Sovereign Roots: Reflection from *Tembawang* Agroforestry Practices for Sustainable Livelihoods Towards Indonesia's Food Security Agenda

Reza Altamaha[1] and Rewina Pratiwi[1]

[1] Alumni of the Department of Anthropology, Universitas Gadjah Mada, Yogyakarta, Indonesia
rezaaltamaha1998@gmail.com*
rere.pratiwi30@gmail.com

Abstract

Indonesia faces the challenge of improving food security and reforming a more sustainable food system, although some policies jeopardize the ecosystem, particularly the forest ecosystem. Therefore, more locally-rooted initiatives like customary practices are required, and food security can be strengthened through *Tembawang* Agroforestry. However, limited studies show the connection between *Tembawang* and food security or sustainable food systems. This study aims to bridge this knowledge gap by exploring the existing *Tembawang* agroforestry in West Kalimantan. Relevant data were collected through stakeholder interviews, field observations, and literature review. However, it is important to consider policies to improve its benefits in the future.

Keywords: Food security, Food system, *Tembawang* agroforestry

1 Introduction

Throughout history, global food crises have occurred repeatedly. Several key underlying causes include conflict, climate, economic factors, and displacement (World Food Programme, 2024). Jennifer Clapp (2024) explains in her research that food crises over time have been triggered by a number of interconnected factors. For instance, the food crisis of the 1970s cannot be separated from the simultaneous geopolitical, energy, and economic crises, as well as the occurrence of multiregional droughts. Similarly, the food crisis between 2008 and 2012 was linked to a major financial crisis and was also driven by the increasingly felt impacts of climate change. One of the inevitable consequences of food crises—beyond the volatility of food commodities—is the widespread rise in hunger.

These vulnerabilities became especially evident during the COVID-19 pandemic. In 2020, the COVID-19 pandemic exposed the alarming vulnerabilities in global food systems, making the food crisis during that period a matter of serious concern. According to reports from various United Nations agencies (FAO; IFAD; UNICEF; WFP; WHO,

© The Author(s) 2025
I. S. Fitrinitia et al. (eds.), *Proceedings of the 9th International Conference on Strategic and Global Studies 2025 (ICSGS 2025)*, Atlantis Highlights in Social Sciences, Education and Humanities 43,
https://doi.org/10.2991/978-94-6463-918-6_42

2022), the number of people experiencing hunger and food insecurity has been steadily rising since 2014. The COVID-19 pandemic then further worsened the situation, as seen in the rising rates of malnutrition among children, including in Indonesia.

The Indonesian government responded to this situation by instructing State-Owned Enterprises (SOEs) to initiate a Food Estate program on wetlands and peatlands on April 28, 2020 (Pantau Gambut, 2020). The development of the Food Estate, or Food Production Center Area (KSPP), aims to enhance food security and achieve agricultural self-sufficiency, as mandated by Law Number 18 of 2012 on Food. Furthermore, this mega project was designated as a National Strategic Project (PSN) to boost economic growth and equitable development, with the goal of improving community welfare and regional development (Sari, 2024). This project has been promoted as a development acceleration engine that will bring about prosperity and food self-sufficiency as part of Indonesia's efforts to fulfill its role as a welfare state. However, the Food Estate program has turned out to be nothing more than a driver of environmental degradation, devastating and disrupting the forest ecosystem. Moreover, when observed as part of the state's effort to 'create' resilience, the initiation of this massive Food Estate reflects an overly materialistic approach that tends to generalize the food needs across all regions of Indonesia. Shabia et al. (2021) in their publication stated that the material and econometric nature of recovery often overlooks or neglects the emotional and human aspects involved in the process. Thus, this article aims to critically examine the government's efforts in ensuring food security and to explore the role of locally rooted practices that may offer more practical, relevant, and sustainable solutions.

This paper adopts the concept of food sovereignty as the primary analytical lens, which was first defined in 1996 by the international peasant federation La Vía Campesina. This concept, defined as "people's right to healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agriculture systems," food sovereignty proposes that people, rather than corporate monopolies, make the decisions regarding our food (Holt-Giménez, 2009). Food sovereignty is a much deeper concept than food security because it proposes not just guaranteed access to food, but democratic control over the food system—from production and processing, to distribution, marketing, and consumption.

This paper examines *Tembawang* Agroforestry as an alternative initiative to the state solution, which emphasizes a large-scale model of food crop production. *Tembawang* is a customary community-based system managed for generations by the Dayak People in Kalimantan, particularly in West Kalimantan. *Tembawang* represents a living example of food sovereignty in practice, offering a lesson learned for sustainable livelihoods towards Indonesia's food security initiatives.

This study also intended to bridge the critical gap in the existing literature. Previous research mainly focused on the ecological and economic dimensions of *Tembawang*,

then this paper addresses the gap in "How *Tembawang* agroforestry could promote sustainable livelihoods towards Indonesia's food security?" Because there is a gap between the state framework that brings large-scale projects like food estates, rather than community-centered alternatives such as *Tembawang*.

The fundamental argument of this paper is that *Tembawang* Agroforestry offers a more sustainable, just, and resilient pathway toward community well-being than the state's model, which in this case is the food estate. Nevertheless, the *Tembawang* Agroforestry could not be intended as a replacement for national food production. Rather, this paper contends that *Tembawang* and similar agroforestry systems need to thrive and contribute to broader food system resilience, which needs to be actively cultivated and supported through integrated interventions. These include: (1) the establishment of robust legal recognition for customary land tenure; (2) targeted and meaningful support through existing national policies such as the social forestry program; and (3) the development of innovative incentive mechanisms that formally recognize and financially support the agroforestry.

2 Methodology

This study uses a descriptive method. The data in this study were collected using the qualitative research approach, integrating field observations and semi-structured interviews with customary leaders, particularly the *Dayak Laya* Sub-ethnic in Sami Village, Sanggau District, West Kalimantan. We also integrate a systematic review method to collect related data and literature from relevant studies and related documents. The primary field data were gathered through semi-structured interviews with customary leaders of the *Dayak Laya* Sub-ethnic in Sami Village, Sanggau District, West Kalimantan. These interviews underline the importance of emic perspectives on the historical context of *Tembawang*, its customary management practices, its role in supporting local livelihoods and cultural identity, and its socio-ecological significance. Secondary data was also gathered through a systematic review of academic literature, reports, policy briefs, and publications from various entities. This review collected critical information and theoretical foundations which analyzed in the context of the *Tembawang* Agroforestry.

3 Result and Discussion

3.1 Indonesia's Persistent Food Insecurity and The Needs for Regenerative Local Practices

Indonesia continues to face major challenges in realizing food security for its population. As many as 23 million out of 270 million people in Indonesia are unable to meet their food needs, with 20% of them being children under 5 years old and suffering from stunting (World Food Programme, 2025). The concepts or principles adopted by the

Government are also important in understanding the orientations of the food estate initiative. This initiative has been a top priority, aimed at securing national food security by boosting food crop production in Indonesia (Center for Indonesian Policy Studies, 2025). In this context, the Indonesian Government is operating on the principle of food security. Food security is defined as "when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food" (FAO, 2006). This framework primarily focuses on food availability and affordability—though it often remains neutral regarding the power dynamics in production and distribution. While this framework may be relevant to global markets and supply chains, it raises questions about how food is produced, where it comes from, and who controls these dynamics.

Historically, Indonesia's attempts to achieve food security have been marked by large-scale initiatives such as Food Estate projects and none of which are entirely new. Under President Soeharto, the country launched the first Food Estate initiative known as the One Million Hectare Peatland Project (Proyek Lahan Gambut or PLG) in Central Kalimantan. This project was later declared a failure by President B.J. Habibie in 1998 through Presidential Decree No. 33 of 1998. A second attempt, during the administration of President Susilo Bambang Yudhoyono (SBY), came in the form of the Merauke Integrated Food and Energy Estate (MIFEE). However, this project led to widespread environmental damage and land conflicts with local communities, many of whom ironically faced even greater food insecurity as a result. Most recently, in 2020, President Joko Widodo initiated a similar project by allocating 30,000 hectares of land in Kalimantan. Notably, military personnel (TNI) were assigned to take part in agricultural activities as part of efforts to ensure the project's success (Tempo, 2023). None of these efforts produced significant results. Instead, they led to the deprivation of customary peoples' livelihoods, deforestation, and the emergence of new vulnerabilities caused by macro-level approaches.

In addition, which is still closely linked with food insecurity and environmental damage caused by the food estate approach, monoculture industry practices contribute significantly to the destruction and loss of biodiversity. Indonesia has experienced, and continues to face, the collapse of its food system due to monoculture practices of genetically modified soybeans (GMOs) and palm oil. This practice clearly has a significant impact on environmental destruction and food systems, as deforestation and agribusiness contribute 20% to Greenhouse Gas (GHG) emissions. This does not yet include the impact of land conversion, which has substantially reduced the area of rainforests (Shiva, 2025). This systemic disruption to food security, according to Panggabean et al. (2024), is largely caused by the lack of food diversification efforts by the government. Given this situation, and with the instability of the global food system and the growing threat to national food security, there is a pressing need for sustainable initiatives at the local level.

3.2 Understanding Tembawang as A Model of Sustainable Agriculture

One initiative or practice that has been running for generations is *Tembawang* Agroforestry. There are several terms defined by experts related to *Tembawang*. Bambang

Soeharto (2010) explains that *Tembawang* is a form of land use system in the *Dayak* community consisting of various types of plants, ranging from large trees with a diameter of more than 100 cm to grasses. *Tembawang* management is carried out with certain techniques in accordance with the local wisdom of the local community and following social rules to form a complex natural forest ecosystem. *Tembawang* is generally a former cultivation area or a former settlement or village which is then planted with fruits. This agroforestry practice has ways of selecting fruit trees considering ecological, economic, and cultural aspects. Ecologically, the trees selected are generally long-lived and have strong roots that are beneficial for preventing erosion and fertilizing the soil. Economically, the fruit grown has a high selling value. Meanwhile culturally, *Tembawang* ownership is closely related to kinship and lineage (Salfius Seko et al., 2023).

In interviews conducted with customary community leaders in Sinu Hamlet, Sami Village, Sanggau District - *Tembawang* has a crucial role as life support for the community. In addition to being historically ancestral heritage and having a role for customary people, *Tembawang* is also rich in local food sources, especially fruits that can be used as an alternative source of livelihood for local people, apart from farming or gardening activities. The complexity of the *Tembawang* system means it is more than just agroforestry. This is also stated by Aaberge et al (2014), in addition to maintaining ecological systems and biodiversity, the system also retains cultural heritage, indigenous knowledge, and spiritual practices – all of which are passed from one generation to the next. These are characteristic values of Indigenous rainforest dwellers of the tropics. Not only that, *Tembawang* also holds family trees for customary people, especially the *Dayak Laya* sub-ethnic.

Tembawang, essentially a forest area rich in various fruit trees like *durian (Durio zibethinus), cempedak (Artocarpus integer),* and *pekawai (Durio kutejensis)*, serves as a vital life support system and a cherished ancestral heritage. Its importance is amplified by the fact that these trees take a considerable amount of time to regrow if felled, underscoring the critical need for their preservation for the benefit of future generations. Beyond being a mere source of sustenance, *Tembawang* is deeply intertwined with the social fabric of the community, holding family genealogies and fostering a strong sense of brotherhood. The shared ownership of a single durian tree, for instance, by multiple families, even those from neighboring hamlets, transforms the harvest season into a meaningful occasion for mutual invitations and the reinforcement of familial bonds. Furthermore, *Tembawang* frequently acts as a reliable source of clean water, the preservation of which benefits not only the residents of Sinu but also those in surrounding villages.

Economically, *Tembawang* contributes significantly, albeit not yet as the primary income source, by offering an alternative livelihood. A notable increase in the sale of fruits such as *durian*, *cempedak*, *langsat*, and *pekawai*. The revenue generated from these Non-Timber Forest Products (NTFPs) has even enabled some residents to acquire household furniture. To illustrate, a single pekawai fruit can fetch Rp1,500, and a single tree has the potential to yield up to 300 fruits, translating to a potential income of

Rp450,000 from just one tree. This demonstrates the tangible economic benefits, even if considered an alternative, that *Tembawang* provides to the community.

Fig. 1. Handicrafts produced from Non-Timber Forest Products (NTFPs) by the local community (Author's documentation, 2025)

Customary law holds a central place in the identity of the *Dayak Laya* community. Rather than being perceived as arbitrary practices, customs serve as guiding principles for life. Examples include the *"Gawai"* in *Dayak* communities, which became one of the most important characteristics of *Dayak* culture and is central to various traditions and celebrations. *Gawai* is a post-harvest celebration that includes a series of traditional ceremonies as a form of gratitude to God or Jubata for the abundance of the harvest. Before holding the West Kalimantan Gawai *Dayak* Celebration, a traditional ceremony called *Ngampar Bide* or spreading mats is held. This ceremony is specifically held prior to the *Gawai Dayak* celebration, which usually takes place in a *Betang Panjang*/Betang house, in this case, the *Rumah Radakng* in West Kalimantan. The purpose is to pray for smoothness and ease during the *Gawai* Dayak celebration and for the blessing of a plentiful harvest in the following year. It can be said that *Ngampar Bide* is a prayer to God or *Jubata* for safety. In Sub-ethnic *Dayak Laya* - the ceremony concludes with "*Pedagi*," a supplication to "*Jubata*" (God) for protection. The "Pedagi" is strategically placed at the edge of the village, symbolizing the safeguarding of the community. *Tembawang* itself is a venue for various customary ceremonies.

Despite the widespread cultivation of oil palm in the region, extensive land clearing for this purpose has not been observed in the hilly areas of Sinu Hamlet, although this situation might differ in flatter terrains. Some community members have indeed transitioned to oil palm as an alternative income source, primarily due to the declining production of rubber. A major hurdle in oil palm cultivation is the necessity for vehicles

for transportation. There is a strong aspiration for achieving a harmonious balance between the cultivation of oil palm, rice, and rubber, and the crucial preservation of *Tembawang*.

To position *Tembawang* Agroforestry and similar customary systems as feasible alternatives, it is not enough to merely criticize the dominant model. Constructive and implementable pathways to strengthen these systems are required. This will require a multifaceted approach that includes legal recognition, policy integration, and economic assessment.

3.3 Enabling Conditions Through Customary Tenure Recognition and Social Forestry

An essential component for preserving *Tembawang* is the necessity for legal recognition of customary land tenure rights. Secure land tenure is the foundation for sustainable land management, recognition of indigenous peoples' rights to their lands will provide them with the opportunity to preserve their cultural existence, including *Tembawang*. Without clear and enforceable rights, indigenous peoples will be vulnerable to land grabbing by those in power and oligarchies, this could mean that the knowledge embedded in their knowledge systems is also threatened.

Constitutional Court Decision *(Keputusan Mahkamah Konstitusi)* No. 35/PUU-X/2012 indicates that customary forests are not state forests and belong to indigenous communities. This decision theoretically provides a strong legal basis for guaranteeing indigenous peoples' land ownership. However, the implementation of this decision has been difficult and full of bureaucratic and political obstacles. This is because the formal recognition process is very complex, and many indigenous peoples lack resources. Therefore, it is necessary to accelerate and simplify the process of recognition and mapping of customary lands, to provide an essential legal basis on which support mechanisms can be built.

Indonesia already possesses a key policy instrument that could be leveraged to support customary agroforestry: the Social Forestry *(Perhutanan Sosial)* Program. The Indonesian government's Agrarian Reform Program seeks to reduce poverty and promote rural economic development by granting local and indigenous communities legal access to forest areas. The Social Forestry Program, launched in 2015, was a significant step toward these goals. The Social Forestry Program aims to provide communities with legal access to 12.7 million hectares of state forests, allowing them to sustainably manage these resources for their livelihoods and forest conservation (World Bank, 2024). systems. The SF program in Indonesia aims to improve community welfare while considering environmental and socio-cultural dynamics through five SF schemes, i.e., village forest, community forestry, a community forest plantation, customary forest, and forestry partnership (The Regulation of the Minister of Environment and Forestry No. 83 of 2016). Those can be essential for poverty alleviation and rural development in areas where up to 10.2 million poor people live near the forest. (Sanudin et al., 2023). The program's stated goals to improve community welfare, reduce poverty, and protect

forests from degradation are perfectly aligned with the demonstrated outcomes of well-managed *Tembawang*. It also shows meaningful benefits not only for environmental/ecological, but also for social/societal, and financial business.

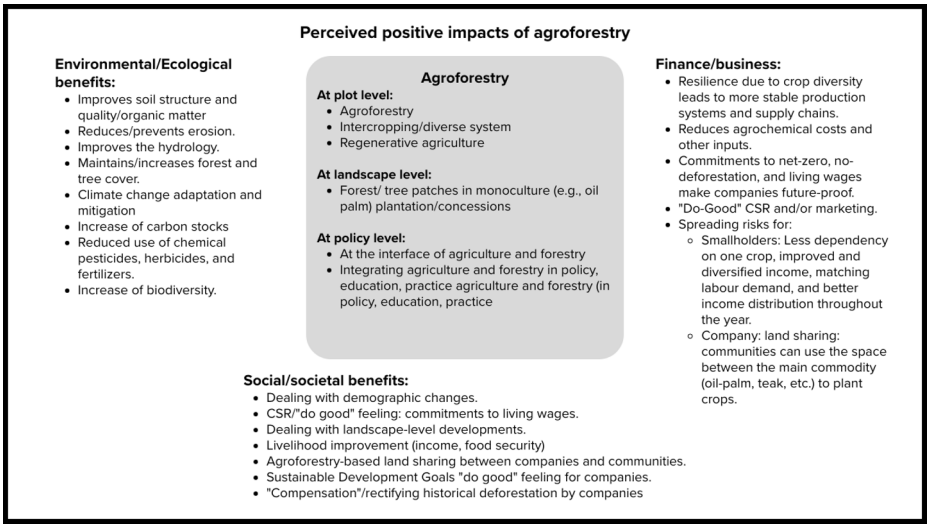

Fig. 2. Positive impacts and benefits of agroforestry in Indonesia from the perspective of stakeholders (Dam et al., 2024)

Despite the benefits, if the Social Forestry Program is expected to be a truly effective instrument in supporting systems such as *Tembawang*, it must be reformed and strengthened. This involves going beyond simply granting permits; it requires robust long-term support for capacity building, technical assistance in good agroforestry practices, and facilitating market access for the diverse products generated by these systems. Furthermore, Dam et al (2024) also underscore a range of solutions is regarding solution pathways to promote the adoption of agroforestry for impact at scale, which include 1) develop a national strategy on agroforestry through a collaborative multistakeholder approach; 2) enhance policies and governance; 3) business and market mobilization; 4) innovative finance mobilization; 5) mobilize knowledge and research; 6) optimize agroforestry design based on local knowledge and practices; 7) strengthen awareness, outreach, and capacity building; and 8) knowledge sharing. Therefore, resolving the core political contradictions with the Food Estate Program is paramount; without it, the Social Forestry Program risks becoming a symbolic gesture in a landscape dominated by destructive industrial expansion.

4 Conclusion: Towards the Future of Indonesia's Food Security

The role of *Tembawang* in Dayak communities reflects a deep-rooted cultural tradition and serves as a living example of a sustainable food system. Where state-led projects

such as food estates often fail due to top-down planning and ecological insensitivity, *Tembawang* operates within a framework that is locally adaptive, socially embedded, and does not rule out ecological approaches. Referring to Tyynela et al (2003) statement, the role of forests in the local context of Dayak communities is part of a complex cultural landscape that includes traditional communities as an integral component, where their livelihood needs are provided by the surrounding forest-based resources. *Tembawang* operates within a framework that is locally adaptive, socially embedded, and ecologically sensitive. This contrasts sharply with the reality in Indonesia, where 68% of the population lacks access to nutritious food. As many as 16 million smallholder farmers struggle to access land, and agrarian conflicts are on the rise (FIAN Indonesia, 2024).

Tembawang is just one of the local practices in Indonesia that has proven to guarantee ecological diversity and collectively sustain livelihoods while also enriching community resilience. However, its potential remains limited without supportive policies. Therefore, strengthening food security in Indonesia still requires guarantees of (1) legal recognition of customary tenure to safeguard indigenous rights; (2) alignment of national programs such as social forestry with community-driven practices; and (3) incentive mechanisms that acknowledge the ecological and economic value of agroforestry. For the sake of advancing national food security, integrating grassroots-based approaches and granting sovereignty to local agricultural practices such as *Tembawang* is not merely an alternative but a necessity. The government must ensure food security and nutrition in ways that safeguard the economic, social, and environmental foundations of future generations. Such integration promotes economic sustainability by generating income (economic sustainability), broad benefits for the community (social sustainability), and positive or neutral impacts on nature (environmental sustainability).

Acknowledgments.

This study is supported by the FOLUR Indonesia Project.

Disclosure of Interests.

The research for this article received support from the FOLUR Indonesia Project. The authors declare they have no other competing interests that are relevant to the content of this article.

References

1. Center for Indonesian Policy Studies. Indonesia's Food Estate in Context: Bridging Past, Present and Future for National Food Security (Issue 28, pp. 1–15). Center for Indonesian Policy Studies. https://repository.cips-indonesia.org/media/publications/619003-indonesias-food-estate-in-context-bridgi-0038a1cd.pdf (2025)

2. Clapp, J.. The Global Food Crisis in the Age of Catastrophe. Retrieved from Rosa Luxemburg Stiftung Website: https://www.rosalux.de/en/news/id/52208/the-global-food-crisis-in-the-age-of-catastrophe (2024)
3. Dam, J. V., Laan, C. V. D., Santoso, H., & Purwanto, E. Pathways to progress: opportunities for contributing to the adoption of agroforestry in Indonesia to reach impact at scale. Tropenbos Indonesia, from https://www.tropenbos-indonesia.org/resources/publications/pathways+to+progress:+opportunities+for+contributing+to+the+adoption+of+agroforestry+in+indonesia+to+reach+impact+at+scale (2024)
4. FAO; IFAD; UNICEF; WFP; WHO. The State of Food Security and Nutrition in the World 2022. Rome: FAO. (2022)
5. FIAN Indonesia. Instrumen Pemantauan Pelanggaran Hak Atas Pangan dan Gizi. FIAN Indonesia. Retrieved August 31, 2025, from https://fian-indonesia.org/instrumen-pemantauan-pelanggaran-hak-atas-pangan-dan-gizi-versi-1/ (2024)
6. Food and Agriculture Organization. In Food Security (pp. 1–4). Food and Agriculture Organization. https://www.fao.org/fileadmin/templates/faoitaly/documents/pdf/pdf_Food_Security_Cocept_Note.pdf (2006)
7. Food and Agriculture Organization. Sustainable food systems Concept and framework. Food and Agriculture Organization. Retrieved April 10, 2025, from https://openknowledge.fao.org/items/8d2575e3-e701-4b1d-8e20-d9c83179c848 (2018)
8. Holt Giménez, E., & Shattuck, A. Food crises, food regimes and food movements: Rumblings of reform or tides of transformation? Journal of Peasant Studies, 38(1), 109–144. https://doi.org/10.1080/03066150.2010.538578 (2011)
9. Holt-Giménez, E. From food crisis to food sovereignty: The challenge of social movements. Monthly Review. https://monthlyreview.org/2009/07/01/from-food-crisis-to-food-sovereignty-the-challenge-of-social-movements/ (2009)
10. Indonesian Academy of Food and Nutrition - Indonesian Academy of Sciences. Food Crisis - A Review of Policy Aspects. Policy Brief, pp. 1-6. (2023)
11. Pagiola, S., & Platais, G. Payments for environmental services. In Environment Strategy Notes (1st ed.). Payments for environmental services (English). Retrieved August 30, 2025, from https://documents.worldbank.org/en/publication/documents-reports/documentdetail/983701468779667772/payments-for-environmental-services (2005)
12. Panggabean, R., Chalidah, S. N., Karina, G., & Haniy, S. U. Membangun Ketahanan Pangan Indonesia 2030. WRI Indonesia. Retrieved April 7, 2025, from https://wri-indonesia.org/id/wawasan/membangun-ketahanan-pangan-indonesia-2030 (2024).
13. Pantau Gambut: Food Estate Kalimantan Tengah, Kebijakan Instan Sarat Kontroversi. Pantau Gambut. (2020)
14. Sanudin, Widiyanto, A., Fauziyah, E., & Sundawati, L.: Agroforestry farmers' resilience in social forestry and private Forest programs during the COVID-19 pandemic in Indonesia. Forest Science and Technology, 19(3), 197-209. https://doi.org/10.1080/21580103.2023.2222156 (2023)
15. Sari, Almonika Cindy Fatika Sari: Proyek Strategis Nasional Bernama Food Estate: Ancaman Otonomi Petani dan Keragaman Sumber Pangan Lokal di Desa Umbu Mamijuk, Sumba Tengah. Jurnal Pembangunan Hukum Indonesia, 352-375 (2024)
16. Seko, S., Lolita, & Soa, A. H.: Hukum adat sebagai sarana perlindungan terhadap Tembawang pada sub suku Dayak Tobag Kalimantan Barat. Bina Hukum Lingkungan, 8(1), 38–51. (2023)
17. Shabia, G. N. A., Dhanwani, N. D., & Pratiwi, R. I.: Kesejahteraan Yang Retak: Mengkritisi Upaya Pemulihan Pascapandemi Dari Posisi Indonesia Sebagai Negara Kesejahteraan. Jurnal Masyarakat Indonesia, 48(2), 161-176. (2022)

18. Shiva, V. Kodrat Alam: Gangguan Metabolik Perubahan Iklim. Marjin Kiri. (2025)
19. Suich, H., Lugina, M., Muttaqin, M. Z., Alviya, I., & Sari, G. K: Payments for ecosystem services in Indonesia. Oryx, 51(3), 489-497. https://doi.org/10.1017/S0030605316000259 (2017)
20. Tempo, Sejarah Food Estate, Proyek Ketahanan Pangan Prabowo yang Dikritik PDIP, https://www.tempo.co/ekonomi/sejarah-food-estate-proyek-ketahanan-pangan-prabowo-yang-dikritik-pdip-154375, last accessed 2025/04/10.
21. Tyynelä, T., Otsamo, R., & Otsamo, A.: Indigenous livelihood systems in industrial tree-plantation areas in West Kalimantan, Indonesia: Economics and plant-species richness. Agroforestry Systems, 57, 87-100. https://doi.org/10.1023/A:1023930805422 (2003)
22. World Bank, Climate Action Game Changers: The Forest Story from Indonesia, https://www.worldbank.org/en/news/feature/2024/06/05/climate-action-game-changers-the-forest-story-from-indonesia, last accessed 2025/04/10.
23. World Food Programme, A Global Food Crisis, https://www.wfp.org/global-hunger-crisis, last accessed 2025/04/10.

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (http://creativecommons.org/licenses/by-nc/4.0/), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.