a replicable template - separately measured knowledge and attitude compared across matched-status groups - for detecting similar decoupling in other smallholder-governance settings, including future RSPO or other voluntary-standard contexts.

Boundary conditions and transferability

The knowledge gap-attitude convergence pattern identified in this study should be interpreted within clear boundary conditions. The comparison holds administrative status constant by design - both villages are fully STD-B-registered - which isolates the effect of post-registration institutional exposure but also means the findings speak specifically to populations that have already cleared the registration threshold. In settings where registration itself remains incomplete, the more basic barrier of administrative access may dominate, and the knowledge-attitude decoupling documented here may be secondary to that more fundamental constraint. Similarly, both villages are located within a single district characterized by broadly comparable agroecological conditions, regulatory exposure, and market access; the magnitude of the 0.19-point knowledge gap and the near-zero attitude difference observed here should therefore be read as evidence that such decoupling can occur, not as a universal effect size expected in every independent-smallholder setting.

Transferability to other voluntary-sustainability-standard contexts, such as RSPO certification among independent smallholders, is plausible but not established by this study. The mechanisms proposed to underlie the pattern - differential socialization intensity, extension contact, and programmatic experience - are generic to smallholder governance rather than specific to STD-B or ISPO, which suggests the broader pattern of administrative-compliance/substantive-readiness decoupling could recur wherever a registration or certification instrument is layered onto heterogeneous local institutional

exposure. Confirming this would require replicating the matched-status comparative design used here across a larger and more diverse set of villages, districts, and certification schemes, ideally combined with a longitudinal component that can track how the knowledge gap evolves as differentiated extension interventions of the kind proposed in this study are implemented. Until such replication is available, the safest reading of the present findings is as a documented instance - rather than a generalized law - of how administrative registration, cognitive knowledge, and behavioral attitude can move at different speeds within smallholder sustainability governance.

CONCLUSION AND RECOMMENDATIONS

A census of 51 STD-B-registered independent oil palm farmers in Halimaung Jaya and Mekar Indah villages, Seruyan Regency, yields four conclusions. First, average knowledge/understanding was 3.33 in Halimaung Jaya and 3.52 in Mekar Indah, both neutral-to-large but with a consistent gap. Second, this gap is statistically significant ($U = 122.000$; $Z = -3.472$; $p < 0.001$; $r = 0.486$), showing that identical administrative status does not produce uniform substantive understanding. Third, attitude scores were positive in both villages (3.69 and 3.75) with no significant difference ($U = 258.500$; $Z = -0.773$; $p = 0.440$; $r = 0.108$), indicating attitude convergence that does not track the knowledge gap. Fourth, together these establish an empirical "knowledge gap-attitude convergence" pattern: administrative compliance, cognitive readiness, and behavioral acceptance are distinguishable layers that can move independently, so extension strategies calibrated only to registration counts risk overlooking meaningful understanding gaps.

The principal managerial implication is that STD-B issuance should be treated as a starting point, not an end point, for governance. Village-specific socialization, thematic training linking STD-B to ISPO, farmer-group-based mentoring, and monitoring frameworks that track knowledge and attitude - not only document counts - are recommended for translating registration into substantive institutional capacity.

This study has limitations. The sample, though a full census, was drawn from only two villages in one district, limiting generalization. The instrument was not subjected to formal psychometric validation (e.g., confirmatory factor analysis); future studies should report such statistics explicitly (Surucu & Maslakci, 2020). The cross-sectional design cannot establish causality between socialization/mentoring factors and outcomes, and self-reported attitude may carry social-desirability bias. Future research should extend this comparative design to more villages and regencies, incorporate objective measures of certification-seeking behavior, and test whether the proposed differentiated extension interventions measurably narrow the knowledge gap.

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