AGRISEP: Journal of Agricultural Socio-Economics and Agribusiness Studies

IDENTIFYING AND DEVELOPING THE MAIN AGRICULTURAL COMMODITIES AROUND KERINCI SEBLAT NATIONAL PARK, LEBONG REGENCY

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ABSTRACT

This research investigates the superior agricultural commodities in villages surrounding the Kerinci Seblat National Park (KSNP), Lebong Regency, aiming to identify the main agricultural commodities and elucidate the enabling conditions for their sustainable development. This study contributes to the broader goal of achieving harmony between human prosperity and environmental sustainability in the KSNP. A mixed-methods approach was employed, using a quantitative Location Quotient (LQ) analysis of production data from 21 villages to identify main commodities. The total number of respondents was 105 farmers and four expert respondents (the Department of Agriculture, Head of a Farmer Group, Businessman, and an academic). This study used both primary and secondary data sources. Primary data were obtained through a survey using structured instruments to obtain information from farmers. The study concludes that the villages around the KSNP have a variety of main agricultural commodities. Each village has advantages in commodity diversification, a high degree of specialization, and an integrated Cultivation Model. The sustainable development of the main agricultural commodities in villages around the KSNP faces several opportunities and challenges. The main opportunities are downstream product development, access to premium and export markets, and agro-tourism. The main challenges faced by almost all villages are similar, rooted in their geographic location are limited land and regulations, infrastructure and market access, and price management.

Cite as:
Romdhon, M., Windirah, N., & Wibowo, H. E. (2026). Identifying and Developing the Main Agricultural Commodities Around Kerinci Seblat National Park, Lebong Regency. *Jurnal AGRISEP: Kajian Masalah Sosial Ekonomi Pertanian dan Agribisnis*, 25(01), 435–448. https://doi.org/10.31186/jagrisep.25.01.435-448

INTRODUCTION

Kerinci Seblat National Park (KSNP) is one of Indonesia's most vital terrestrial ecosystems and a crucial habitat for a diverse array of flora and fauna species. It

spans 13,750 km² (Wadrianto, 2024) across Lampung, Bengkulu, South Sumatra, and West Sumatra. The park provides habitat for numerous endemic and endangered species, such as the Sumatran tiger (*Panthera tigris sumatrae*), Sumatran elephant (*Elephas maximus sumatranus*), and Sumatran rhinoceros (*Dicerorhinus sumatrensis*), as well as a rich assemblage of tropical flora. Beyond its ecological importance, KSNP provides critical ecosystem services, including water regulation, soil fertility maintenance, and carbon sequestration, that support the livelihoods of surrounding communities.

However, the ecological sustainability of the KSNP has been increasingly threatened by persistent anthropogenic pressures. Among these, aggressive forest encroachment for agricultural purposes is the most alarming. Driven largely by subsistence needs, limited livelihood options, and inadequate access to sustainable economic alternatives, local communities surrounding the park have gradually expanded their cultivation areas into protected zones. This encroachment not only reduces forest cover but also disrupts wildlife habitats, accelerates soil erosion and undermines ecosystem resilience. This problem is further exacerbated by population growth and weak institutional capacity for effective natural resource governance. Consequently, the balance between conservation and livelihood sustainability in KSNP buffer zones has become a pressing concern for policymakers, researchers, and conservation practitioners.

Conservation approaches in Indonesia have historically relied on a protectionist paradigm that emphasizes law enforcement, surveillance, and punitive measures to deter encroachment. However, numerous studies have demonstrated that enforcement alone is insufficient to achieve long-term conservation outcomes. Highlight, such approaches fail to address the underlying socioeconomic drivers of forest degradation—namely, poverty, limited access to markets and capital, and dependency on natural resources. Effective conservation in human-dominated landscapes requires the integration of ecological protection with community-based development strategies (Sargolzaei & Keshtegar, 2013). In this context, modern conservation frameworks emphasize the necessity of coupling biodiversity protection with livelihood enhancement and participatory governance. Strengthening the economic well-being of communities in buffer zones reduces their reliance on forest exploitation, thereby contributing to sustainable conservation (Putri et al., 2023). The concept of "conservation through development" thus emerges as a promising strategy for reconciling ecological and socioeconomic objectives. Empowering local communities through sustainable livelihood diversification, agricultural productivity improvement, and commodity specialization can create a mutually reinforcing relationship between human welfare and environmental sustainability. This approach aligns with global conservation trends, emphasizing the inclusive and integrated management of protected areas.

Lebong Regency in Bengkulu Province has the largest number of villages within the KSNP buffer zone. These villages play a strategic role. The majority of the population in these villages depends on agriculture as their primary source of livelihood. The agricultural sector in this region has great potential because of the availability of diverse commodities (Windirah et al., 2014; Sitorus, 2018). The region's agro-ecological diversity supports a wide range of commodities, ranging from coffee, cinnamon, rubber, arcea nut, rice, and horticultural crops to livestock and secondary

forest products. This diversity reflects the region's high agricultural potential but simultaneously presents structural inefficiencies. The dispersion of production across numerous small-scale commodities has led to challenges in achieving economies of scale, optimizing resource use, and enhancing household income. Fragmentation of productive resources, such as land, labor, and capital, further constrains the community's capacity to generate sustained and equitable economic growth (Hastuti, 2017). The fragmentation of resources, such as land, labor, and capital, often hinders significant and sustainable economic growth at the community level (Syaiful et al., 2014; Muchendar et al., 2020). While the agricultural potential of Lebong Regency's KSNP buffer zone has long been acknowledged, systematic identification of the main agricultural commodities—those with clear comparative and competitive advantages—remains absent. Without such identification, communities often engage in unspecialized and low-efficiency production systems that yield suboptimal results. This situation is compounded by limited access to information, weak institutional linkages between farmers and markets, and restrictive land-use regulations associated with conservation areas. Consequently, local economic development initiatives tend to be fragmented and short-lived, lacking the analytical foundation necessary to inform evidence-based planning and sustainable resource management.

To address this gap, the present study was designed with two main objectives. First, it seeks to quantitatively identify the main superior agricultural commodities in each KSNP buffer zone village in Lebong Regency, Bengkulu Province. This identification is expected to provide an empirical basis for determining which commodities possess the highest comparative and competitive advantages under local biophysical and socioeconomic conditions. Second, this study aims to analyze the specific opportunities and challenges associated with developing these commodities, considering both conservation regulations and local resource limitations. This study aims to strengthen the empirical foundation for integrating economic empowerment and conservation management in one of Indonesia's most ecologically significant yet socio-economically vulnerable regions (Michailidis et al., 2015; Mousavi & Akbari, 2012). By identifying the main agricultural commodities and elucidating the enabling conditions for their sustainable development, this research contributes to the broader goal of achieving harmony between human prosperity and environmental sustainability in the KSNP.

RESEARCH METHOD

The research was conducted in 21 villages around the KSNP area of the Lebong Regency in Bengkulu Province. These villages are 1) Sungai Lisai, 2) Sebelat Ulu, 3) Ketenong II, 4) Ketenong Jaya, 5) Ketenong I, 5) Bioa Putiak, 7) Air Kopras, 8) Embong I, 9) Embong Uram, 10) Lemeu, 11) Ujung Tanjung III, 12) Ujung Tanjung II, 13) Ujung Tanjung I, 14) Muning Agung, 15) Magelang Baru, 16) Limaupit, 17) Tabeak Kauk, 18) Tabeak Dipoa, 19) Ladang Palembang, 20) Sukau Datang, and 21) Talang Liak I. The research locations were purposively selected in villages directly bordering the KSNP area in Lebong Regency, Bengkulu Province. Five farmer respondents were selected from each village, for a total of 105 farmers in the study. The four expert respondents consisted of one from the Department of Agriculture, one Head of a Farmer Group, one businessman, and one academic. The number of

respondents was considered representative based on agroecological conditions, market access, and land use. This study used a mixed-methods approach, employing both primary and secondary data. The data were collected from July to August 2025. Primary data were obtained through a survey using structured instruments to obtain information from farmers, in-depth interviews, and focused discussions with stakeholders. The primary data included production, prices, and farmer income from farming, while secondary data included village administrative.

The determination of main agricultural commodities used the Location Quotient (LQ) analysis to measure economic specialization in villages surrounding the KSNP (Yuanasari & Huda, 2023). The LQ formula is:

$$LQ = \frac{R_i / R_t}{N_i / N_t}$$

Where:
Ri: Revenue of commodity i at the j th village level.
Rt: Total revenue of commodity i at the j th village level.
Ni: Revenue of commodity i at the sub-district level in Lebong Regency.
Nt: Total Revenue of the commodity at the sub-district level in Lebong Regency.

The criteria for determining the main commodities in villages surrounding the KSNP using the LQ analysis are:
LQ>1, meaning the commodity is a Main commodity.
LQ=1, meaning the commodity can meet regional needs and is a main commodity.
LQ<1, meaning the commodity is a non-Main commodity.

The second objective, namely the opportunities and challenges of developing main agricultural commodities, was analyzed descriptively (Coman & Ronen, 2009; Romdhon & Sukiyono et al., 2016a, 2016b; Haninda et al., 2022) based on information obtained through discussions with experts to gain insight into the supporting and inhibiting factors for developing main agricultural commodities in villages around the KSNP.

RESULT AND DISCUSSION

Identifying the Main Agricultural Commodity

The main agricultural commodities in each village were identified by their Location Quotient (LQ) value. An LQ value greater than 1 indicates the village's main agricultural commodity. The higher the LQ value, the greater the commodity's superiority and specialization in the village. The main commodities based on their LQ values are described as follows. The following distribution maps of the main agricultural commodities in each village regarding their LQ value.

Figure 1.
Distribution Maps of the Main Agricultural Commodities in Each Village

The spatial pattern of agricultural specialization around the Kerinci Seblat National Park (KSNP) reveals a clear commodity-based clustering, where each village develops a main commodity according to its agroecological conditions, market access, and land use. When visualized on a map, these villages form a "mosaic of specialization zones," each contributing differently to the regional economy but sharing a common challenge: production expansion is constrained by KSNP boundaries and conservation regulations. This unique spatial configuration creates a dual dynamic: strong commodity specialization with high economic potential, but bounded by strict ecological limits.

The spatial distribution of commodities across the listed villages forms three major economic clusters: horticulture, plantation, and livestock. Each reflects agroecological advantages, cultural practices, and market linkages. The spatial pattern of agricultural specialization around the Kerinci Seblat National Park (KSNP) reveals a clear commodity-based clustering, where each village develops a dominant commodity according to its agroecological conditions, market access, and historical land use trajectories. When visualized on a map, these villages form a "mosaic of specialization zones," each contributing differently to the regional economy but sharing a common challenge: production expansion is constrained by KSNP boundaries and conservation regulations. This unique spatial configuration creates a dual dynamic of strong commodity specialization with high economic potential but is bounded by strict ecological limits, forming potential development sub-regions for targeted interventions. Villages clustered based on the main agricultural commodities indicated by the LQ value (see Figure 1).

Generally, of the 21 villages surveyed, there were 20 villages that had main commodities; only one, Tabeak Dipoa, did not yet have a main agricultural

commodity. The village has a main agricultural commodity, as indicated by the very high LQ value. The production of the commodity in the village or in each cluster is much larger and more efficient than the average in other villages or clusters. The production not only meets local needs but also produces a large surplus that can be sold to other villages (Putri, 2016). This very high figure indicates a massive production volume, far exceeding the country's internal needs (Edy & Saputra, 2019). An LQ value of less than one indicates that the crop is not a main agricultural commodity. Production tends to be smaller than the average for the entire village and is strongly suspected of not being the main focus of the village economy. The production in this village only meets local needs and cannot be sold to other villages (Putri, 2016). A small LQ value indicates that the production of the commodity in this village was not as efficient as the average in other villages.

In the horiculture clusters, there were six villages with main commodities such as vegetables, fruits, paddy, and other short-cycle crops. Some villages demonstrated high LQ values in horticulture (vegetables and fruits). These clusters are often associated with fertile valleys, accessible water sources, market-oriented farming, and strong links to household income due to fast turnover. These clusters also show strong inter-village supply relations. These villages in the clusters function as vegetable and fruit surplus hubs, supplying nearby villages. In the case of Air Kopras with watermelon, chili, and durian. Ujung Tanjung I with tomato, long beans, eggplant, and Embong Uram with durian. They are the most highly specialized horticultural sector, with high LQ values. These villages are centers for diverse horticultural production and have great potential. They also represent a typical intensification zone and high productivity, but on very limited land adjacent to the KSNP. These advantages demonstrate the availability of land and agro-climatic conditions that strongly support commodity growth.

In plantation clusters, there were thirty villages with three main commodities: coffee, cinnamon, and rubber. Ten villages (47,62%) of the total 21 villages have coffee as their main commodity. Coffee is a main commodity in villages such as Sungai Lisai, Sebelat Ulu, Ketenong II, Ketenong Jaya, Ketenong I, Bioa Putiak, Embong I, Lemeu, Tabeak Kauk, and Sukau Datang. The high concentration of production in these villages creates opportunities to build a more integrated coffee industry with the support of a stable and surplus supply (Tui, 2022). Others, the main commodities in these clusters were cinnamon, which is the main agricultural commodity in Sebelat Ulu and Talang Liak I, located along the cinnamon-producing ridge, forming a clear plantation belt on the map. Cinnamon thrives in forest–edge ecosystems, making these villages ideal for agroforestry-based development, indicating a synergy between forest ecology and spice production. Rubber is a leading commodity in Ladang Palembang and Sukau Datang Villages, with very high LQ values. These villages form a rubber-producing monoculture enclave typically found in lowland zones. This very high figure indicates a massive production volume, far exceeding the country's internal needs (Edy & Saputra, 2019). Rubber expansion is spatially limited due to KSNP; thus, productivity improvement and diversification are key.

In livestock clusters, there was one village (Muning Agung) with three main commodities: chicken, duck, and goldfish. This village forms a compact aquaculture–livestock integration area optimized for limited land, which indicates a specialization

in the freshwater fisheries and poultry farming sectors (Edy & Saputra, 2019). The very high LQ value indicates that the production of the commodity in each cluster is much larger and more efficient than the average in other villages or in different clusters. The Production in those villages in each cluster not only meets local needs but also produces a large surplus that can be sold to other villages (Putri, 2016). This village has a specific dual advantage. This very high figure indicates a massive production volume, far exceeding internal needs (Edy & Saputra, 2019).

The Opportunities and Challenges of Developing the Main Agricultural Commodities in Each Cluster

The development of main agricultural commodities is generally carried out by identifying the opportunities and challenges faced by the village in each cluster (Budi et al, 2016; Coman & Ronen, 2009).

Horticulture Cluster: The Opportunities and Challenges

Opportunities for developing the main commodity in the horticulture cluster, according to Rahayu (2022), can be achieved through the following efforts: 1) Marketing to Premium Markets: A very high LQ value indicates efficient production, opening up opportunities to supply high-quality fresh vegetables to supermarkets and restaurants in nearby large cities. Establishing direct cooperation with distributors can ensure a stable supply and better prices; 2) Processed Product Development: to overcome price fluctuations and peak harvests, farmers can make processed products from tomatoes and long beans, such as tomato sauce, chili sauce, or dried long beans. This not only adds value to the product but also extends its shelf life and expands its market reach. This can also be processed into value-added products (Dwi et al., 2018). For example, watermelon can be processed into juice or fruit ice, chili into chili sauce, and durian into ice cream or sticky sweet. This opens new markets and adds economic value; 3) Product Certification: Taking care of certifications such as Good Agricultural Practices (GAP) will increase consumer confidence and open access to modern markets that demand higher product safety and quality standards; 4). Integrated and Diverse Marketing: With a variety of main commodities, the village can offer a variety of product packages. This attracts distributors seeking diverse supplies from a single source. Marketing can be targeted directly to traditional markets, restaurants, or supermarkets in nearby cities such as Bengkulu or Jambi; 5) Horticultural Agrotourism: Located near KSNP1, this village can develop agrotourism focused on horticulture. Tourists can visit watermelon gardens, pick chilies, or enjoy durians straight from the tree. This creates a new source of income and directly promotes local products (Putri, 2016). (6) Integrated Farming System (agroforestry): On land bordering the KSNP10 area, farmers can implement an integrated farming system that combines rice crops with other commodities (e.g., fruits or fish) to optimize land use. This system is more environmentally friendly and supports conservation.

Challenges in development include: 1) Limited Land and Extensification: Limited land around the KSNP is a major obstacle to expanding the planted areas. This forces farmers to optimize their existing land through agricultural intensification. 2) Peak Harvest Management: The simultaneous abundance of horticultural crops, especially watermelon and durian, can lead to drastic price declines. Farmers require well-developed marketing and processing strategies to

overcome this challenge. 3) Conservation Regulations: Unsustainable agricultural practices, such as the excessive use of pesticides and chemical fertilizers, can damage the KSNP ecosystem. Farmers must comply with strict regulations and shift to sustainable farming methods to achieve this. 4) Infrastructure and Transportation: Limited Road infrastructure can make it difficult to transport fresh, perishable commodities, such as watermelon and durian, to the market. This affects product quality and limits access to more distant markets. 5) Conservation Regulations: Agricultural practices must comply with strict conservation regulations. Excessive use of pesticides and chemical fertilizers can be banned, forcing farmers to adopt more sustainable farming methods; and 6) Market Price Fluctuations: Despite abundant production, farmers are vulnerable to price drops during the main harvest. This can significantly impact their income.

Table 1. Opportunities and Challenges for Developing the Main Commodities

No	Cluster	Village	Opportunity	Chalengges
1	Horticulture	1. Air Kopras 2. Ujung Tanjung I 3. Ujung Tanjung II 4. Ujung Tanjung III 5. Embong Uram 6. Magelang Baru	a. Marketing to Premium Markets b. Processed Product Development c. Product certification d. Integrated and Diverse Marketing e. Horticultural Agrotourism and f. Integrated Farming System (Agroforestry)	a. Limited Land and Extensification. b. Peak Harvest Management c. Conservation Regulations d. Infrastructure and Transportation e. Conservation Regulations f. Market Price Fluctuations:
2.	Plantation	7. Sungai Lisai 8. Ketenong I 9. Ketenong II 10. Ketenong Jaya 11. Bioa Putiak 12. Embong I 13. Sebelat Ulu 14. Ladang Palembang 15. Tabeak Kauk 16. Tabeak Dipoa 17. Talang Liak I	a. Export market access b. Processed Product Development c. Sustainable Certification: d. Partnerships with Industry e. Agroforestry-Tourism Development	a. Land Limitations and Status b. Strict Conservation Regulations c. Access & Infrastructure d. Capital and Technology e. Quality Standardization

No	Cluster	Village	Opportunity		Chalengges	
					f.	Global Market Price Fluctuations
3.	Livestock	18. Sukau Datang 19. Lemeu 20. Limaupit 21. Muning Agung	a.	Integrated Cultivation System	a.	Limited Land and Restrictions in the KSNP
			b.	Downstream Product Diversification	b.	Conservation Regulations
			c.	Specific Markets	c.	Market Price Fluctuations
			d.	Integrated Cultivation System	d.	Access and Infrastructure: regulations

Plantation Cluster: The Opportunities and Challenges

The high concentration of plantation commodity production in clusters creates opportunities to build a more integrated industry with the support of stable and surplus supply availability. Plantation commodity development opportunities in this cluster are as follows: 1) Export market access: With a very high LQ, this cluster has a great opportunity to penetrate the export market, especially in countries in South Asia and Europe that have a high demand for this spice. This will provide access to a wider and more profitable market. 2) Processed Product Development: To increase sales value, farmers can process cinnamon into downstream products, such as powder, essential oils, or extracts, for the pharmaceutical industry. This strategy not only adds economic value but also simplifies logistics and extends the shelf life of the product. 3) Sustainable Certification: Due to its proximity to the KSNP, this village has the opportunity to obtain environmentally friendly or organic certification. This certification can increase the trust of international buyers and add value to the product, differentiating it from competitors. 4) Partnerships with Industry: There are opportunities to build direct partnerships with processing factories at the district and provincial levels. This partnership can guarantee a more stable selling price and reduce dependence on middlemen (Tehrani, 2017). 5) Development of a specialty product, with a high LQ value, there is great potential to produce a specialty product. The focus is not on quantity but on quality. Specialty products have a selling value many times higher than that of regular products. Farmers can be provided with post-harvest training, and 6) Agroforestry-Tourism Development: The KSNP attracts many tourists. Villages can develop agroforestry tourism by offering experiences from farm to cup for coffee and cinnamon. This will provide a new source of income and directly promote products.

There are challenges in plantation clusters that must be overcome, especially related to the KSNP, namely 1) Land Limitations and Status: The main issue is the legal status of the land. Most of the land potential for coffee plantations is located within or directly adjacent to the KSNP. This poses the risk of land conflicts and complicated permits, hindering large-scale investment and development (Srdjevic et

al, 2012). 2) Strict Conservation Regulations: KSNP has strict regulations to protect the ecosystem. Unsustainable agricultural practices, such as the excessive use of chemical fertilizers or tree felling, can be prohibited (Tehrani, 2017). Farmers must adapt their farming methods to comply with conservation principles. 3) Access and Infrastructure: Villages close to KSNP often have limited infrastructure, such as difficult roads and unstable communication networks. This makes it difficult for farmers to transport their crops and access market information, and 4) Capital and Technology: Farmers in these villages generally have limited capital to invest in Main seeds, modern post-harvest equipment, and certification. This hampers efforts to improve quality and productivity. 5) Quality Standardization: To meet export market standards, cinnamon and coffee must be of consistent and high quality, including optimal essential oil content. Ensuring uniform quality from every farmer is a significant challenge, and 6) Global Market Price Fluctuations: Despite stable demand, coffee cinnamon prices in the global market can fluctuate. Without strong partnerships with exporters, farmers are vulnerable to price fluctuations.

Livestock Cluster: the Opportunities and Challenges

The livestock cluster is located in Limaupit Village and Muning Agung. The Limaupit chicken demonstrates strong specialization and excels in chicken production. This village has a very specific advantage: this very high figure indicates a massive production volume, far exceeding internal needs (Edy & Saputra, 2019). Muning Agung has significant advantages in the integrated cultivation of Goldfish and Ducks, which indicates a specialization in the freshwater fisheries and poultry farming sectors (Edy & Saputra, 2019). Opportunities for developing these commodities include the following: 1) Integrated Cultivation System: The triple advantages of chicken, goldfish, and ducks show great potential for an integrated cultivation system. Waste from chicken and duck farming can be used as a natural feed for goldfish. The benefit was reducing production costs and optimizing the use of limited land. 2) Downstream Product Diversification, in addition to selling fresh products, this village can increase its selling value by processing products into higher-value goods. For example, processing duck eggs into salted eggs or salted goldfish, which have high demand in the regional market, 3) Specific Markets: Goldfish, chicken, and duck cultivation have clear and stable target markets, such as restaurants, traditional markets, and processing industries. Establishing direct partnerships with these business actors can ensure stable supply and prices; 4) Integrated Cultivation System: land limitations can be overcome by implementing an integrated cultivation system between poultry farming (chicken and duck) and fishery farming, which helps optimize land use and waste.

Several challenges faced in development include the following: 1) Limited Land and Restrictions in the KSNP: Limited land around the KSNP is a major obstacle to the expansion of livestock clusters. Opening new land is not possible, and KSNP regulations can limit the scale of livestock farming and fish ponds because of environmental concerns. 2) Conservation Regulations: Unsustainable livestock practices, such as waste disposal, can pollute ecosystems. Farmers must comply with strict KSNP regulations and implement proper waste management practices. 3) Market Price Fluctuations: Prices for livestock products can fluctuate significantly in the market, impacting farmer incomes. Without strong partnerships, farmers are vulnerable to price fluctuations. 4) Access and Infrastructure: Limited Road

infrastructure can make it difficult to transport fresh livestock products. This can impact product quality and limit access to wider markets in the future. Overall, this livestock cluster has strong advantages, and its sustainable development depends heavily on the ability to implement efficient and environmentally friendly cultivation systems while complying with land restrictions and KSNP conservation regulations.

The policy implications or practical benefits for the management of the KSNP buffer area are as follows. The future of the main agricultural commodity development must force innovation rather than expansion due to strong agricultural specialization, but land and conservation constraints. A spatially grounded strategy for sustainable agricultural development around the KSNP. Programs that could be implemented include intensification, value addition, agroforestry, integrated systems, certification, tourism integration with KSNP, and coordinated cluster-based development. Rubber is a leading commodity in Ladang Palembang Village and Sukau.

CONCLUSION

The conclusions of this study indicate that the villages around the KSNP have a variety of main agricultural commodities based on the LQ value. They are distributed across 20 villages, except for one village, Tabeak Dipoa. This reflects agro-ecological advantages, cultural practices, and market linkages. The spatial distribution of commodities forms three major economic clusters: horticulture, plantation, and livestock.

The sustainable development of the main agricultural commodities in villages around the KSNP faces several opportunities and challenges. The main opportunities that can be utilized are 1) Downstream Product Development, 2) Access to Premium and Export Markets, and 3) agroforestry tourism. The main challenges are almost similar, rooted in their geographic location: 1) Limited Land and Regulations, 2) Infrastructure and Market Access, and 3) Price Management.

AUTHOR CONTRIBUTION STATEMENT

[Author 1]: Research conceptualization, research design, data collection, and initial manuscript draft. [Author 2]: Research supervision, analytical guidance, and manuscript editing. [Author 3]: Data analysis and responses to reviewers' comments. All authors: Manuscript review and final version approval.

DECLARATION OF COMPETING INTEREST

The authors declare that this research is funded by the Research and Community Service Board through the Fundamental Research Scheme, University of Bengkulu. But there are no competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

ACKNOWLEDGMENT

Department of Agriculture, Lebong Regency, KSNP Office, Lebong, and field research personnel who have made significant contributions in assisting with technical assistance and consultation.

ETHIC STATEMENT

Ethical review and approval were waived for this study as it did not involve any intervention and posed minimal risk to participants. Nevertheless, informed consent was obtained from all respondents prior to participation, and all data were anonymized and kept confidential.

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