E-ISSN 2599-2872; P-ISSN 2549-8150

J-PEN Borneo: Jurnal Ilmu Pertanian

journal homepage: https://jurnal.ubt.ac.id/index.php/jpen

Research Paper 9(2) (2026) 18 – 24

The Role Of The Konservasi Mandiri Community Group In Mangrove Conservation In Kampung Empat, Tarakan, Indonesia

Azriel Nugraha Prandika[1] and Nia Kurniasih Suryana[1]

[1]*Agribusiness Study Program, Faculty of Agriculture, Universitas Borneo Tarakan, Tarakan, Indonesia*

*Corresponding author: nia@borneo.ac.id

Submitted/Received: October 2026 ; Accepted: October 2026

ARTICLE INFO

Keywords:
Community group
Government support
Mangrove conservation
Participation
Perceived benefits

ABSTRACT

Community involvement is an important component of mangrove conservation. This study aimed to describe the conservation activities of the Konservasi Mandiri community group and summarize members' responses concerning participation, government support, and mangrove benefits in Kampung Empat, Tarakan, Indonesia. A census covered all 30 group members. Observations, structured interviews, and documentation were analyzed descriptively. Nine questionnaire items were coded on a three-point scale, giving a possible composite range of 9–27. Reported participation was highest in maintenance (96.7%), followed by planning (86.7%), monitoring (73.3%), site selection (66.7%), and field schools (63.3%). Positive responses to seedling provision, government instruction during planting, and direct and indirect benefits were 63.3%, 66.7%, 83.3%, and 86.7%, respectively. The mean composite score was 24.53 out of 27, within the upper descriptive interval. Mean dimension scores were 5.53 for planning and monitoring, 10.40 for rehabilitation-related items, 2.93 for maintenance, and 5.67 for utilization-related items. Because the questionnaire combines different constructs, the composite is an exploratory summary rather than a validated measure of participation or conservation effectiveness. The findings support improving consistency in monitoring and field-school attendance; ecological and income outcomes were not measured.

INTRODUCTION

Mangrove ecosystems connect coastal environmental protection with the everyday use of natural resources by surrounding communities. Their functions include providing habitat for aquatic organisms, supporting fisheries, storing carbon, and contributing to coastal protection. These benefits do not necessarily occur with equal intensity at every site. Sievers et al. [1] examined the spatial co-occurrence of mangrove biodiversity and ecosystem services, illustrating why conservation priorities need to consider several functions together. At the local level, conserving mangroves therefore involves more than establishing vegetation. It also involves maintaining activities, organizing responsibilities, and understanding how people relate to the ecosystem. Community groups provide an identifiable setting in which these social aspects of conservation can be described without assuming that group membership itself guarantees successful ecological outcomes.

The national context reinforces the relevance of examining local conservation activities. The Indonesian Ministry of Forestry reported approximately 3.45 million hectares of mangroves, representing about 23% of the global mangrove area, based on the 2025 National Mangrove Map [2]. The ministry also reported that the Mangroves for Coastal Resilience project planted 15,574 hectares across North Kalimantan, North Sumatra, Riau, and East Kalimantan during 2024–2025 [3]. These national figures describe the scale of mangrove resources and rehabilitation initiatives; they do not establish the condition or success of a particular community-managed site. Understanding local practices requires information about who participates, which activities are undertaken, and how support and perceived benefits are represented in the evidence collected from members.

Previous studies have examined complementary dimensions of community-based mangrove management. Damastuti et al. [4] investigated management practices and coastal protection in Central Java, while Sudrajat et al. [5] examined institutional performance and stakeholder roles in rehabilitation and conservation. Valenzuela et al. [6] considered participation in restoration projects alongside social capital and livelihoods in the Philippines. These studies provide a basis for considering community organization within a broader social and ecological context. However, their findings cannot be transferred automatically to another group with a different instrument, location, and membership. A local descriptive assessment is useful for identifying reported activities and differences among responses, provided that the interpretation remains consistent with what each questionnaire item actually asks.

Participation, support, and perceived benefits are related but distinct concepts. Participation refers here to members' reported involvement in activities such as planning, monitoring, site selection, field schools, and maintenance. Government support concerns reported provision of seedlings or instruction during planting. Perceived benefits concern respondents' views about possible development and environmental functions. Apelabi [7], for example, examined perceptions of mangrove conservation using the New Environmental Paradigm approach; such perceptions should not be treated as direct observations of participation. Likewise, interpretation planning for conservation education [8], rehabilitation-related learning [9], and community participation in mangrove ecotourism maintenance [10] address different aspects of management. A questionnaire combining these aspects requires careful labeling so that positive responses do not become unsupported claims about ecological recovery or economic improvement.

The Konservasi Mandiri community group in Kampung Empat, East Tarakan, North Kalimantan, provides a local case for examining these distinctions. Its activities encompass planning, monitoring, rehabilitation, maintenance, and educational use of the mangrove area. Nevertheless, the existence of these activities does not establish that all members participate consistently or that environmental and income outcomes have improved. The descriptive gap addressed by this study concerns how activities and members' responses are distributed within this particular group. The study aimed to describe the group's mangrove conservation activities and summarize responses concerning participation, government support, and perceived benefits. The expected contribution was a bounded account that could inform activity coordination and subsequent monitoring. No causal hypothesis was tested, and the study did not evaluate ecological restoration effectiveness or changes in household income.

MATERIALS AND METHODS

Research site and time

The study was conducted in Kampung Empat, East Tarakan District, Tarakan City, North Kalimantan, Indonesia. The location was selected purposively because the Konservasi Mandiri community group conducted mangrove conservation activities there. The overall research period lasted six months in 2026. The site context included the group's activities around RT 8 near the golf course. This descriptive setting defined the unit of investigation; it did not represent a comparative selection of several mangrove management sites.

Research design and respondents

A descriptive approach combined qualitative accounts of activities with numerical summaries of questionnaire responses. The population comprised all 30 members of the Konservasi Mandiri community group, and a census included those 30 members as respondents. This followed the meaning of complete population coverage described by Hardani et al. [11]. The resulting descriptions applied to the focal group. The census did not extend the inference to non-members or to the entire population of Kampung Empat. No experimental treatments, treatment replications, or tests of intervention effects were used.

Data sources and collection

Primary information was collected through observation of group activities and structured interviews using a questionnaire. Documentation included written records and activity photographs. Secondary information comprised scientific literature, institutional documents, and relevant agency reports. The distinction between primary and secondary sources followed Sugiyono [12]. Activity accounts supplied contextual descriptions, whereas the questionnaire supplied the response frequencies summarized in the results. Questionnaire responses were treated as self-reports rather than independent measurements of attendance, vegetation change, water quality, seedling survival, or income. The study did not report an experimentally controlled or longitudinal assessment of conservation outcomes.

Questionnaire and measured constructs

The questionnaire contained nine items organized under planning and monitoring, rehabilitation, maintenance, and utilization, as shown in Table 1. Items 1–4 and 7 asked about involvement in activities. Item 5 concerned government provision of seedlings, and item 6 concerned government instruction during planting. Items 8–9 concerned development potential and perceived indirect benefits. The original Indonesian item wording was retained to distinguish the questions administered from their interpretation. Each item used the codes Yes = 3, Sometimes = 2, and No = 1. The instrument combined different constructs, and the frequency meaning of Sometimes and its reference period were not operationally defined. Consequently, the combined score was treated as an exploratory summary rather than a validated participation scale.

Descriptive calculations and interpretation

Response percentages were calculated as $p = (f/30) \times 100\%$, where f was the number of respondents selecting a category. The mean score for an item was $s = (3fYes + 2fSometimes + fNo)/30$. A dimension score was the sum of its item means; the overall mean composite S was the sum of all nine item means. The theoretical composite range was 9–27. Calculations used unrounded values, with percentages reported to one decimal place and scores to two decimals. No adjustment was made to force rounded percentages to sum to exactly 100%. The class-width expression was $(27 - 9)/3 = 6$. Descriptive intervals were low, $9 \leq S \leq 15$; moderate, $15 < S \leq 21$; and high, $21 < S \leq 27$.

For a dimension containing k items, the theoretical range was k–3k. Low scores were defined as $k \leq D \leq 5k/3$, moderate scores as $5k/3 < D \leq 7k/3$, and high scores as $7k/3 < D \leq 3k$. The dimensions contained two, four, one, and two items, respectively. Absolute scores from dimensions of different lengths were therefore not interpreted as equivalent activity intensity. These intervals were arithmetic descriptors, not externally validated thresholds of conservation effectiveness. Aggregate response frequencies permitted calculation of means but did not establish individual score variability, internal consistency, or relationships among questionnaire items. No inferential test or significance claim was applied.

Table 1. Questionnaire dimensions and original administered items

The questionnaire wording is retained in Indonesian. Responses were coded Yes = 3, Sometimes = 2, and No = 1.

No.	Dimension	Parameter	Original questionnaire item and coding
1	Planning and monitoring	Conservation planning	1.Apakah saudara terlibat dalam perencanaan tanaman mangrove a.Ya (3) b. Kadang-kadang (2) c. Tidak (1)
		Mangrove monitoring	2.Apakah dalam pengawasan pelaksanaan dan pemeliharaan tanaman mangrove saudara terlibat a.Ya (3) b. Kadang-kadang (2) c. Tidak (1)
2	Rehabilitation	Site selection	3.Apakah saudara terlibat dalam pemilihan lokasi penanaman tanaman mangrove a.Ya (3) b. Kadang-kadang (2) c. Tidak (1)
		Field school	4.Apakah saudara terlibat dalam kegiatan sekolah lapang a.Ya (3) b. Kadang-kadang (2) c. Tidak (1)
		Nursery work	5.Apakah dalam pembibitan saudara mendapat penyaluran bibit dari pemerintah a.Ya (3) b. Kadang-kadang (2) c. Tidak (1)
		Planting	6.Apakah dalam penanaman ada pembelajaran dari pemerintah a.Ya (3) b. Kadang-kadang (2) c. Tidak (1)
3.	Maintenance	Mangrove maintenance	7.Apakah saudara terlibat dalam kegiatan pemeliharaan a.Ya (3) b. Kadang-kadang (2) c. Tidak (1)
4.	Utilization	Direct benefits	8.Apakah pemanfaatan langsung mangrove dapat dikembangkan lebih lanjut untuk meningkatkan kesejahteraan masyarakat tanpa merusak lingkungan? a.Ya (3) b. Kadang-kadang (2) c. Tidak (1)
		Indirect benefits	9.bagaimana hutan mangrove berkontribusi pada peningkatan kualitas air di sekitar pemukiman Anda? Apakah ada perubahan yang terlihat ketika hutan mangrove rusak atau direhabilitasi? a.Ya (3) b. Kadang-kadang (2) c. Tidak (1)

RESULTS

Respondent characteristics

The study included 30 group members. Twenty respondents were aged 41–65 years (66.7%), while ten respondents (33.3%) were outside that range. Twenty-eight respondents (93.3%) had completed senior secondary education or its equivalent, and two (6.7%) had another educational level. Twenty respondents (66.7%) worked as fishers, while ten (33.3%) had other occupations. These complementary counts describe the reported dominant categories and their arithmetic residuals; they do not subdivide the remaining respondents into unreported age, education, or occupational classes. No relationship between these characteristics and individual questionnaire scores was estimated.

Planning and monitoring

Planning activities included group deliberation, identifying site conditions, selecting locations and species, and estimating seedling and budget requirements. Activities were situated in RT 8 around the golf course. As shown in Table 2, 26 respondents (86.7%) reported involvement in planning, three (10.0%) selected Sometimes, and one (3.3%) selected No. Monitoring concerned seedling development, disturbance, and corrective actions such as replacement planting. The activity account described an initial check around one week after establishment and a subsequent check after three months. Table 3 shows 22 Yes responses (73.3%), seven Sometimes responses (23.3%), and one No response (3.3%).

Table 2. Reported involvement in planning

No.	Response	n	%
1	Yes	26	86.7
2	Sometimes	3	10.0
3	No	1	3.3
	Total	30	100.0

Source: primary data, 2026. Percentages were rounded independently.

Table 3. Reported involvement in monitoring

No.	Response	n	%
1	Yes	22	73.3
2	Sometimes	7	23.3
3	No	1	3.3
	Total	30	100.0

Source: primary data, 2026. Percentages were rounded independently.

Rehabilitation activities and reported support

Rehabilitation-related activities comprised site selection, field schools, nursery work, and planting. The species mentioned in the group's activities were *Avicennia marina*, *Nypa fruticans*, *Sonneratia caseolaris*, and *Rhizophora mucronata*; nursery work primarily concerned *Avicennia marina* and *Rhizophora mucronata*. These descriptions did not quantify the planting of every species at every site. Site selection considered substrate, tides, and visible degradation. Table 4 records 20 Yes responses (66.7%), eight Sometimes responses (26.7%), and two No responses (6.7%) for involvement in site selection. Table 5 records 19 Yes responses (63.3%), nine Sometimes responses (30.0%), and two No responses (6.7%) for field-school involvement.

Table 4. Reported involvement in site selection

No.	Response	n	%
1	Yes	20	66.7
2	Sometimes	8	26.7
3	No	2	6.7
	Total	30	100.0

Source: primary data, 2026. Percentages were rounded independently.

Table 5. Reported involvement in field schools

No.	Response	n	%
1	Yes	19	63.3
2	Sometimes	9	30.0
3	No	2	6.7
	Total	30	100.0

Source: primary data, 2026. Percentages were rounded independently.

Nursery activities were described as propagule collection, preparation of planting material and media, and seedling care. However, the corresponding questionnaire item asked whether respondents received government-distributed seedlings. Table 6 therefore reports support rather than nursery participation: 19 respondents (63.3%) answered Yes, ten (33.3%) answered Sometimes, and one (3.3%) answered No. Planting activities included site preparation, seedling distribution, staking, and planting. The corresponding question asked about government instruction during planting. Table 7 records 20 Yes responses (66.7%), nine Sometimes responses (30.0%), and one No response (3.3%). These answers described reported instruction, without quantifying individual planting participation or learning gains.

Table 6. Reported government provision of seedlings

No.	Response	n	%
1	Yes	19	63.3
2	Sometimes	10	33.3
3	No	1	3.3
	Total	30	100.0

Source: primary data, 2026. Percentages were rounded independently.

Table 7. Reported government instruction during planting

No.	Response	n	%
1	Yes	20	66.7
2	Sometimes	9	30.0
3	No	1	3.3
	Total	30	100.0

Source: primary data, 2026. Percentages were rounded independently.

Maintenance and perceived benefits

Maintenance activities included removing waste, repairing stakes, replacing dead seedlings, monitoring growth, and protecting plants from disturbance. Table 8 shows that 29 respondents (96.7%) reported maintenance involvement and one (3.3%) answered No; no respondent selected Sometimes. The questionnaire did not quantify the number of surviving seedlings. Educational use included field schools and the development of Mangrove Edupark. In Table 9, 25 respondents (83.3%) answered Yes to the possibility of further developing direct benefits for community welfare without environmental damage, four (13.3%) selected Sometimes, and one (3.3%) selected No. This was a view about development potential, not a measured economic outcome.

Table 8. Reported involvement in maintenance

No.	Response	n	%
1	Yes	29	96.7
2	Sometimes	0	0.0
3	No	1	3.3
	Total	30	100.0

Source: primary data, 2026. Percentages were rounded independently.

Table 9. Views on developing direct mangrove benefits

No.	Response	n	%
1	Yes	25	83.3
2	Sometimes	4	13.3
3	No	1	3.3
	Total	30	100.0

Source: primary data, 2026. Percentages were rounded independently.

The indirect-benefit item concerned perceived contributions to water quality and visible changes associated with degradation or rehabilitation. Table 10 records 26 Yes responses (86.7%), four Sometimes responses (13.3%), and no No responses. Because the item combined more than one question, its distribution was interpreted cautiously. It did not establish improved water quality or universal participation in conservation. The absence of No answers applied only to the response distribution for that item.

Table 10. Responses concerning perceived indirect benefits

No.	Response	n	%
1	Yes	26	86.7
2	Sometimes	4	13.3
3	No	0	0.0
	Total	30	100.0

Source: primary data, 2026. Percentages were rounded independently.

Exploratory score summary

Table 11 presents the dimension means and composite. The weighted totals for the nine items were 85, 81, 78, 77, 78, 79, 88, 84, and 86, respectively. Their sum was 736, giving an overall mean composite of 24.53 out of 27. The planning and monitoring dimension mean was 5.53, the rehabilitation-related mean was 10.40, maintenance was 2.93, and utilization-related items totaled 5.67. These figures were calculated before rounding. Each dimension and the overall composite fell within the upper descriptive interval. The classifications summarized responses across mixed constructs and did not demonstrate a validated high level of conservation effectiveness.

Table 11. Dimension means and exploratory composite

Dimension	Items; range	Mean	Interval
Planning and monitoring	2; 2–6	5.53	High
Rehabilitation-related	4; 4–12	10.40	High
Maintenance	1; 1–3	2.93	High
Utilization-related	2; 2–6	5.67	High
Exploratory composite	9; 9–27	24.53	High

Source: primary data, 2026. Means were calculated before rounding. Intervals describe theoretical score ranges, not validated conservation effectiveness.

DISCUSSION

The main finding was an uneven pattern of self-reported involvement across activities, with maintenance receiving the largest proportion of positive responses among items directly asking about involvement. Planning also involved most respondents, while monitoring and field schools had larger Sometimes categories. This pattern identifies coordination priorities within the group without showing why individual members participated more or less frequently. Maintenance can be discussed as a widely reported activity, but a response frequency is not a measure of the amount of work undertaken, the area maintained, or the quality of implementation. The practical value of the findings lies in identifying activities that warrant more consistent scheduling and documentation rather than in ranking ecological achievements.

Measurement alignment is central to interpreting the remaining findings. The seedling item describes a government input, and the planting item describes instruction rather than actual planting involvement. Positive answers may indicate that support reached respondents, but they do not establish how recipients used seedlings or applied instruction. Duryat and Rodiani [9] examined learning and skills in a mangrove rehabilitation activity, illustrating a related but different outcome domain. In the present study, neither knowledge change nor skill improvement was measured. Future assessment would benefit from separating receipt of support, attendance, tasks completed, and learning outcomes. This separation would allow the conservation role of the group to be described with more specific evidence while retaining the distinction between institutional inputs and member actions.

The benefit items require an additional distinction between expectations and observed outcomes. Approval of development potential does not establish increased welfare, and perceived water-quality contributions do not replace environmental measurements. Conservation education and interpretation planning, such as that considered by Yusrini and Eviana [8], provide context for educational uses of mangrove areas. However, the development of Mangrove Edupark should not be evaluated as successful solely because respondents express positive views. A future assessment could record visits, educational activities, costs and revenues, alongside ecological indicators relevant to the site. Such indicators are proposed monitoring needs, not outcomes demonstrated by the present census. This distinction prevents the conclusion from extending beyond the evidence actually collected.

Institutional and livelihood considerations provide plausible context but remain untested explanations. The activity account included links with KPH Tarakan and BRGM through field schools, and two-thirds of respondents worked as fishers. Sudrajat et al. [5] considered institutions and stakeholder roles, while Valenzuela et al. [6] studied restoration participation, social capital, and livelihoods in another national setting. Those studies support the relevance of investigating such relationships, but they do not establish their operation in Kampung Empat. Likewise, respondent age and education cannot substitute for measures of experience, motivation, or knowledge. Setiyowati et al. [13] investigated farmer characteristics and innovation knowledge in a different context. The national education statistics [14] provide background for describing educational attainment, rather than evidence of local conservation capacity.

Comparisons of categorical scores across locations also require caution. Ilyas et al. [15] reported community participation in mangrove conservation in Batu Gajah, Natuna, while Handayani and Sugiarti [10] examined management and maintenance participation at Luppung. Different instruments, respondent groups, and score boundaries can produce different categories even when activities appear similar. Therefore, the upper descriptive interval in this study should not be interpreted as proof of superior management. Damastuti et al. [4] examined mangrove management in relation to coastal protection using evidence beyond simple positive response frequencies. The present results concern a narrower descriptive question. Their contribution is to make that scope explicit and to identify which responses describe actions, support, or perceptions.

Several limitations constrain inference. The census covered one group, self-reports may be affected by socially desirable answers, and the instrument mixed constructs without establishing scale validity. The compound indirect-benefit item did not fit the response categories well, and Sometimes lacked a defined time reference or frequency threshold. Aggregate counts cannot establish reliability, individual variation, or associations among items. The composite therefore remains exploratory even after its arithmetic is corrected. Ecological outcomes and income change were not measured. Practical follow-up should prioritize a monitoring roster, clear division of responsibilities, and field-school attendance records, given the Sometimes proportions of 23.3% and 30.0%. Subsequent research should define separate constructs, evaluate question comprehension and validity, and combine reported activities with directly recorded outcomes. These improvements would strengthen future assessment without retroactively changing the questionnaire or inventing missing observations.

CONCLUSION

The Konservasi Mandiri community group's mangrove conservation activities in Kampung Empat comprised planning, monitoring, rehabilitation, maintenance, and educational use. Among questions directly addressing involvement, maintenance had the highest proportion of Yes responses, at 96.7%. The mean composite was 24.53 out of 27 and fell within the upper descriptive interval, but its interpretation was limited by the combination of participation, government support, and perceived-benefit items. It should therefore be treated as an exploratory response summary rather than a validated indicator of conservation effectiveness. The findings support improving monitoring consistency and documenting field-school attendance. Ecological recovery, seedling survival, water-quality improvement, and income gains were not demonstrated. Future evaluation should use clearer construct-specific questions and direct outcome measurements before conservation success is inferred.

REFERENCES

[1] Sievers, M., Brown, C. J., McGowan, J., Turschwell, M. P., Buelow, C. A., Holgate, B., Pearson, R. M., Adame, M. F., Andradi-Brown, D. A., Arnell, A., Mackey, B. G., zu Ermgassen, P. S. E., Gosling, J., McOwen, C. J., Worthington, T. A., & Connolly, R. M. (2023). Co-occurrence of biodiversity, carbon storage, coastal protection, and fish and invertebrate production to inform global mangrove conservation planning. Science of the Total Environment, 904, 166357. https://doi.org/10.1016/j.scitotenv.2023.166357

[2] Kementerian Kehutanan. (2026, 26 Juli). Kelola 2,73 juta hektar mangrove di kawasan hutan, Kemenhut perkuat rehabilitasi dan ekonomi masyarakat pesisir. https://www.kehutanan.go.id/news/kelola-2-73-juta-hektar-mangrove-di-kawasan-hutan-kemenhut-perkuat-rehabilitasi-dan-ekonomi-masyarakat-pesisir

[3] Kementerian Kehutanan. (2025, 31 Desember). Kemenhut melalui proyek M4CR telah menanam 20,8 juta batang mangrove. https://www.kehutanan.go.id/news/kemenhut-melalui-proyek-m4-cr-telah-menanam-20-8-juta-batang-mangrove

[4] Damastuti, E., van Wesenbeeck, B. K., Leemans, R., de Groot, R. S., & Silvius, M. J. (2023). Effectiveness of community-based mangrove management for coastal protection: A case study from Central Java, Indonesia. Ocean & Coastal Management, 238, 106498. https://doi.org/10.1016/j.ocecoaman.2023.106498

[5] Sudrajat, J., Jamaludin, J., Anshari, G. Z., Gusmayanti, E., Sawerah, S., & Jabbar, A. (2023). Analisis keberhasilan pengelolaan hutan mangrove: Kasus rehabilitasi dan konservasi oleh komunitas peduli pesisir. Buletin Ilmiah Marina Sosial Ekonomi Kelautan dan Perikanan, 9(1), 73–86. https://doi.org/10.15578/marina.v9i1.11845

[6] Valenzuela, R. B., Yeo-Chang, Y., Park, M. S., & Chun, J.-N. (2020). Local people's participation in mangrove restoration projects and impacts on social capital and livelihood: A case study in the Philippines. Forests, 11(5), Article 580. https://doi.org/10.3390/f11050580

[7] Apelabi, G. O. (2019). Persepsi masyarakat terhadap pelestarian hutan mangrove dengan pendekatan NEP (New Environmental Paradigm) (Studi kasus Kelurahan Kota Uneng dan Desa Talibura Kabupaten Sikka). Gema Wiralodra, 10(2), 282–298. https://gemawiralodra.unwir.ac.id/index.php/gemawiralodra/article/view/83

[8] Yusrini, L., & Eviana, N. (2019). Perencanaan program interpretasi wisata alam berbasis konservasi mangrove di Taman Wisata Alam Mangrove Angke Kapuk Jakarta. Eduturisma, 4(1), 1–23. https://ejournal.asaindo.ac.id/index.php/eduturisma/article/view/1186

[9] Duryat, D., & Rodiani, R. (2023). Rehabilitasi mangrove untuk kesehatan lingkungan dan kesejahteraan masyarakat. Jurnal Pengabdian Fakultas Pertanian Universitas Lampung, 2(2), 133–145. https://doi.org/10.23960/jpfp.v2i2.7879

[10] Handayani, E. A., & Sugiarti, A. (2022). Tingkat partisipasi masyarakat dalam pemeliharaan ekowisata mangrove Luppung Kabupaten Bulukumba. Prosiding Seminar Nasional Politeknik Pertanian Negeri Pangkajene Kepulauan, 3, 52–61. https://doi.org/10.51978/proppnp.v3i1.282

[11] Hardani, H., Andriani, H., Ustiawaty, J., Utami, E. F., Istiqomah, R. R., Fardani, R. A., Sukmana, D. J., & Auliya, N. H. (2020). Metode Penelitian Kualitatif dan Kuantitatif. Yogyakarta: CV Pustaka Ilmu Group.

[12] Sugiyono. (2022). Metode Penelitian Pendidikan Pendekatan Kuantitatif, Kualitatif, dan R&D. Bandung: Alfabeta.

[13] Setiyowati, T., Fatchiya, A., & Amanah, S. (2022). Pengaruh Karakteristik Petani terhadap Pengetahuan Inovasi Budidaya Cengkeh di Kabupaten Halmahera Timur. Jurnal Penyuluhan, 18(2), 208–218. https://doi.org/10.25015/18202239038

[14] Badan Pusat Statistik. (2020). Statistik Pendidikan 2020. Badan Pusat Statistik.

[15] Ilyas, Lumangkun, A., & Natalina, U. (2013). Peran serta masyarakat dalam pelestarian hutan mangrove di Desa Batu

Gajah Kabupaten Natuna. Jurnal Hutan Lestari, 1(2), 92–99.
https://doi.org/10.26418/jhl.v1i2.1880