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SUSTAINABILITY OF LOCAL CORN FROM THE PERSPECTIVE OF FARMERS IN DUKO TAMBIN VILLAGE, BANGKALAN REGENCY

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Abstract

This research analyzes the sustainability of local corn farming from the farmers' perspective in Duko Tambin Village, Bangkalan Regency, Madura. The approach used is qualitative descriptive-analytical with data triangulation. Data were collected through in-depth interviews and analyzed using NVivo software. The results show that farmers' perceptions regarding the sustainability of local corn are divided into four main dimensions: economic, ecological, social and cultural, and technological. Economically, farmers continue to cultivate local corn despite low income because of cheap production costs, land ownership, and easy marketing. From an ecological perspective, local corn is considered drought-resistant and more environmentally friendly, although it still faces challenges from pest attacks and the use of chemical pesticides. Socially, family values and farmer solidarity persist, although mutual assistance practices are beginning to fade. From a cultural aspect, local corn has symbolic value and is cultivated through generations, but it is threatened by shifting preferences of the younger generation and modernization. In terms of technology, limited access to information, training, and costs make it difficult for farmers to adopt new innovations. This research concludes that the sustainability of local corn is more supported by cost efficiency, local wisdom, and ecological adaptation, compared to systemic support or modern technology.

Keywords: ***Sustainability of Farming, Local Corn, Farmers' Perspective***

INTRODUCTION

The diverse uses of corn make this commodity highly valuable economically and serve as a primary or supplementary source of income for many farming households in various regions, including areas with suboptimal land. In Madura, especially in Bangkalan Regency, local corn has become part of the community's life, not only as a food commodity but also as part of local tradition and culture. Local corn has adaptive advantages to dry soil conditions and minimal irrigation, as commonly found in many areas of Bangkalan Regency. Farmers in these regions choose local corn because of its relatively short growing period, lower production costs, and ease of harvesting and post-harvest processes (Amzeri, 2018). The harvest period for hybrid corn is longer compared to local corn. Local corn requires only 70-80 days, while hybrids need at least 120 days (Wulandari & Suprapti, 2023).

Data from (Dinas Pertanian Kabupaten Bangkalan, 2024) hows fluctuations in corn production in several sub-districts of Bangkalan Regency during the 2019–2023 period. This decline is influenced by climate change, limited access to agricultural technology and inputs, and lack of support in developing quality local seeds. According to the average income of local corn farmers in Tanjung Bumi is only IDR 5,122,100 per planting season with a production of around 1,262 kg per 0.47 hectares. Furthermore, Ningsih et al. (2023) state that the income contribution from corn farming to the total household income of farmers is only 16.48%, which is considered small.

Table 1. Corn Production in Bangkalan Regency (Quintals)

Regency	2019	2020	2021	2022	2023
01. Kamal	38.800,56	36.261,20	52.592,00	41.067,45	40.475,70
02. Labang	28.595,68	31.537,50	37.468,19	32.091,49	31.512,96
03. Kwanyar	42.791,70	73.508,43	94.316,81	44.591,39	72.035,40
04. Modung	90.884,24	80.249,75	135.911,66	100.806,72	104.965,06
05. Blega	164.595,20	77.855,68	96.134,40	78.791,70	74.410,60
06. Konang	107.485,63	69.463,66	132.802,92	86.621,44	85.603,20
07. Galis	168.944,25	121.620,73	159.468,77	128.514,10	101.009,15
08. Tanah Merah	68.296,55	52.474,32	67.302,04	48.665,52	20.588,17
09. Tragah	37.105,33	35.801,28	49.328,72	26.304,73	41.230,98
10. Socah	54.660,94	56.502,73	73.005,36	64.251,82	60.480,62
11. Bangkalan	26.763,68	16.393,58	6.505,13	13.741,52	9.459,06
12. Burneh	29.523,69	19.630,80	10.019,75	13.739,67	6.810,51
13. Arosbaya	28.945,40	27.203,77	27.221,25	16.857,75	36.263,50
14. Geger	69.577,53	69.516,12	100.160,57	76.527,77	77.377,83
15. Kokop	102.000,36	61.005,00	71.407,12	30.411,30	35.195,10
16. Tanjungbumi	79.122,90	80.745,06	100.509,30	71.767,44	67.239,91
17. Sepulu	49.881,80	38.591,95	48.633,11	42.006,83	34.550,87
18. Klampis	54.631,78	79.795,24	93.573,10	67.700,80	36.634,15

Local corn production in several sub-districts shows significant fluctuations, even declines, reflecting disparities and instability between regions. This condition is influenced by various factors such as climate change, limited capital, restricted access to technology and agricultural inputs, as well as pest and rat infestations that are not optimally managed. The impact is low farmer income, especially when production costs rise while selling prices remain unstable. In this situation, farmers face a dilemma between maintaining local corn cultivation, which aligns with land conditions, limited capital, and availability of family labor, or switching to hybrid corn, which is considered more economically profitable but less reflective of cultural values and local wisdom. Some farmers choose to plant local corn not to preserve culture but due to practical considerations such as land suitability, labor efficiency, and lower production costs compared to other commodities. This indicates a shift in farmers' orientation from cultural preservation to pragmatic economic adaptation (Wulandari & Suprapti, 2023). This phenomenon poses challenges to the sustainability of local corn farming, which must consider not only environmental aspects but also social and economic factors, particularly farmers' resilience in running their businesses sustainably. If the profitability of local corn cultivation continues to diminish, farmers may potentially switch to more profitable commodities, threatening the existence of local corn as part of local wisdom (Fajariyah & Wijayati, 2024).

The phenomenon of challenges to the sustainability of local corn farming encompasses economic, social, and environmental aspects that must be addressed simultaneously. If the profitability of local corn cultivation declines, farmers tend to switch to more profitable commodities, threatening the existence of local corn as part of local wisdom. Several studies emphasize the importance of good management practices to support the sustainability of local corn farming, including planning, organizing, directing, and controlling, which significantly affect the economic and social aspects of farmers (Alviansyah et al., 2023). Additionally, according to (Wulandari & Suprapti, 2023) factors such as limited capital, pest attacks, use of traditional technology, and price fluctuations are also major obstacles in maintaining the sustainability of local corn farming.

The phenomenon of sustainability in local corn farming is influenced by various factors, ranging from access to production facilities, preservation of agricultural traditions, to innovations in marketing management. According to (Mubaraq, 2021) his research found that 91.07% of farmers in Malalin Village, Enrekang Regency, consider corn cultivation profitable, mainly due to support from production facilities such as subsidized seeds (78.83%) and fertilizers (75.77%). This underscores the importance of access to production inputs in enhancing positive perceptions and the sustainability of local corn farming. Efforts to improve sustainability can be carried out through the implementation of Good Agricultural Practice (GAP), development of superior varieties, targeted subsidies, as well as education and training for farmers to increase productivity and reduce risks (Sidqi & Adetya, 2024). Social capital and community support also play a crucial role in maintaining the sustainability of corn farming at the local level (Wardani et al., 2021).

LITERATURE REVIEW

Sustainable Agriculture

Sustainability in agriculture refers to efforts to meet current food, energy, and water needs without compromising the ability of future generations, by integrating the Triple Bottom Line (TBL) principles that include economic (profit), social (people), and environmental (planet) aspects as the basis for measuring sustainable performance (Adwiyah et al., 2024). In the agricultural context, the economic aspect emphasizes production efficiency and farmers' income, the social aspect covers social justice, farmers' welfare, and community participation, while the environmental aspect highlights the preservation of natural resources and soil fertility.

Recent studies emphasize the importance of a multidisciplinary approach combining adaptive technology, environmentally friendly pest control, local policies, and farmer participation in planning to enhance agricultural sustainability, especially in vulnerable areas like Madura (Hammada, 2024). For example, the use of microorganisms in agricultural practices has been proven to produce environmentally friendly products while increasing agricultural productivity (Akinsemolu, 2018), aligning with the Sustainable Development Goals (SDGs). Conversely, agricultural practices that focus solely on financial gain without considering environmental impact contradict the core principles of the SDGs. Therefore, the agricultural sector is a key element in supporting the success of the sustainable development agenda (Bogoviz, 2019).

Locl Wisdom

Local wisdom refers to traditional knowledge and practices that have been passed down through generations within indigenous communities, playing a crucial role in natural resource management and agricultural sustainability. Studies on sago plantations in Indonesia show that management based on local wisdom can enhance the long-term sustainability of plantations by considering environmental, economic, social, and institutional aspects, despite challenges such as low productivity and unsupportive policies (Dahliani, 2024). Furthermore, the revitalization of local wisdom adopted in village regulations, such as in Pasar Terusan, has successfully preserved and even expanded sustainable food agricultural land through rituals and life philosophies that strengthen community awareness of the importance of protecting farmland (Rakhman & Lega, 2023).

Moreover, local wisdom also plays a role in mechanisms to fulfill the food needs of indigenous communities, as found in the Kasepuhan Cicarucub community, where traditional agricultural systems based on local wisdom help maintain household food security without drastic measures during food crises (Widiati et al., 2020). Ethnographic research on the Bugis community reveals that the maddoja bine ritual functions not only as an agricultural practice but also as a means of actualizing social and cultural values such as diligence, mutual cooperation, and respect for nature, which strengthen community character while preserving traditions amid modernization (Sadewa & Kilawati, 2024). Thus, local wisdom contributes not only to the technical aspects of agriculture but also forms the social and cultural foundation that supports the sustainability and resilience of agrarian communities.

METHOD

This study employs a qualitative descriptive-analytical approach with a deductive method to explore and understand farmers' perceptions of the sustainability of local corn cultivation in Duko Tambin Village, Bangkalan Regency. This approach allows the researcher to compare sustainability theory and local wisdom with empirical findings in the field. Data collection was conducted through in-depth interviews, participatory observation,

questionnaires, and documentation. Key informants were purposively selected based on criteria such as experience, involvement in farmer groups, and deep knowledge of local corn cultivation. Data analysis was carried out interactively using the Miles and Huberman model, assisted by NVivo 12 Pro software for coding and theme grouping. The analyzed data covers four main aspects: economic, ecological, social and cultural, and technological, structured based on sustainability theory and reinforced by empirical references from previous studies. Source triangulation was performed to enhance data validity, while data reduction, presentation, and conclusion drawing were systematically conducted until data saturation was reached.

RESULTS AND DISCUSSION

Farmer characteristics, such as age, education level, farming experience, and number of family dependents, greatly influence their decision-making patterns and farming strategies. Most farmers in this area have low formal education but extensive farming experience, which contributes to their ability to adapt to production challenges on suboptimal land.

Regarding land, the majority of farmers manage limited dry land but still maintain local corn production as their main commodity. Crop diversification, such as planting rice and peanuts, is also an important strategy to improve the economic sustainability of farming households. A study by (Amin et al., 2024) shows that diversification through intercropping can strengthen the resilience of farming systems and increase productivity.

Farmers' main income sources come from agricultural products, especially local corn, with some farmers also engaging in side jobs. Participation in farmer groups is an important factor for access to information, training, and government assistance, which enhances farmers' adaptive capacity to environmental and market changes. Research by (Handayani et al., 2019) confirms that active participation in farmer groups and agricultural extension significantly contributes to increased knowledge and the application of sustainable farming principles. The sustainability of farming systems in the region results from a complex interaction of social, economic, technical, and cultural factors. A study by (Nurjanah et al., 2018) also shows that variables such as land size, farming experience, and number of family dependents strongly determine income levels and the success of corn farming, which ultimately affects farmers' motivation and perceptions of sustainability.

Farmers' Perceptions of Local Corn Sustainability

Farmers' perceptions of the sustainability of local corn farming are a crucial aspect that reflects how farmers assess and respond to various challenges and opportunities in sustainable corn cultivation. To gain a deeper understanding of why farmers continue to plant local corn, the researcher used source triangulation by comparing and examining responses from six respondents with different backgrounds, ages, and experiences in local corn farming. The triangulation focused on four main categories: adaptation to suboptimal land conditions, economic factors including production costs and profits, ease of cultivation and post-harvest processes, and social and cultural factors related to heritage and customs. The sustainability of local corn farming is viewed not only from an economic perspective but also involves interconnected ecological, social, cultural, and technological dimensions. A study in Bandung Regency showed that the economic and environmental dimensions fall into the fairly sustainable category, while the socio-cultural and technological aspects are considered highly sustainable, indicating the important role of non-economic factors in supporting the continuity of corn farming (Puspita Gusti et al., 2023). Furthermore, the adoption of appropriate agricultural technology and suitable socio-cultural approaches can increase productivity while maintaining the sustainability of the agricultural ecosystem(Yusriadin et al., 2024). Thus, farmers' perceptions of local corn sustainability result from a complex interaction between ecological, economic, technical, social, and cultural factors that collectively encourage them to maintain local corn cultivation amid the challenges of agricultural modernization.

Farmers' Perceptions from the Economic Aspect

Farmers' perceptions of the economic aspect in local corn farming in Duko Tambin Village are highly focused on production cost efficiency and the profits gained. Farmers consider local corn an economical choice due to its relatively low production costs, mainly because of the use of their own seeds and minimal inputs of fertilizers and pesticides. Although local corn productivity is lower compared to hybrid corn, this cost efficiency makes local corn farming still profitable and worth maintaining. The sustainability approach based on the Triple Bottom Line (TBL) principle emphasizes that the economic aspect must be balanced with environmental and social dimensions to achieve holistic sustainability in agriculture (Elkington, 1999). Thus, farmers' economic motivation is a key factor in their decision to sustain local corn cultivation, which must also be viewed in the context of balancing

environmental and social aspects to ensure long-term sustainability. Besides production cost efficiency, farmers' perceptions are also influenced by the income stability derived from local corn farming. Several studies indicate that although local corn yields tend to be lower, price stability and local market demand provide economic security for farmers (Amin et al., 2024) This aligns with findings that local corn has added value from local wisdom and consumer preferences that support farmers' economic sustainability (Puspita et al., 2024) Other research in Bangkalan Regency confirms that land suitability is crucial to ensuring farming sustainability.

However, economic challenges such as market price fluctuations and limited access to capital remain obstacles that need attention to improve the competitiveness of local corn. Therefore, strengthening farmer institutions and access to appropriate technology are important strategies to increase productivity while maintaining cost efficiency (Ali et al., 2024). verall, farmers' economic perceptions show that although income and selling prices from local corn are not high, low production costs, land availability, and ease of marketing are the main reasons farmers continue to maintain this commodity. Compared to previous studies, this research reveals that the sustainability of local corn farming in Madura is driven more by farmers' survival strategies and locality factors than by strong market incentives.

Farmers' Perceptions from the Ecological Aspect

In the context of sustainable agriculture, attention to ecological aspects is crucial to ensure the continuity of production systems without damaging natural resources. This aligns with Elkington's Triple Bottom Line (TBL) approach, which emphasizes the importance of balancing profit (economic), planet (environmental), and people (social). Analysis using NVivo 12 Pro reveals that farmers' perceptions of local corn in Duko Tambin Village show varying awareness of ecological factors affecting the sustainability of their farming. Most farmers recognize that long-term use of chemical fertilizers and pesticides can reduce soil fertility and harm the micro-ecosystem (Sinambela, 2024). Some farmers have begun adopting a combination of organic and chemical fertilizers, especially those with access to livestock manure. This practice reflects an ecological adaptation based on local resources, as highlighted by (Sari & Zuber, 2020), who stress the importance of traditional knowledge in preserving agroecosystems. Agricultural waste such as corn stalks and husks is also increasingly used as animal feed, compost fertilizer, or fuel. Although still not optimal, these efforts align with findings by (Nurman et al., 2019) emphasizing the potential of agricultural waste to contribute to soil fertility and replace external inputs.

Regarding water management, farmers perceive local corn as highly drought-adaptive, requiring water only during the early growth phase. This supports rainfed agriculture and aligns with (Hammada, 2024), indings on the importance of water use efficiency in sustainable farming systems, especially in facing climate variability. However, ecological challenges remain, such as rat pest attacks and extreme weather. Most farmers still rely on chemical pesticides due to considerations of effectiveness and availability, despite awareness of their negative impacts on soil and health (Sinambela, 2024). Overuse of pesticides has also been reported to cause soil fertility decline and plant damage symptoms, indicating the need for alternative approaches like Integrated Pest Management (IPM), which unfortunately is still not widely adopted. Overall, farmers' perceptions of ecological aspects reflect an understanding that sustainability depends not only on productivity but also on the farming system's ability to respond to environmental pressures and wisely utilize resources. A tendency toward utilizing local wisdom and environmentally friendly practices is emerging as a potential adaptive response to be further developed.

Farmers' Perceptions from the Social and Cultural Aspects

This study identified five main social aspects influencing the sustainability of local corn farming: mutual cooperation (gotong royong), social relationships among farmers, the role of farmer groups, family involvement, and youth participation. Although mutual cooperation practices are gradually being replaced by wage labor systems, social solidarity still appears in information exchange and moral support among farmers (Turasih, 2019). Farmer groups also play an important role as sources of information and access to assistance, although support for local corn is considered not yet optimal (Tobing et al., 2023). Beyond social aspects, cultural dimensions are also key elements in maintaining the sustainability of local agriculture. Culture influences farmers' perceptions and practices passed down through generations. In local contexts like Madura, culture should be considered the fourth dimension in the sustainability framework, given its closeness to community identity and value systems (Hasbullah, 2020).

The study identified five cultural subthemes shaping farmers' perceptions of sustainability: traditional consumption patterns, inherited knowledge, philosophical values of corn, farming traditions, and the role of corn in

customs. Corn rice as a staple food is increasingly abandoned by the younger generation, although still consumed by the older generation as part of local food identity(Narsin et al., 2023). Farming knowledge is transmitted informally, covering planting times, types of fertilizers, and use of natural signs (Hasrina et al., 2024). The philosophical value of local corn as a symbol of resilience and simplicity remains alive in farmers' narratives, although the motivation to plant it is now more economic than symbolic (Imbang et al., 2020). Farming traditions, intuitive and rooted in ancestral experience, are still practiced alongside the adoption of modern technologies such as tractors and chemical fertilizers (Sari & Zuber, 2020). The role of corn in traditional rituals has diminished, replaced by rice and modern symbols, although some farmers still maintain the symbolic meaning of corn. Overall, farmers' perceptions indicate that the sustainability of local corn farming relies not only on production efficiency but also on the continuity of social and cultural values. Culture is not merely an addition but a foundation that strengthens the identity and resilience of local farming systems amid modernization.

Farmers' Perceptions from the Technological Aspect

Farmers' perceptions of agricultural technology play an important role in determining the successful adoption of innovations in the agricultural sector (Wilheppi et al., 2023). These perceptions influence farmers' attitudes and decisions in farming, ultimately impacting productivity and efficiency. Various factors affect farmers' perceptions of technology, including farmer characteristics, experience, access to information, and social and institutional support. Internal factors such as education level, age, and land size can influence how farmers accept and adopt new technology (Hertanto et al., 2019). Farmers with higher education levels tend to be more open to innovation (Wilheppi et al., 2023). Farming experience also plays a significant role, where more experienced farmers may be either more conservative or more willing to take risks in trying new technologies.

Access to information is a crucial external factor (Sirajuddin & Liskawati Kamba, 2021). Information about the benefits, usage, and impacts of technology can shape farmers' perceptions. Agricultural extension workers have a critical role in delivering this information to farmers (Syamsir et al., 2024). Effective and participatory communication methods can enhance farmers' understanding of technology. However, positive perceptions of technology do not always guarantee successful adoption. Factors such as investment costs, resource availability, and technology complexity must also be considered. Additionally, socio-cultural aspects and local preferences can influence farmers' decisions to adopt technology. In this digital era, information and communication technology (ICT) holds great potential to improve farmers' access to information and knowledge. The use of smartphones and agricultural applications can help farmers obtain information about better farming practices, market prices, and weather. However, digital literacy and accessibility to ICT infrastructure remain challenges in many areas (Sirajuddin & Liskawati Kamba, 2021). Therefore, it is important to understand farmers' perceptions of technology comprehensively. A holistic approach that considers internal and external factors and involves farmers in the development and dissemination process of technology can enhance innovation adoption and support sustainable agriculture

CONCLUSION

Based on the research results in Duko Tambin Village, Bangkalan Regency, it can be concluded that farmers continue to plant local corn because it is better suited to land conditions, easier in planting and post-harvest processes, and requires lower production costs while being considered more practical compared to hybrid corn. Farmers' perceptions of local corn sustainability tend to be positive yet pragmatic, with ideals still attached. Although not explicitly linked to cultural preservation, farmers maintain local corn due to convenience, cultural habits, and limited alternative farming options. To support the sustainability of local corn farming, it is recommended that the government, through the Bangkalan Regency Agriculture Office, provide production facilities such as organic fertilizers and manual corn shellers, as well as organize simple cultivation training tailored to land conditions and farmers' skills. Farmers in Duko Tambin Village are also encouraged to actively participate in training, utilize available assistance, and collaborate within farmer groups or cooperatives to strengthen bargaining positions and market access. The adoption of appropriate simple technology is highly recommended to improve productivity and efficiency in local corn farming. With these measures, it is hoped that the sustainability of local corn farming can be maintained while strengthening the economic and social resilience of farmers in the area.

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