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Optimizing the Traditional Agroforestry System (*Dusung*) of the Airlouw Community: Review of Ecology and Productivity of Food Commodities

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Abstract: This study investigates the traditional *Dusung* agroforestry system of the Airlouw Hamlet community in Nusaniwe District, Ambon City, focusing on its ecology and productivity as a sustainable source of food commodities. The research employs a review of the Dusung system's capacity to meet the daily subsistence needs of the local community through its regular and continuous management. Data were collected using a census of 30 *Dusung* managers, incorporating both primary data (direct observation and interviews) and secondary sources (literature and existing reports). Analysis was conducted descriptively using both quantitative (productivity metrics) and qualitative (management practices) methods. The findings indicate that the high productivity and yield potential of the *Dusung* system are critically dependent on the optimal ecological management practices implemented by the farmers. The traditional system, characterized by a mix of agricultural commodities and livestock integration, functions as a primary source of food for the Airlouw community. However, the study reveals that the size of the Dusung plot does not linearly correlate with the actual commodity yield. Therefore, optimizing the system hinges on enhancing management strategies rather than merely expanding land area.

Keywords: Airlouw hamlet; Contribution; Hamlet; Local wisdom

Introduction

Airlouw is one of two hamlets within the Nusaniwe customary territory, which falls under the Nusaniwe administrative jurisdiction of Ambon City. This hamlet plays a significant role socially, economically, and culturally, as its residents still uphold the traditional values inherited from their ancestors (Nabilla et al., 2024; Abbas, 2023). Geographically, Airlouw Hamlet is located in the southwest of Ambon City and enjoys a strategic position connecting the city center and the surrounding coastal and mountainous areas. Airlouw is derived from the words "Air" (water) and "Louw" (close together), which literally translates as "Water That Always Heads to the Situ." This reflects the geographical character of this area as an area through which water flows and collects (Xu et al., 2024; Sima et al., 2013; Arsyad et al., 2025). In terms of customary governance, Airlouw Hamlet is led by a Hamlet Head who reports directly to the King of Nusaniwe and coordinates with the Saniri (head of the village) in carrying out government functions and preserving customs. The existence of Airlouw Hamlet is an integral part of the social and cultural fabric of Negeri Nusaniwe, which continues to uphold ancestral customs and traditions in daily life. To meet their daily needs, the Airlouw community regularly and continuously manages their dusung (mixed garden) as a source of food (Shrestha et al., 2025). This dusung is a traditional agroforestry system that has been practiced for generations. Dusung

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emerged as a form of local wisdom that has grown within the civilization of farming communities in Maluku (Kurnia et al., 2022; Budiaman et al., 2023; Naeem & Waheed, 2023).

Research in Ambon also confirms that traditional dusung agroforestry has become part of land management on small islands as an ecological (Syafnan et al., 2025), economic, and socio-cultural solution (Romadhon et al., 2025; Kristianto et al., 2024). Agronomically, the cropping patterns in dusung are highly diverse and resemble forest structures. In a thesis evaluating cropping patterns in Ambon City, Kristianto et al. (2024) and Lestari et al. (2024) found that within a single dusung, there are various types of plants: fruit trees such as durian (*Durio zibethinus*), langsat (Lansium domesticum), snake fruit (*Salacca edulis*), plantation crops such as coconut (*Cocos nucifera*), spices such as nutmeg (*Myristica fragrans*), cloves (*Eugenia aromatica*), and seasonal food crops such as cassava (*Manihot utilisima*), sago (*Metroxylon sagu*), and even forest trees such as *Gmelina mollucana*, *Pterocarpus indicus*, and *Alstonia scholaris* (Ruslan et al., 2021; Bosshard et al., 2021). In addition to fruit and spice trees, the people of Airlouw also fill every inch of their land with hard-stemmed (Engels et al., 2021; Moreno-Mínguez et al., 2018), vegetables such as moringa (*Moringa oleifera*), katuk (*Sauropus androgynus*), matel, and sweet potatoes, as well as other horticultural crops such as chayote, cucumber, bok choy, kale, mustard greens, chili peppers, and tomatoes (Ngawit et al., 2024).

These are not cultivated on a large scale but rather on a subsistence basis, solely for their daily needs; any surplus during the harvest is sold (Holmelin, 2021; Achmad et al., 2022). Airlouw farmers are considered local farmers who are not commercially active (Warsaw et al., 2021). They view agriculture as a productive endeavor carried out using traditional methods inherited from their ancestors, but not yet geared towards the high efficiency of modern agricultural practices (Habib et al., 2025; Chen, 2023). Their orientation toward the use of modern inputs is relatively low. The mindset of Airlouw farmers still relies heavily on organic farming traditions (Rozumowska et al., 2025; Zhou & Ding, 2022). They believe more The focus is on the effectiveness of manure and natural methods passed down through generations (Khumalo et al., 2025; Feliciano, 2022). They consider organic fertilizers more environmentally friendly and suited to the characteristics of their land, although the resulting agricultural productivity is not comparable to that of farmers using subsidized chemical fertilizers. For this reason, along with crop development, several types of livestock are also raised (Shanmugam et al., 2024; Said, 2022).

This not only combines agricultural income and livestock sales, demonstrating a diversified livelihood, maintaining household economic stability amidst family simplicity and reducing dependence on a single income source; it also serves as a source of organic fertilizer for the development of dusung agriculture in their area. Therefore, this study aims to analyze the contribution of the dusung system to the household income of Airlouw Hamlet farmers.

Method

Research Location and Time

This research was conducted in June 2025 in Airlouw Hamlet, located in Nusaniwe District, Ambon City.

Population and Sample

The population in this study were 30 farming families in Airlouw Hamlet. The sample size was 30 respondents. The sample size was determined using a census method.

Data Types and Sources

The data sources used were primary and secondary data. Primary data is data obtained directly through direct observation, interviews, surveys, or experiments. In this case, the primary data sources or direct informants were the head of the GPM congregation in Airlouw Hamlet, the Nusaniwe District Government, the Head of Airlouw Hamlet, the Airlouw Neighborhood Association (RT), and farming families in Airlouw Hamlet. Secondary data was obtained from books, scientific journal articles, databases, previous research reports, and other existing data sources.

Data Analysis Techniques

This research uses qualitative and quantitative descriptive analysis methods.

Results and Discussion

Of the hamlets owned by farmers in Airlouw, 93.33% are privately owned, while 6.67% are owned by others and given to those who wish to manage them (Table 1).

Table 1. Types of Hamlet ownership

Dusung Ownership Type	Frequency (F)	Presentation%
Owned by others	28	93.33
Owned by others	2	6.67
Total	30	100

This indicates that the majority of farming households in Airlouw Hamlet have control over their own productive assets, which can provide security in developing farming businesses and support sustainable livelihood strategies. The area of land owned by the

community varies according to land type. For garden land, the area managed by the community ranged from 0.01 to 0.06 hectares (13 respondents), followed by 0.075 to 0.99 hectares (14 respondents), and 1 to 1.50 hectares (3 respondents) (Table 2).

Table 2. Size of land owned

Land Type	Land Area (Ha)	Number of people)	Average Income/Year (Rp)	Average Income/Month (Rp)
Dusung Garden	0.01–0.06	13	15,360,120.1	1,280,010.01
	0.07–0.99	14	24,115,384.20	2,009,615.35
Dusung	1–1.50	3	33,430,083.70	2,785,840.31

Research shows that the average size of hamlet gardens is smaller than that of village land, due to inheritance patterns that have persisted for several generations. Limited land size encourages them to optimize their use for household consumption. If there is an excess harvest, it is usually sold primarily to the local community, either directly from the garden or taken to local markets (Onomu et al., 2025). Farmers' land use is fundamentally linked to efforts to meet their economic and social needs. Furthermore, land size does not reflect the income of each farmer in the hamlet (Koirala et al., 2022; Neudert et al., 2015). The low income from large plots, while the higher income from small plots is largely influenced by the optimal utilization of each plot by the hamlet farmers (Savin & Bergh, 2024). When farmers optimally utilize the available land, this will result in increased income (Sulistiyowati et al., 2023; Le et al., 2024).

Table 3. Types of Dusung commodities

Commodities	Average Income/Year (Rp)	Average Income/Month (Rp)
Horticultural Crops	17.192.52	1.432.71
Long-Life Crops	5.870.00	489.16
Livestock	3.715.00	309.58
Total	26.777.59	2.231.46

The types of commodities typically planted by farmers in their hamlets can be seen in Table 3, namely horticultural crops, long-lived crops, and livestock. Horticultural crops consisting of vegetables (kale, long beans, winged beans, mustard greens) and fruits (papaya, pineapple, banana) provide the largest income contribution of Rp 17,192.52 annually to each hamlet owner, this is due to the varied harvest times and occurring several times a year due to the diversification of the types of crops cultivated (Ray & Foley, 2013; Gou et al., 2022; Ngawit et al., 2024). This encourages farmers to continuously fill their hamlets with types of horticultural crops that have harvest times almost throughout the year. The harvested crops follow the 313612 model (3 weeks; 1 month; 3 months; 6 months; 12 months), thus food production for Airlouw Hamlet farmers remains available throughout the year. This is followed by perennial crops (coconut, nutmeg, clove, langsat, langsat, breadfruit, mango, durian, bamboo), with an average income of Rp 5,870,000 per farmer per hamlet per year, and livestock (cattle, chickens, pigs, dogs) at Rp 3,715,000 per year.

Diversifying income through livestock farming and managing perennial crops is a way to maintain household economic balance. In hamlet management, farmers continue to rely on chicken manure and organic farming practices, in line with the island agricultural system. AirLouw Hamlet has 30 farmers who manage their hamlets as a source of family food. Table 4 shows that 80% of them (24 people) are pure farmers who manage their hamlets daily for their livelihood. The hamlets they manage are inherited from their parents and continue to be used as a source of local food for their livelihood (Ambarwati & Chazali, 2024; Chazali et al., 2024).

Table 4. Hamlet farmers in airlouw hamlet

Main Occupation	(F)	(%)	Number of Dependents (Persons)	Average Income/Year (Rp)	Average income/Month (Rp)
Farmer	24	80	3	18,529,307.30	1,544,108.92
Honorary Employee	2	6.67	3	15,246.53	1,270,544.17
Retiree	3	10	3	47,683.33	3,973,611.08
Services	1	3.33	2	24,000,000	2,000,000
Total	30	100			

The income earned from the hamlet yields each month is around Rp 1,544.10. If we look at the total household income for one year against the minimum family needs based on the poverty line of Ambon City in 2025, which is Rp 783,697 per capita per month (Duvil et al., 2024), then the income earned by hamlet farming households in Airlouw is in a vulnerable condition, where the income from the hamlet yields is not enough to meet the minimum family needs (Marín-Puig et al., 2022; Pitriani et al., 2022), considering the average

number of members per family is 3 people (Harini et al., 2020). Likewise, honorary employees who decide to manage the hamlet as a livelihood strategy for the sustainability of their household, only have an average monthly income of around Rp 1,270,544.17 with 3 dependents. This is different from retirees and service entrepreneurs who have a monthly income from their main job above the poverty line of Rp 783,697/capita/month. Their household income ratio (>1,000,000) is sufficient to meet minimum needs and provides the potential for asset accumulation or investment (Anggaunitakiranantika & Hanum, 2022; DeLong et al., 2023). By not relying solely on agriculture as their primary occupation, as hamlet managers, most farmers have chosen to pursue side jobs to supplement their family income (d'Angelo et al., 2021). These side jobs vary, from those related to agriculture to those outside of agriculture. This can be seen in Table 5, which illustrates the types of side jobs undertaken by Airlouw hamlet farmers to increase their household income.

Table 5. Side jobs

Side Jobs	(F)	%	Average Income/Year (Rp)	Average Income/Month (Rp)
Fisherman	7	23.34	7,200,000	600,000
Construction Worker	1	3.33	27,373,000	2,281,250
Motorcycle Taxi Driver	4	13,33	21,900,000	1,825,000
Kiosk	2	6.67	31,025,000	2,585,416
Brick Making Business	4	13.33	21,000,000	1,750,000
Broiler Chicken Business	1	3.33	17,000,000	1,416,666
Church Administrator	1	3.33	1,400,000	116,000
Remittances	4	13.33	12,750,000	1,062,500
Farmer	6	20	10,590,885	882,537.75
Total	30	100		

Because they have to shoulder the dual responsibilities of hamlet management, household chores, and socio-religious affairs, it's difficult for them to consistently manage their hamlet. This situation ultimately creates a shift in roles based on age (Schröders et al., 2021; Syrda, 2023). Therefore, to meet the family's needs, they rely on their children, who work outside the area, for support in the form of monthly remittances (Waidler & Devereux, 2019; Fauk et al., 2025).

Table 6. Women managing airlouw hamlet

Farmer	Age	Main Income/Year (Rp)	Side Income/Year (Rp)	Total Income/Month (Rp)
P1	49	28,651,291	-	2,387,607.58
P2	68	14,622,692	-	1,218,557.67
P3	60	8,545,871	25,550,000	2,841,322.58
P4	63	9,687,376	-	807,281.33
P5	43	24,000,000	3,877,500	2,323,125
P6	55	35,451,702	-	2,954,308.50

Conclusion

The research results show that Airlow Hamlet has 30 households that manage hamlets and utilize them as a source of income. Twenty percent of hamlet farmers are women. Hamlets contribute income to the farming households that manage them. When the hamlet does not provide sufficient income, farmers will engage in side jobs to meet their household needs.

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N.F.W., contributed to the research; N.F.W. and S.M., analyzed the data together and wrote the article.

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Conflicts of Interest
We researchers declare that we have no conflict of interest.

References

Abbas, B. A. (2023). Traditional and Non-Traditional Feeds in Poultry Feeding: A Review. *Radinka Journal of Science and Systematic Literature Review*, *1*(2), 111–127. https://doi.org/10.56778/rjslr.v1i2.139

Achmad, B., Sanudin, S., Siarudin, M., Widiyanto, A., Diniyati, D., Sudomo, A., Hani, A., Fauziyah, E., Suhaendah, E., Widyaningsih, T. S., Handayani, W., Maharani, D., Suhartono, S., Palmolina, M.,

Swestiani, D., Sulistiadi, H. B. S., Winara, A., Nur, Y. H., Diana, M., … Ruswandi, A. (2022). Traditional Subsistence Farming of Smallholder Agroforestry Systems in Indonesia: A Review. *Sustainability*, *14*(14), 8631. https://doi.org/10.3390/su14148631

Ambarwati, A., & Chazali, C. (2024). The Long Road to Becoming a Farmer in Kebumen, Central Java, Indonesia. In S. Srinivasan (Ed.), *Becoming A Young Farmer* (pp. 361–382). Springer International Publishing. https://doi.org/10.1007/978-3-031-15233-7_13

Anggaunitakiranantika, A., & Hanum, N. A. L. (2022). Work Sustainability: Challenges of Employment Environments for Factory Workers. *KnE Social Sciences*, *7*(16). https://doi.org/10.18502/kss.v7i16.12183

Arsyad, U., Amaliah, R., & Ridhayani, F. (2025). Identification of the Spatial Distribution of Water Infiltration Areas Condition Using Geographic Information Systems in the Segeri Watershed. *IOP Conference Series: Earth and Environmental Science*, *1553*(1), 012051. https://doi.org/10.1088/1755-1315/1553/1/012051

Bosshard, E., Jalonen, R., Kanchanarak, T., Yuskianti, V., Tolentino, E., Warrier, R. R., Krishnan, S., Dzulkifli, D., Thomas, E., Atkinson, R., & Kettle, C. J. (2021). Are Tree Seed Systems for Forest Landscape Restoration Fit for Purpose? An Analysis of Four Asian Countries. *Diversity*, *13*(11), 575. https://doi.org/10.3390/d13110575

Budiaman, B., Hidayaht, A. N., & Kurniawan, N. (2023). Local Wisdom in Agricultural Management of the Samin Indigenous Peoples, Indonesia. *IOP Conference Series: Earth and Environmental Science*, *1190*(1), 012018. https://doi.org/10.1088/1755-1315/1190/1/012018

Chazali, C., Ambarwati, A., Huijsmans, R., & White, B. (2024). Young Farmers' Access to Land: Gendered Pathways into and Out of Farming in Nigara and Langkap (West Manggarai, Indonesia). In S. Srinivasan (Ed.), *Becoming A Young Farmer* (pp. 337–359). Springer International Publishing. https://doi.org/10.1007/978-3-031-15233-7_12

Chen, M. (2023). Traditional Farm Tools Observed from an Ecological and Health Perspective. *Cultures of Science*, *6*(3), 292–299. https://doi.org/10.1177/20966083231199847

d'Angelo, M. J., Brunstein, J., & Telles, J. M. (2021). Becoming Family Farmers: The Contribution of the Existential Ontological Perspective to the Social Learning for Sustainability Theory. *Sustainability*, *13*(15), 8186. https://doi.org/10.3390/su13158186

DeLong, A., Swisher, M. E., Chase, C. A., Irani, T., & Ruiz-Menjivar, J. (2023). The Roots of First-Generation Farmers: The Role of Inspiration in Starting an Organic Farm. *Land*, *12*(6), 1169. https://doi.org/10.3390/land12061169

Duvil, J., Feuillet, T., Emmanuel, E., & Paul, B. (2024). Assessing the Vulnerability of Farming Households on the Caribbean Island of Hispaniola to Climate Change. *Climate*, *12*(9), 138. https://doi.org/10.3390/cli12090138

Engels, M., Wahrendorf, M., Dragano, N., McMunn, A., & Deindl, C. (2021). Multiple Social Roles in Early Adulthood and Later Mental Health in Different Labour Market Contexts. *Advances in Life Course Research*, *50*, 100432. https://doi.org/10.1016/j.alcr.2021.100432

Fauk, N. K., Seran, A. L., & Ward, P. R. (2025). The Impacts of Parental Migration on the Mental and Physical Health, Daily Needs, and Social Lives of Indonesian Caregivers of Left-Behind Children: A Qualitative Study. *International Journal of Environmental Research and Public Health*, *22*(8), 1307. https://doi.org/10.3390/ijerph22081307

Feliciano, D. (2022). Factors Influencing the Adoption of Sustainable Agricultural Practices: The Case of Seven Horticultural Farms in the United Kingdom. *Scottish Geographical Journal*, *138*(3–4), 291–320. https://doi.org/10.1080/14702541.2022.2151041

Gou, Z., Yin, W., Asibi, A. E., Fan, Z., Chai, Q., & Cao, W. (2022). Improving the Sustainability of Cropping Systems via Diversified Planting in Arid Irrigation Areas. *Agronomy for Sustainable Development*, *42*(5), 88. https://doi.org/10.1007/s13593-022-00823-2

Habib, M., Singh, S., Jan, S., Jan, K., & Bashir, K. (2025). The Future of the Future Foods: Understandings from the Past Towards SDG-2. *NPJ Science of Food*, *9*(1), 138. https://doi.org/10.1038/s41538-025-00484-x

Harini, R., Ramadhan, C., & Rudi, F. S. (2020). Agricultural Resource Potential for Improving Food Security and Community Welfare in Penimbun Village, Karanggayam, Kebumen, Central Java. *IOP Conference Series: Earth and Environmental Science*, *451*(1), 012041. https://doi.org/10.1088/1755-1315/451/1/012041

Holmelin, N. B. (2021). National Specialization Policy Versus Farmers' Priorities: Balancing Subsistence Farming and Cash Cropping in Nepal. *Journal of Rural Studies*, *83*, 71–80. https://doi.org/10.1016/j.jrurstud.2021.02.009

Khumalo, T. A., Chakale, M. V., Asong, J. A., Aremu, A. O., & Amoo, S. O. (2025). Indigenous Farming Methods and Crop Management Practices Used by Local Farmers in Madibeng Local Municipality, South Africa. *Scientific Reports*, *15*(1), 8918. https://doi.org/10.1038/s41598-025-91210-w

Koirala, P., Kotani, K., & Managi, S. (2022). How Do Farm Size and Perceptions Matter for Farmers'

Adaptation Responses to Climate Change in a Developing Country? Evidence from Nepal. *Economic Analysis and Policy*, *74*, 188–204. https://doi.org/10.1016/j.eap.2022.01.014

Kristianto, B., Novindra, N., & Sapanli, K. (2024). Ecotourism: An Alternative Solution for Socio-Ecological Crisis in Pahawang Island, Indonesia. *IOP Conference Series: Earth and Environmental Science*, *1359*(1), 012052. https://doi.org/10.1088/1755-1315/1359/1/012052

Kurnia, G., Setiawan, I., Tridakusumah, A. C., Jaelani, G., Heryanto, M. A., & Nugraha, A. (2022). Local Wisdom for Ensuring Agriculture Sustainability: A Case from Indonesia. *Sustainability*, *14*(14), 8823. https://doi.org/10.3390/su14148823

Le, Y. T., Yuerlita, Y., Febriamansyah, R., & Pham, V. H. T. (2024). Farmers' Livelihood Strategies for Adapting to Reduced Water Resources in the Upstream Mekong Delta, Vietnam. *IOP Conference Series: Earth and Environmental Science*, *1349*(1), 012037. https://doi.org/10.1088/1755-1315/1349/1/012037

Lestari, N., Paidi, P., & Suyanto, S. (2024). A Systematic Literature Review About Local Wisdom and Sustainability: Contribution and Recommendation to Science Education. *Eurasia Journal of Mathematics, Science and Technology Education*, *20*(2), em2394. https://doi.org/10.29333/ejmste/14152

Marín-Puig, A., Ariza, E., & Casellas, A. (2022). Unattended Gap in Local Adaptation Plans: The Quality of Vulnerability Knowledge in Climate Risk Management. *Climate Risk Management*, *38*, 100465. https://doi.org/10.1016/j.crm.2022.100465

Moreno-Mínguez, A., Ortega-Gaspar, M., & Gamero-Burón, C. (2018). A Socio-Structural Perspective on Family Model Preferences, Gender Roles and Work–Family Attitudes in Spain. *Social Sciences*, *8*(1), 4. https://doi.org/10.3390/socsci8010004

Nabilla, H. L., Mibtadin, M., Farhah, E., & Talib, K. A. (2024). Religion, Tradition, and Modernization: Portrait of the Shift in Dawuhan Tradition in the Ngerso Community, Tawangmangu Karanganyar. *Analisa: Journal of Social Science and Religion*, *9*(2), 290–307. https://doi.org/10.18784/analisa.v9i2.2547

Naeem, M., & Waheed, M. (2023). Waves of Waste the Textile Industry's Contribution to Ocean Pollution. *Radinka Journal of Science and Systematic Literature Review*, *1*(3), 160–165. https://doi.org/10.56778/rjslr.v1i3.189

Neudert, R., Goetter, J. F., Andriamparany, J. N., & Rakotoarisoa, M. (2015). Income Diversification, Wealth, Education and Well-Being in Rural South-Western Madagascar: Results from the Mahafaly Region. *Development Southern Africa*, *32*(6), 758–784. https://doi.org/10.1080/0376835X.2015.1063982

Ngawit, I. K., Sudika, I. W., & Suana, I. W. (2024). Weed Biology and Ecology Studies: Diversity, Dominance, Population and Weed Growth and Land Use Efficiency in Intercropping Corn (Zea mays l.) with Leguminous Crops in Dryland. *Jurnal Penelitian Pendidikan IPA*, *10*(6), 3193–3204. https://doi.org/10.29303/jppipa.v10i6.7230

Onomu, A. R., Taruvinga, A., & Chinyamurindi, W. T. (2025). Significance of Home Garden, Determinant of Its Sustainability, and the Influence of the Gardener's Experience on the Decision to be Involved in Mainstream Farming. *International Journal of Agricultural Sustainability*, *23*(1), 2591507. https://doi.org/10.1080/14735903.2025.2591507

Pitriani, P., Melania, A., Almaratul M, V., Sanjaya, K., & Vidyanto, V. (2022). Mapping of Acute Respiratory Infection (ARI) Vulnerability in Toddlers Based on Physical Condition of Houses in Palu City, Indonesia. *Journal of Health and Nutrition Research*, *1*(2), 111–118. https://doi.org/10.56303/jhnresearch.v1i2.29

Ray, D. K., & Foley, J. A. (2013). Increasing Global Crop Harvest Frequency: Recent Trends and Future Directions. *Environmental Research Letters*, *8*(4), 044041. https://doi.org/10.1088/1748-9326/8/4/044041

Romadhon, A., Jakfar, A. A., & Sugiarti, T. (2025). Assessing Cultural Ecosystem Service Status for Small Island Tourism: (Case Study Sapudi Island, Indonesia). *Egyptian Journal of Aquatic Research*, S1687428525000834. https://doi.org/10.1016/j.ejar.2025.09.004

Rozumowska, W., Soliwoda, M., Kulawik, J., Galnaitytė, A., & Kurdyś-Kujawska, A. (2025). Factors Influencing the Adoption of Organic Farming in Lithuania and Poland. *Sustainability*, *17*(12), 5623. https://doi.org/10.3390/su17125623

Ruslan, R. K., Maulany, R. I., Nasri, N., & Ngakan, P. O. (2021). Potential and Regeneration of Tree Species Used as Roosting Habitat by Sulawesi Fruit Bats Acerodon celebensis in Jenetaesa, Maros Regency. *IOP Conference Series: Earth and Environmental Science*, *807*(2), 022036. https://doi.org/10.1088/1755-1315/807/2/022036

Said, M. I. (2022). The Role of the Livestock Farming Industry in Supporting the Global Agricultural Industry. In Md. Asaduzzaman & M. Afroz (Eds.), *Agricultural Development in Asia – Potential Use of Nano-Materials and Nano-Technology*. IntechOpen. https://doi.org/10.5772/intechopen.97868

Savin, I., & Bergh, J. V. D (2024). Reviewing Studies of Degrowth: Are Claims Matched by Data, Methods and Policy Analysis? *Ecological Economics*, *226*,

108324. https://doi.org/10.1016/j.ecolecon.2024.108324

Schröders, J., Nichter, M., Sebastian, M. S., Nilsson, M., & Dewi, F. S. T. (2021). 'The Devil's Company': A Grounded Theory Study on Aging, Loneliness and Social Change Among 'Older Adult Children' in Rural Indonesia. *Frontiers in Sociology*, *6*, 659285. https://doi.org/10.3389/fsoc.2021.659285

Shanmugam, P. M., Sangeetha, S. P., Prabu, P. C., Varshini, S. V., Renukadevi, A., Ravisankar, N., Parasuraman, P., Parthipan, T., Satheeshkumar, N., Natarajan, S. K., & Gopi, M. (2024). Crop–Livestock-Integrated Farming System: A Strategy to Achieve Synergy between Agricultural Production, Nutritional Security, and Environmental Sustainability. *Frontiers in Sustainable Food Systems*, *8*, 1338299. https://doi.org/10.3389/fsufs.2024.1338299

Shrestha, S., Maraseni, T., & Apan, A. (2025). Enhancing Food Security Through Home Gardening: A Case Study in Phoukhoud District, Lao PDR. *Agriculture*, *15*(7), 716. https://doi.org/10.3390/agriculture15070716

Sima, L. C., Kelner-Levine, E., Eckelman, M. J., McCarty, K. M., & Elimelech, M. (2013). Water Flows, Energy Demand, and Market Analysis of the Informal Water Sector in Kisumu, Kenya. *Ecological Economics*, *87*, 137–144. https://doi.org/10.1016/j.ecolecon.2012.12.011

Sulistiyowati, E., Setiadi, S., & Haryono, E. (2023). The Dynamics of Sustainable Livelihoods and Agroforestry in Gunungkidul Karst Area, Yogyakarta, Indonesia. *Forest and Society*, *7*(2), 222–246. https://doi.org/10.24259/fs.v7i2.21886

Syafnan, S., Rambe, R. H., & Pasaribu, I. (2025). Implementation of Local Wisdom-Based Early Childhood Education Curriculum to Improve Early Childhood Cultural Identity. *Journal of Digital Learning and Distance Education*, *4*(1), 1460–1467. https://doi.org/10.56778/jdlde.v4i1.528

Syrda, J. (2023). Gendered Housework: Spousal Relative Income, Parenthood and Traditional Gender Identity Norms. *Work, Employment and Society*, *37*(3), 794–813. https://doi.org/10.1177/09500170211069780

Waidler, J., & Devereux, S. (2019). Social Grants, Remittances, and Food Security: Does the Source of Income Matter? *Food Security*, *11*(3), 679–702. https://doi.org/10.1007/s12571-019-00918-x

Warsaw, P., Archambault, S., He, A., & Miller, S. (2021). The Economic, Social, and Environmental Impacts of Farmers Markets: Recent Evidence from the US. *Sustainability*, *13*(6), 3423. https://doi.org/10.3390/su13063423

Xu, S., Zhai, L., Zou, B., & Sang, H. (2024). Multiscale Analysis of Water Area, Level and Flow and Their Relationships for a Large Lake Connected to Rivers: A Case Study of Dongting Lake, China. *Water*, *16*(9), 1198. https://doi.org/10.3390/w16091198

Zhou, X., & Ding, D. (2022). Factors Influencing Farmers' Willingness and Behaviors in Organic Agriculture Development: An Empirical Analysis Based on Survey Data of Farmers in Anhui Province. *Sustainability*, *14*(22), 14945. https://doi.org/10.3390/su142214945