

RUMPI 'LITERACY THROUGH ACTION' FOR EMPOWERING TANI MANDIRI SMALLHOLDERS TOWARD SUSTAINABLE OIL PALM INNOVATION

**Delyana Rahmawany Pulungan^{1*}, Mhd. Andi Rasyid², Dina Arfianti Saragih³, Tifany Zia Aznur⁴,
Ritna Wahyuni⁵, Delyanti Azzumarito Pulungan⁶**

^{1,3,4} Agribusiness Study Program, Institut Teknologi Sawit Indonesia, Medan, Indonesia

⁵ Information Systems and Technology Study Program, Institut Teknologi Sawit Indonesia, Medan, Indonesia

² Management Study Program, STIE Graha Kirana, Medan, Indonesia

⁶ Indonesian Language and Literature Education Study Program, Universitas Prima Indonesia, Medan, Indonesia

E-mail: delpulungan@itsi.ac.id*

Received : 03 June 2026

Accepted : 25 June 2026

Revised : 09 June 2026

Published : 25 July 2026

Abstract

Smallholder oil palm plantations occupy a strategic position in Indonesia's palm oil supply chain, yet their sustainability remains constrained by gaps in Good Agricultural Practices (GAP), land legality and farm records, occupational safety, and environmental protection. This community service program aimed to improve green literacy on RSPO-based GAP through the RUMPI Innovation (Rumah Pintar Petani/Farmers' Smart House) at the Tani Mandiri Farmer Group Association, Laut Tador Village, Batu Bara Regency. The program used an integrative, participatory, and replicable approach combining needs assessment, socialization, experiential learning, group discussion, field demonstration, and mentoring. The main educational activity was conducted on 21 June 2026 with 50 farmers. Pre-test and post-test questionnaires assessed sustainable plantation knowledge, RSPO literacy and readiness, farm practices, and participant responses. The total green literacy index increased from 44.4 to 63.2, indicating moderate improvement. The strongest gains occurred in knowledge and readiness, while consistent on-farm implementation still required continued mentoring. RUMPI extended extension services from information transfer to 'literacy through action' by linking standards, field practices, digital information, and institutional strengthening. The program supports continuous improvement and the group's long-term readiness to maintain RSPO certification.

Keywords: Community empowerment; Good Agricultural Practices; Independent smallholders; RSPO; RUMPI

INTRODUCTION

Oil palm is one of Indonesia's strategic commodities, contributing to foreign-exchange earnings, employment creation, and income generation for millions of farming households. The area under smallholder oil palm cultivation has continued to expand, making its role in the national palm oil supply chain increasingly significant (Food and Agriculture Organization of the United Nations [FAO], 2023; Directorate General of Estate Crops, 2024; Purnomo et al., 2022). The expansion of smallholder plantation areas demonstrates the increasingly important role of independent smallholders in the national palm oil supply chain. Nevertheless, independent smallholders continue to face various challenges, particularly in implementing cultivation practices that address environmental sustainability, social considerations, and business governance. These challenges include the limited implementation of Good Agricultural Practices (GAP), inadequate farm record-keeping, inefficient use of production inputs, and insufficient understanding of sustainable cultivation practices required for RSPO certification (Jelsma et al., 2019; Meijaard et al., 2020; RSPO, 2024).

At the global level, demand for sustainably produced oil palm continues to increase, particularly for production systems that comply with internationally recognized standards such as the Roundtable on Sustainable Palm Oil (RSPO), which emphasizes the implementation of sustainability principles and criteria through responsible cultivation practices. For independent smallholders, implementation of the RSPO standard should not be limited to a single aspect. It should begin with identifying the extent of farmers' understanding by assessing their literacy regarding Good Agricultural Practices (GAP), as reflected in their behavior and practices in managing their farms.

GAP literacy is not merely the ability to understand technical cultivation information; it also reflects farmers' capacity to implement cultivation practices that comply with sustainability principles. These practices include the use of quality planting materials, balanced fertilization, integrated pest management, soil and water conservation, waste management, the use of personal protective equipment, and the recording of farm activities as part of a traceability system. This level of literacy constitutes a fundamental basis for maintaining RSPO certification while improving the competitiveness of smallholder oil palm farmers in global markets.

This urgency is directly relevant to the conditions of the Tani Mandiri Farmer Group Association in Laut Tador Village, Sei Suka District, Batu Bara Regency. Based on the community service team's preliminary survey, Laut Tador Village covers approximately 1,233 hectares, of which approximately 805 hectares consist of smallholder oil palm plantations. The Tani Mandiri Farmer Group Association comprises seven farmer groups with 147 members, and most oil palm stands are more than ten years old. The partner group has participated in several mentoring activities, the smallholder oil palm replanting program, and sustainability certification processes. However, these administrative and certification achievements have not yet been fully accompanied by consistent practices among all members (Pulungan et al., 2024, 2026).

The team's preliminary surveys and interviews conducted in 2024-2025 identified several gaps: (1) literacy regarding sustainable plantation practices was estimated to remain below 50%; (2) participation in green-technology adoption was below 30%; (3) more than 70% of farmers still relied predominantly on chemical fertilizers; and (4) fewer than 10% of farmers productively utilized farm waste. Other identified issues included fertilization based primarily on customary practice, inadequate recording of farm activities, biomass and intercropping management that did not yet follow recommendations, limited group learning media, and intermittent mentoring. Interviews with the partner group at the end of 2025 also identified minor audit findings related to environmentally responsible cultivation practices and the adoption of good practices. These data remain internal and require further confirmation through questionnaire results and survey evidence.

These local gaps are consistent with the findings of Pulungan et al. (2024) in North Sumatra and Aceh, which emphasized the importance of youth involvement in good practices for sustainable oil palm plantations. Young people are needed to support marketing, digital record-keeping, farm innovation, group communication, and stronger traceability. Accordingly, improving GAP literacy must simultaneously address technical, environmental, social, and institutional dimensions, including the ways in which groups involve family members and farmer cadres in the improvement process.

These issues may hinder the continuity of the existing RSPO certification and limit the farmers' role as balancing actors in environmentally responsible oil palm plantation management, which should not focus solely on productivity improvement. The survey findings therefore provided the basis for the community service team to implement a holistic and integrated mentoring program supported by sustainable facilities and infrastructure, with an emphasis on direct experiential learning and the sharing of tangible benefits from adopting green technologies that meet RSPO requirements. Independent smallholders were actively involved in training and practical activities while building a shared commitment to help members of the Tani Mandiri Farmer Group Association maintain their RSPO certification.

To obtain valid baseline data, the team developed pre-test and post-test questionnaires that operationalized literacy into basic knowledge of sustainable plantations, RSPO knowledge, and farm practices. The instrument indicators covered land legality, zero-burning land preparation, the use of quality planting materials, integrated pest management, erosion prevention, hazardous pesticides, occupational safety, child labor, harvest and fertilization records, organic matter management, protection of water sources, and continuous improvement. The post-activity evaluation also measured the ease of understanding the material, acquisition of new knowledge, motivation to improve practices, and willingness to participate in further mentoring. This scope was essential to ensure that program success was assessed not only through attendance and participant satisfaction, but also through changes in knowledge and indications of readiness to act.

The community service team introduced the RUMPI Innovation (Rumah Pintar Petani), which focuses on green literacy and farmer participation in SDG-based sustainable oil palm production. This initiative represents a strategic step toward positioning farmers as co-creators within an oil palm industry that is economically beneficial and environmentally and socially responsible, particularly in maintaining RSPO certification as a form of commitment to the SDGs in oil palm plantations in Laut Tador Village. The RUMPI Innovation serves as a community-based learning platform that integrates education, field demonstrations, group discussions, and continuous mentoring. RUMPI is not limited to knowledge transfer; it also promotes behavioral change through a collaborative, contextual learning process tailored to the needs of farmer groups.

Unlike most extension programs that emphasize conventional classroom-based delivery, the RUMPI Model adopts a participatory learning approach that positions farmers as the principal actors in the learning process. Integrating RSPO-based GAP literacy with field practice is expected to strengthen farmers' readiness to maintain RSPO certification while improving the sustainability of smallholder plantation management.

Based on these conditions, this activity aimed to improve farmers' literacy regarding RSPO-based Good Agricultural Practices through the implementation of the RUMPI Innovation ('literacy through action') and to evaluate changes in farmers' knowledge and readiness to implement sustainable oil palm cultivation practices.

METHOD

Methods, Location, and Participants

The community service activity employed a one-group evaluation method with measurements conducted before and after the intervention (one-group pre-test-post-test evaluation). This method was used to assess changes in participants' literacy after they completed a series of educational, discussion-based, and practical activities, without intending to establish a causal relationship. The activity was implemented through several scheduled sessions between May and August 2026.

The first activity was conducted on 4 May 2026, when the community service team and the farmers discussed the problems encountered and prepared for the implementation of RUMPI in Laut Tador Village, Sei Suka District, Batu Bara Regency. The second activity, consisting of the main educational session and farmer field school, was conducted on 21 June 2026. Needs assessment, preparation of learning media, mentoring, and monitoring were undertaken according to the 2026 community service program schedule.

The RUMPI Innovation (Rumah Pintar Petani/Farmers' Smart House) applies an integrative-participatory-replicable approach under the slogan 'Literacy through Action.' Farmers act as co-creators and are involved in needs identification, problem discussion, demonstrations, reflection on results, and the preparation of improvement plans. Integration is achieved by linking RSPO materials, GAP practices, learning media, and participants' farm experiences, whereas the replicable component is intended to enable learning materials, record-keeping formats, and simple practices to be reused by other farmer groups.

Table 1. Stages of RUMPI Model Implementation

Stage	Main Activities	Partner Role	Outputs
Needs assessment	Surveys, interviews, and discussions with managers and members to map literacy, farm practices, learning-media needs, and constraints in implementing RSPO.	Describe farm conditions, audit experiences, learning needs, and priority problems.	Problem map, required materials, and required learning program
Baseline literacy measurement	Administration of the pre-test for baseline identification.	Complete the questionnaire with assistance from students and the community service team.	Baseline knowledge score
Literacy through action	Brief presentations, case discussions, question-and-answer sessions, demonstrations, and record-keeping exercises that connect RSPO principles with farmers' daily farm needs.	Share experiences, practice the material, identify gaps, and formulate alternative improvements.	Improved understanding, basic skills, and commitment to action.
Evaluation and follow-up plan	Administration of the post-test, satisfaction evaluation, group reflection, and formulation of priorities for further mentoring.	Provide feedback and identify the practices to be improved.	Results data, recommendations, and a group action plan.

RUMPI 'LITERACY THROUGH ACTION' FOR EMPOWERING TANI MANDIRI SMALLHOLDERS TOWARD SUSTAINABLE OIL PALM INNOVATION

Delyana Rahmawany Pulungan et al

Stage	Main Activities	Partner Role	Outputs
Mentoring and sustainability	Continuous monitoring and periodic learning forums.	Conduct learning forums, share evidence of practice, and report progress periodically.	Institutional strengthening and continuous improvement.

The participants were members of the Tani Mandiri Farmer Group Association who managed smallholder oil palm farms and were willing to participate in the entire series of activities. A total of 50 participants from seven farmer groups attended the program. Pre-test and post-test data were analyzed as paired observations for participants who completed both instruments in full. Participants who completed only one measurement were still recorded as program participants but were excluded from the paired change analysis.

RSPO-Based GAP Literacy Materials

The materials were developed based on the identified problems, preliminary survey data, and the main RSPO principles applicable in 2026. The content was not delivered as a set of certification requirements to be memorized; instead, it was translated into examples of decisions and evidence of practices that farmers could implement. The learning materials were grouped into five principal topics: (1) legality and governance; (2) agronomic practices, introduced gradually beginning with balanced fertilization, soil health, and fertilizer placement; (3) environmental protection, including zero-burning land preparation, erosion control, protection of riparian zones and water sources, and recognition of areas of conservation value; (4) safety and social aspects, including the use of personal protective equipment, pesticide handling and storage, prohibition of washing spraying equipment in water bodies, protection of vulnerable groups, and prevention of child labor; and (5) integrated pest management and continuous improvement.

Pre-Test and Post-Test Literacy Measurement

Participant characteristics, domain scores, distribution of practices, and responses to the activity were analyzed descriptively using frequencies, percentages, means, standard deviations, medians, and ranges, as appropriate for each data type.

Table 2. Instrument Structure and Operationalization of Measurement

Component	Number of Items	Response Format	Scoring	Output
Basic knowledge of sustainable plantations	15 items	True/false	Correct = 1; incorrect = 0	Score of 0-15 and percentage of correct responses
Literacy and readiness for RSPO good practices	21 statements	5-point Likert scale	Strongly do not know/disagree = 1 to strongly know/agree = 5	Total score of 21-105 and mean score by dimension
Current farm practices	17 items	Yes/no/do not know	Yes = 1; no/do not know = 0; categories remain reported	Practice/readiness index of 0-100
Post-activity evaluation	9 items	5-point Likert scale	Strongly disagree = 1 to strongly agree = 5	Total score of 9-45 and mean score per item

RESULTS AND DISCUSSION

Partner Participation and Farmer Conditions

The community service activity involved 50 farmers from seven farmer groups affiliated with the Tani Mandiri Farmer Group Association. The partner group did not merely receive the materials; its members were also involved in problem mapping, selection of farmer field school topics, discussion of audit experiences, completion of the instruments, farm-based practice, and preparation of follow-up plans. Such involvement is important because

compliance with sustainability standards among independent smallholders is strongly influenced by group organizational capacity, clarity of land legality, farm management practices, and facilitator support. The ITSI community service team was responsible for activity design, material facilitation, data processing, and recommendations, while students assisted with administration, documentation, completion of the instruments, and field practice. Together with the resource person, the farmers practiced fertilization using an innovative fertilizer application tool while learning the Five Rights (5T) concept in fertilization. Farmer participation is essential because compliance with sustainability standards among independent smallholders is strongly influenced by organizational capacity, legal clarity, farm management practices, and facilitator support (de Vos et al., 2023; Schoneveld et al., 2019; Watts et al., 2021).

The team's preliminary survey and interviews in 2024-2025 showed that literacy regarding sustainable plantation practices remained below 50%, while participation in green-technology adoption was below 30%. More than 70% of farmers continued to rely predominantly on chemical fertilizers, whereas fewer than 10% had utilized farm waste as organic matter or value-added products. These findings do not imply that all farmer practices were inappropriate; rather, they indicate gaps between knowledge, customary field practices, documentation, and consistency of implementation. The most evident gaps concerned fertilization and harvest records, implementation of the Five Rights (5T) fertilization principles, the use of personal protective equipment, biomass management, protection of water sources, and members' access to group information.

The pre-test instrument provided a more detailed assessment of the preliminary survey findings through three levels of measurement. First, 15 true-false statements assessed basic knowledge of sustainability, legality, record-keeping, pesticides, harvest maturity, biomass, conservation, youth involvement, and fertilization. Second, 21 Likert-scale statements mapped literacy and readiness to implement practices across the dimensions of institutions, traceability, GAP, the environment, occupational health and safety, farm record-keeping, participation, innovation, and soil health. Third, a 17-item checklist identified practices that farmers had implemented, had not implemented, or did not yet understand.

The pre-test findings are presented in Table 3.

Table 3. Pre-Test Results

Dimension	Preliminary Survey/Pre-Test Findings	Community Service Team Strategy
Sustainability literacy	Baseline literacy was estimated at <50%; understanding was uneven among members.	Materials should be simple, contextual, and linked to everyday farm decisions; literacy and green-technology modules should be prepared.
Adoption of green practices	Participation in green-technology adoption was <30%.	Implement farmer field schools through direct experiential practice.
Soil and fertilization	>70% of farmers still relied predominantly on chemical fertilizers; implementation of the Five Rights (5T) was inconsistent.	Prioritize demonstrations on fertilization, soil health, organic matter, and dose recording.
Biomass and waste	<10% of farmers productively utilized farm waste.	Strengthen the return of pruned fronds, composting, and organic matter management.
Record-keeping and traceability	Records of farm area, palm stands, harvests, sales, fertilizers, pesticides, and costs were not consistently maintained by all members.	Provide simple record formats, group archiving, and digital support.
Occupational health and safety and the environment	Understanding of personal protective equipment, safe pesticide use, riparian zones, and pollution prevention varied among members.	Provide simulations, examples of evidence of practice, and on-farm monitoring.

Source: Preliminary Survey Results (2026)

Implementation of Education and the Farmer Field School ('Literacy through Action')

The farmer field school was conducted on 21 June 2026 on a member's farm and involved a resource person, the ITSI community service team, students, the association's management, and participating farmers. The classroom material was delivered briefly to establish a conceptual framework, followed by observation of farm conditions, case discussions, demonstrations, and practical activities. The principal topics included institutions and certification, legality and traceability, good agricultural practices, environmental protection, occupational health and safety and chemical use, farm record-keeping, and sustainable soil and fertilizer management. The materials were aligned with the 2024 RSPO standard (RSPO, 2024). The 'literacy through action' farmer field school focused on fertilization and directly applied an innovative fertilization method that met the Five Rights (5T) criteria.

During the field session, participants practiced the Five Rights (5T) fertilization principles: the right type, right dose, right time, right method, and right placement. The resource person demonstrated the active root zone, appropriate distance and placement of fertilizer, considerations related to palm age and condition, and the use of a fertilizer application aid. Participants were then asked to repeat the procedure, explain the rationale for the selected method, and identify the risks if fertilizer entered drainage channels or water sources. The practice was complemented by discussions on soil health, returning pruned fronds to the field as organic matter, recording fertilizer type, dose, application time, and cost, and obtaining farmers' feedback on the innovation and use of the fertilizer application tool.



Figure 2. Farmer Field School ('Literacy through Action') on the Farm

Changes in Farmer Literacy

The community service team administered the post-test after the indoor educational session and farmer field school. The results showed that post-test scores were higher than pre-test scores for both basic knowledge and the literacy-readiness scale. Improvements were particularly evident in participants' understanding that sustainability concerns not only production, but also legality, occupational safety, environmental protection, governance, and welfare; the importance of transparent institutions; the recording of fresh fruit bunch origins and farm activities; the prohibition of land clearing by burning; the use of personal protective equipment; protection of water sources; and balanced fertilization principles. In the post-test, participants also demonstrated stronger acceptance of youth

involvement in digital record-keeping, marketing, innovation, and farmer regeneration. The results are presented in Table 4.

Table 4. Changes in the Farmer Literacy Index Before and After Stage I Education

Component	Pre-Test (Mean)	Post-Test (Mean)	Interpretation
Basic knowledge	48.0	67.3	Increased from the moderate to the high category. Farmers began to understand the basic concepts of GAP and RSPO, but further reinforcement is still required regarding technical implementation and documentary evidence.
RSPO literacy and readiness	46.3	64.8	Increased from the moderate category to the lower boundary of the high category. The results indicate growing understanding and readiness, although these have not yet been fully translated into consistent practice.
Farm practice/readiness index	38.8	57.6	Increased from the low to the moderate category. The change primarily reflects greater awareness and readiness to improve; actual practices still require verification through farm monitoring.
Activity evaluation	Not measured	78.0	The activity was rated as good. Participants considered the materials easy to understand, relevant to farm needs, and supportive of their readiness to participate in the next mentoring stage.
Total Green Literacy Index	44.4	63.2	Overall literacy increased from the moderate category to the lower boundary of the high category. This achievement indicates the effectiveness of the first educational stage, but it does not represent the final outcome of the RUMPI program.

Source: Preliminary Survey Results (2026)

The evaluation results showed that the first educational stage of the RUMPI Innovation increased the farmers' green literacy index from 44.4 to 63.2, an increase of 18.8 points categorized as moderate. Basic knowledge of GAP and RSPO increased from 48.0 to 67.3, while RSPO literacy and readiness increased from 46.5 to 64.8. These improvements indicate that the farmer field school, discussions, and farm-based demonstrations helped farmers understand land legality, farm record-keeping, occupational safety, environmental protection, and appropriate fertilization.

The farm practice and readiness index also increased from 38.8 to 57.6, although it remained within the moderate category. This finding indicates that knowledge increased more rapidly than actual practices. Therefore, the post-test results represent an initial achievement that must be reinforced through further mentoring, farm visits, record-keeping practice, balanced fertilization, the use of personal protective equipment, pesticide management, and the utilization of organic waste. The community service team also prepared the Farmers' Smart House and the Tani Mandiri Farmer Group Association website to function as centers for learning, discussion, documentation, and monitoring in support of the sustained implementation of GAP and RSPO certification.

During the demonstration, participants were able to identify more appropriate fertilizer placement, explain the Five Rights (5T) components, use the fertilizer application aid, and relate fertilization decisions to soil conditions and financial capacity. Farmers identified the minimum information that should be recorded, including fertilizer type, dose, application date, area or block, labor, and cost. Regarding occupational health and safety, the discussion indicated improved understanding of personal protective equipment, label instructions, the prohibition of washing spraying equipment in water bodies, and the protection of vulnerable workers. Regarding environmental aspects,

participants were able to identify the risks of river pollution, erosion, land burning, and inappropriate biomass management.

Nevertheless, skills acquired in a single session cannot yet be considered evidence of sustained behavioral change. The immediate post-test can only be interpreted as indicating improved understanding and readiness to implement practices. Evidence of behavioral change will be reviewed, monitored, and further evaluated by the community service team through farm visits, examination of record books, observation of personal protective equipment use, fertilization documentation, and verification of follow-up actions after 30-90 days. Knowledge must be supported by land legality, group organization, facilitation, and the capacity to comply with and consistently demonstrate the required practices (de Vos *et al.*, 2023; Jelsma & Schoneveld, 2016).

Institutional Strengthening through the Website and Farmers' Smart House

The program outputs extended beyond improvements in farmer knowledge. The community service team delivered a design for developing the Tani Mandiri Farmer Group Association website so that it would be more informative, educational, and manageable. The proposed content included the group's profile and organizational structure, information on members and farmer groups, GAP-RSPO materials, activity agendas and news, reports on good practices, farmer field school documentation, GAP-RSPO checklist forms, legality information suitable for publication, and a communication channel for the association. At this stage, the website is intended to broaden members' access to learning materials, strengthen communication transparency, and promote a culture of documentation.

The team also designed the arrangement of the association's office as a Farmers' Smart House serving as a community-based learning space. The proposed layout includes a discussion table, reading corner, standards information board, shelves for legality records or books, a display of personal protective equipment, access to computers or other digital devices, and a consultation area. The Farmers' Smart House is expected to host monthly forums, provide repeat learning sessions for members who did not attend the training, store evidence of practices, support internal audit preparation, and serve as a coordination center for mentoring.

This institutional strengthening is relevant to the RSPO certification system, under which the group manager is responsible for managing the operations of independent smallholder groups and their members. The manager's capacity, history of non-conformities, diversity of members, and effectiveness of the group system constitute important elements of the assessment process. Certification is also maintained through periodic surveillance audits and does not end with the issuance of the certificate (RSPO, 2024). Accordingly, the website and Farmers' Smart House are strategically important as supporting learning and communication infrastructure, although the continuity of certification remains dependent on compliance with the standard and evidence of implementation by all farmer members of the Tani Mandiri Farmer Group Association in Laut Tador.

The sustainability of changes in farmer practices is determined not only by technological competence, but also by institutional support and collaboration among actors. emphasized that support from government, research institutions, and farming communities is an important factor in accelerating the adoption of sustainable agriculture. Therefore, the Farmers' Smart House and the association's website are intended to connect farmers with information, mentors, government agencies, and other partners that support the continuous fulfillment of GAP and RSPO practices.

Sustainability and Monitoring Agenda

Program sustainability is directed through a 30-, 60-, and 90-day monitoring plan. During the first 30 days, the management will finalize the RUMPI management structure, appoint personnel responsible for record-keeping and website management, and distribute farm record-book formats. On day 60, the team will examine samples of harvest, fertilizer, pesticide, and cost records, as well as the use of personal protective equipment and other good practices. On day 90, a group reflection session will compare post-test commitments with evidence of practice, identify unresolved gaps, and formulate the next improvement plan. A discussion forum held at least once per month is required to prevent the knowledge gained from being lost after the activity.

Table 5. Sustainability Monitoring Plan for the RUMPI Innovation

Time	Focus	Indicator	Evidence
0-30 days	Organization of RUMPI	Management structure established; forum and learning media available.	Decree/assignment letter, schedule, photographs of the room, and list of materials.
31-60 days	Implementation of record-keeping, personal protective equipment, fertilization, and environmental practices.	Some members begin keeping records and demonstrating priority practices.	Farm record books, photographs, and visit checklists.
61-90 days	Verification of changes and correction of gaps.	A progress summary and farmers' corrective action plan are available.	Monitoring report.
Periodic	Website, learning forum, and internal audit support.	Content updated; regular meetings conducted; findings followed up.	Website log, attendance lists, corrective-action records, and activity documentation.

Overall, the improvements generated by the program are gradual, beginning with increased individual literacy and basic practical skills, followed by the provision of supporting tools and formats, broader access to information through the website, and strengthened learning and documentation spaces through the Farmers' Smart House. This combination demonstrates that the RUMPI Innovation is more comprehensive than one-way socialization. Nevertheless, its contribution to RSPO certification should be positioned as strengthening readiness and continuous improvement rather than guaranteeing successful certification. Long-term success depends on the consistency of practices among all farmer members of the Tani Mandiri Farmer Group Association, the capacity of its management, the quality of records, the resolution of findings, and a sustained commitment to mentoring.

CONCLUSION

The implementation of the RUMPI Innovation as a form of 'literacy through action' through participatory education and a farmer field school improved farmers' literacy regarding RSPO-based Good Agricultural Practices. The farmers' green literacy index increased from 44.4 to 63.2, with a normalized gain of 0.34, representing a moderate level of improvement. Basic knowledge of GAP and RSPO increased from 48.0 to 67.3, while RSPO literacy and readiness increased from 46.5 to 64.8. The farm practice and readiness index also increased from 38.8 to 57.6, although it remained within the moderate category.

These results indicate that improvements in farmers' knowledge and readiness occurred more rapidly than changes in actual farm practices. The activity therefore fulfilled the community service objective as an initial stage of empowerment that should be continued through mentoring, monitoring, and verification of practice implementation. The development of the association's office as a Farmers' Smart House and the provision of a more informative website design strengthen RUMPI's function as a center for learning, discussion, documentation, and knowledge management. This model has the potential to support the consistent implementation of GAP and assist the Tani Mandiri Farmer Group Association in maintaining sustainable, long-term RSPO certification.

The Tani Mandiri Farmer Group Association requires regular mentoring and supervision focused on RSPO-compliant good practices that support the continuity of its existing RSPO certification. All members should use standardized record-keeping formats for harvests, fertilization, pesticide use, labor, costs, and the origin of fresh fruit bunches, particularly in accordance with RSPO audit requirements. The Farmers' Smart House should be formally designated as the learning and documentation center of the Tani Mandiri Farmer Group Association and supported by a management team responsible for discussion schedules, document storage, website management, and member monitoring. The website should contain GAP-RSPO materials, record-keeping formats, documentation of good practices, and information on certification progress.

Strategically, the association should prepare an RSPO mentoring roadmap that integrates education, practice improvement, governance strengthening, the provision of objective evidence, and follow-up actions on audit findings. Program sustainability should be reinforced through collaboration with higher education institutions, extension officers, local government, partner companies, and certification bodies.

ACKNOWLEDGMENT

The authors express their gratitude to the Directorate General of Research and Development, Ministry of Higher Education, Science, and Technology, for funding support and facilitation of the 2026 BIMA Community Service Program. Appreciation is also extended to Institut Teknologi Sawit Indonesia for institutional, administrative, facility, and team-assignment support during program implementation, and to STIE Graha Kirana for its academic collaboration and non-financial contributions to this community empowerment program. The authors further thank the management and all members of the Tani Mandiri Farmer Group Association in Laut Tador Village for their active participation, openness, and commitment throughout the education, farmer field school, evaluation, and development of the Farmers' Smart House to support sustainable oil palm plantation practices and the continuity of RSPO certification.

REFERENCES

- de Vos, R. E., Suwarno, A., Slingerland, M., van der Meer, P. J., & Lucey, J. M. (2023). Pre-certification conditions of independent oil palm smallholders in Indonesia: Assessing prospects for RSPO certification. *Land Use Policy*, 130, 106660. <https://doi.org/10.1016/j.landusepol.2023.106660>
- Directorate General of Estate Crops. (2024). Statistik perkebunan jilid I 2022–2024. Ministry of Agriculture of the Republic of Indonesia. <https://ditjenbun.pertanian.go.id/?publikasi=statistik-perkebunan-jilid-i-2022-2024>
- Food and Agriculture Organization of the United Nations. (2023). Agricultural production statistics 2000–2022 (FAOSTAT Analytical Brief No. 79). <https://doi.org/10.4060/cc9205en>
- Jelsma, I., & Schoneveld, G. C. (2016). Towards more sustainable and productive independent oil palm smallholders in Indonesia: Insights from the development of a smallholder typology. *Center for International Forestry Research*. <https://doi.org/10.17528/cifor/006222>
- Jelsma, I., Woittiez, L. S., Ollivier, J., & Dharmawan, A. H. (2019). Do wealthy farmers implement better agricultural practices? An assessment of implementation of Good Agricultural Practices among different types of independent oil palm smallholders in Riau, Indonesia. *Agricultural Systems*, 170, 63–76. <https://doi.org/10.1016/j.agry.2018.11.004>
- Kahar, A., Hermansyah, Saladin, K., Pratama, V. M., Kurniati, A., Deska, J. P., Zain, M. A. F., & Izan, N. F. (2025). Sustainable agriculture utilization in maintaining biodiversity and plant productivity in Batu Bajanjang Village. *International Review of Practical Innovation, Technology and Green Energy*, 5(1), 159–163. <https://doi.org/10.54443/irpitage.v5i1.3398>
- Meijaard, E., Brooks, T. M., Carlson, K. M., Slade, E. M., Garcia-Ulloa, J., Gaveau, D. L. A., ... Sheil, D. (2020). The environmental impacts of palm oil in context. *Nature Plants*, 6(12), 1418–1426. <https://doi.org/10.1038/s41477-020-00813-w>
- Pulungan, D. R., Saragih, D. A., & Tanjung, Y. W. (2024). The participation of the young generation as palm oil farmers in good practices of sustainable palm oil plantations in North Sumatra and Aceh. *International Journal of Economics Development Research*, 5(4), 3357–3368. <https://doi.org/10.37385/ijedr.v5i4.6189>
- Pulungan, D. R., Saragih, D. A., Tanjung, Y. W., & Aznur, T. Z. (2026). Participatory management model for youth engagement in sustainable smallholder oil palm practices. *Fundamental and Applied Management Journal*, 4(1), 297–314. <https://doi.org/10.66314/famj.v4i1.771>
- Purnomo, H., Kusumadewi, S. D., Ilham, Q. P., Kartikasara, N. H., Okarda, B., Dermawan, A., Puspitaloka, D., & Brady, M. A. (2022). Harnessing political economy and global green trade to increase Indonesia's palm oil sustainability. *CIFOR-ICRAF*. <https://doi.org/10.17528/cifor/008637>
- Roundtable on Sustainable Palm Oil. (2024). RSPO Independent Smallholder Standard for the production of sustainable palm oil and oil palm products. <https://rspo.org/rspo-members-adopt-the-2024-principles-and-criteria-and-independent-smallholder-standard/>
- Schoneveld, G. C., van der Haar, S., Ekowati, D., Andrianto, A., Komarudin, H., Okarda, B., Jelsma, I., & Pacheco, P. (2019). Certification, good agricultural practice and smallholder heterogeneity: Differentiated pathways for resolving compliance gaps in the Indonesian oil palm sector. *Global Environmental Change*, 57, 101933. <https://doi.org/10.1016/j.gloenvcha.2019.101933>
- Waddington, H., Snilstveit, B., Hombrados, J. G., Vojtkova, M., Anderson, J., & White, H. (2012). Farmer field schools for improving farming practices and farmer outcomes in low- and middle-income countries: A systematic review. *Campbell Systematic Reviews*, 8(1), 1–335. <https://doi.org/10.4073/csr.2014.6>

RUMPI 'LITERACY THROUGH ACTION' FOR EMPOWERING TANI MANDIRI SMALLHOLDERS TOWARD SUSTAINABLE OIL PALM INNOVATION

Delyana Rahmawany Pulungan **et al**

Watts, J. D., Pasaribu, K., Irawan, S., Tacconi, L., Martanila, H., Wiratama, C. G. W., Musthofa, F. K., Sugiarto, B. S., & Manvi, U. P. (2021). Challenges faced by smallholders in achieving sustainable palm oil certification in Indonesia. *World Development*, 146, 105565. <https://doi.org/10.1016/j.worlddev.2021.105565>