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Strategic Management of Sustainable Agribusiness for Maize Commodity on Sumbawa Island

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Abstract
Sumbawa Island in West Nusa Tenggara Province holds significant potential for the development of sustainable maize agribusiness, particularly as a strategic commodity in the food and animal feed sectors. This review aims to formulate strategic management approaches for sustainable agribusiness by considering economic, environmental, and social dimensions. The study employs a literature review method, drawing on recent and relevant scholarly works. The analysis reveals that while maize significantly contributes to the local economy, its development faces numerous challenges, including land degradation, dependence on chemical inputs, limited market access, and inadequate technology adoption. Sustainable agribusiness strategies should encompass product diversification, the use of organic fertilizers, and the enhancement of farmers' capacity through training, financial access, and multistakeholder collaboration. Such synergy between the government, farmers, and the private sector is essential. This paper underscores the need for a holistic approach that integrates economic, environmental, and social considerations to ensure the long-term sustainability of maize agribusiness on Sumbawa Island. The adoption of appropriate technologies, development of marketing networks, and improvement of production efficiency through environmentally friendly practices are strongly recommended to support farmer welfare while preserving ecological balance.

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1. Introduction

To optimize regional economic growth, development strategies should be oriented toward sectors or commodities that possess the highest comparative advantage in the respective region, while also demonstrating strong competitiveness in local, regional, national, and even international markets-particularly in the context of an increasingly open global economy. Among the key food crops with high strategic value aside from rice is maize (Sukardi *et al*., 2023) [1]. Maize plays a crucial and strategic role in the national development agenda as part of the food crop sub-sector. Its contribution to both food security and the Indonesian economy is well-documented (Nurwahidah, 2018) [2].

Sumbawa Island, located in West Nusa Tenggara Province (NTB), is recognized as one of Indonesia's agrarian regions with substantial agricultural potential. Among its primary agricultural commodities, maize stands out as a flagship product. Maize plays a strategic role not only in food supply but also as livestock feed and industrial raw material. According toMartauli *et al*. (2023) [3], maize has become a key crop used in food and feed industries. Due to insufficient domestic production, Indonesia continues to rely on maize imports to meet local demand. Mulyani and Suwanda (2020) [4] emphasize that maize agribusiness and cultivation in the Nusa Tenggara region hold promising potential, considering the vast market demand for both food and animal feed.

In NTB Province, maize is classified as a leading commodity and has been included in government-supported initiatives such as the PIJAR program (an integrated effort to boost production of cattle, maize, and seaweed). Beyond PIJAR, maize development has also been advanced through the national UPSUS PAJALE (Special Efforts Program for Rice, Maize, and Soybean) (Sari & Sjah, 2016; Sukardi *et al*., 2021; Sukardi *et al*., 2023) [5–7]. The growing demand for maize, driven by the expansion of the food and feed industries, indicates its substantial role in the growth of the food crop sub-sector (Muflihun *et al*., 2023) [8].

However, the maize agribusiness sector on Sumbawa Island faces multiple challenges, including declining soil fertility, dependence on chemical agricultural inputs, climate change impacts leading to weather anomalies, and limited access to markets and technology among farmers. In addition, unsustainable farming practices have led to land degradation, biodiversity loss, and long-term declines in productivity. A verification study in Caliya District, West Oromia, Ethiopia, showed that phosphorus fertilizer recommendations based on crop response to soil tests resulted in significant increases in maize yields, with an average grain yield of 8,195 kg/ha in the STCR treatment compared to 1,802 kg/ha in the control treatment without fertilizer (Isho *et al*. 2024) [9]. Therefore, a sustainable agribusiness management strategy is urgently needed to ensure efficient, environmentally friendly maize production that also positively impacts farmer welfare. This sustainable agribusiness approach not only focuses on yield improvement but also on ecosystem preservation and the enhancement of farmers' socio-economic conditions. Interestingly, a study by Obinaju *et al*. (2024) [10] at the Faculty of Agriculture, University of Uyo, Nigeria, showed that most agriculture students viewed agribusiness as a financially rewarding career with significant entrepreneurial potential.

Based on the aforementioned issues, this literature review explores various studies and research related to the strategic management of sustainable maize agribusiness on Sumbawa Island. The objective is to formulate strategic approaches for sustainable maize agribusiness through a holistic framework that integrates economic, environmental, and social considerations. It is expected that this review will provide valuable insights and recommendations for stakeholders in their efforts to optimize the strategic management of sustainable maize agribusiness on the island.

2. Method

This study employs a literature review method aimed at examining and interpreting existing and relevant literature. This method was chosen as it enables the authors to obtain a comprehensive overview (Assyakurrohim *et al*., 2022) [11] of strategic management practices in sustainable maize agribusiness. Data were collected through internet-based searches, and the selected literature ware then analyzed and synthesized to serve as the foundation for the review. This paper specifically focuses on key aspects of sustainable strategic agribusiness management for the maize commodity on Sumbawa Island.

3. Results and Discussion

1. Overview of corn agribusiness in Sumbawa Island

a. Resource and production potential

Sumbawa Island possesses geographical conditions conducive to the development of corn agribusiness (Dewi, 2018) [12]. The island features fertile soils suitable for corn cultivation, particularly in lowland areas with moderate rainfall. Moreover, its tropical climate allows for up to two corn harvests per year (Sari, 2016; Suryani *et al*., 2022) [13,14], providing a competitive advantage over other regions in Indonesia. In addition, the availability of vast agricultural land offers significant potential for future expansion of corn cultivation (Hanani *et al*., 2023; Shafiani, 2020) [15,16]. His underscores Sumbawa's considerable potential to position corn as a flagship commodity. Given its favorable geographical and climatic conditions, Sumbawa Island has the potential to become a major corn production hub in Indonesia. With appropriate development strategies, the corn agribusiness sector in Sumbawa can continue to grow and contribute positively to both regional and national economies.

However, this potential has not been fully utilized, as much of the land remains underutilized. Several areas also face challenges regarding limited irrigation water during the dry season (Soedireja, 2016; Yolanda *et al*., 2023; Yulianto, 2016) [6,17,18]. Therefore, effective and efficient resource management is key to increasing corn productivity (Mulyani & Suwanda, 2019; Soedireja, 2016) [4,6].

b. The role of corn in the local economy

Corn plays a highly significant role in the economy of the Sumbawa community. It serves not only as a vital food source but also as raw material for livestock feed, supporting the livestock sector (Hanani *et al*., 2023) [15]. Furthermore, corn contributes to farmers' income, particularly through government initiatives such as the PIJAR program (Tajidan, 2018) [19] which aims to increase production. Programs like PIJAR have enabled farmers in Sumbawa to improve their income through corn sales. Additionally, corn presents opportunities for farmers to diversify their enterprises, such as processing corn into value-added or ready-to-eat products. Consequently, corn not only plays a crucial role in food security but also serves as a key pillar in improving the economic well-being of the Sumbawa population.

Nevertheless, corn's contribution to the economy has yet to reach its full potential (Handayani *et al*., 2019) [20]. This is due to factors such as low selling prices during harvest season, lack of stable market access, and limited post-harvest processing capabilities to increase added value. Therefore, efforts to strengthen the corn agribusiness value chain are crucial to deliver a greater economic impact locally. Strategic actions are needed, such as product quality improvement, product diversification, development of extensive distribution networks, and enhancement of farmers' skills in post-harvest processing. With such efforts, corn can deliver greater contributions to household income and the overall welfare of the Sumbawa community. Additionally, the role of government and other stakeholders is essential in developing supportive policies for corn agribusiness advancement.

c. Government policy analysis

The PIJAR and UPSUS PAJALE programs are strategic government initiatives aimed at increasing corn productivity in Sumbawa, West Nusa Tenggara. These programs provide support through fertilizer subsidies, the provision of high-quality seeds, and technical training for farmers (Sukardi *et al*., 2023) [1]. These interventions have significantly enhanced corn production capacity on the island in recent years.

However, ongoing evaluation and improved synergy among local governments, farmers, and the private sector are needed to ensure the sustainability of these programs. Strong collaboration among all stakeholders is essential to ensure that the benefits of these programs are maximally realized by corn farmers in West Nusa Tenggara, particularly in Sumbawa. In addition, rigorous monitoring of program implementation is necessary to evaluate their long-term impact. With such approaches, the PIJAR and UPSUS PAJALE programs can continue to contribute positively to regional corn productivity and support farmers' welfare.

2. Challenges in corn agribusiness development

a. Environmental factors and land degradation

One of the major challenges in developing corn agribusiness on Sumbawa Island is declining soil fertility caused by excessive use of chemical fertilizers. Years of uncontrolled chemical fertilizer application have led to land degradation and reduced crop productivity (Yusuf *et al*., 2023) [21], In addition, climate change has altered rainfall patterns, disrupting planting and harvesting seasons (Rusmayadi *et al*., 2024; Sulaminingsih *et al*., 2024) [22,23]. Efforts to address these challenges include the use of organic fertilizers as an environmentally friendly alternative and the adoption of sustainable agricultural practices to maintain soil fertility. Furthermore, research and innovation in the development of climate-resilient corn varieties must continue to enhance the resilience of corn agribusiness on Sumbawa Island.

Moreover, soil and water conservation-based approaches are also essential for maintaining soil fertility, improving groundwater absorption, and supporting ecosystem services (Noywuli, 2023) [24]. The use of organic fertilizers and crop rotation can serve as effective solutions for restoring soil health and ensuring agricultural sustainability (Kusmiati *et al*., 2023; Rachma & Umam, 2020) [25,26]. Additionally, soil conservation practices such as erosion control and water management can help maintain the ecological balance of agricultural systems.

b. Dependence on chemical inputs

The intensive use of pesticides and chemical fertilizers has become a common practice in corn cultivation throughout Indonesia (Mamangkay *et al*., 2023) [27], including on Sumbawa Island. While this approach may increase short-term yields, excessive dependence poses a threat to the long-term sustainability of the agribusiness sector (Muflihani *et al*., 2024; Zendrato *et al*., 2024) [28, 29]. Moreover, environmental impacts such as soil and water pollution are becoming increasingly concerning.

The implementation of more environmentally friendly farming practices, such as Integrated Pest Management (IPM), offers a critical alternative to reduce reliance on chemical inputs (Mudjiono, 2013) [30]. This approach not only promotes environmental sustainability but also lowers production costs for farmers. A paradigm shift in corn cultivation toward more sustainable agricultural practices is necessary in Sumbawa. Increasing the adoption of organic and eco-friendly farming techniques will reduce dependency on pesticides and chemical fertilizers. Additionally, a more holistic and sustainable management approach must be adopted to preserve the environment on Sumbawa Island.

c. Limited market and technology access

Farmers' access to broader markets remains a significant challenge (Trilestari & Kirana, 2020) [31]. Most corn farmers in Sumbawa Island rely on middlemen who often dictate unfavorable prices. Enhancing market access through the establishment of farmer cooperatives and the use of digital marketing platforms can be practical solutions. Furthermore, technical training and farmer assistance programs should be prioritized to improve farmers' capacity and competitiveness.

3. Strategic management approach to sustainable agribusiness

a. Economic Dimension

A sustainable agribusiness management strategy must incorporate efforts to enhance production efficiency through the adoption of modern technologies and improved resource management (Kamakaula, 2023) [32]. Product diversification based on corn, such as corn flour and animal feed, can also increase the added value of the commodity. Furthermore, corn holds strategic significance in supporting both national and global economies, particularly as a primary raw material for the food industry, animal feed, and renewable energy.

Therefore, an economic analysis is essential to ensure the long-term sustainability of corn agribusiness. Several key aspects of the economic dimension include:

- **Production Efficiency**

Efficiency in corn production involves the effective management of resources such as land, labor, and agricultural inputs to achieve maximum productivity at minimal cost. The adoption of modern agricultural technologies, including high-yield seeds, precision irrigation, and mechanization, can enhance efficiency while reducing production costs.

- **Economic Value Addition**

Developing the value chain through the diversification of corn-based products—such as corn flour and animal feed-can significantly contribute to the income of farmers and agribusiness actors. By leveraging innovation and processing technology, corn can become a high-value commodity capable of competing in both domestic and international markets.

- **Price Stability**

Price fluctuations often pose challenges for farmers and industry stakeholders. Therefore, government policy interventions through price stabilization mechanisms—such as setting floor prices, input subsidies, and stock management—can help mitigate market volatility and provide profit assurance for farmers.

- **Market Access**

Market access plays a crucial role in supporting the economic dimension of corn agribusiness. Adequate infrastructure, such as roads, ports, and storage facilities, is vital for facilitating the distribution of harvests from farmers to consumers. Improving market access can also be achieved by integrating farmers into modern markets through partnerships with large-scale industries.

The economic dimension in the strategic management of sustainable corn agribusiness aims not only to increase productivity and income but also to ensure that all economic activities in the corn value chain are conducted efficiently, equitably, and sustainably. Hence, the economic aspect forms a strong foundation for achieving sustainability amid increasingly complex global challenges.

b. Environmental Dimension

Environmentally friendly approaches, such as the use of organic fertilizers and agroforestry techniques, can help

maintain ecosystem balance (Dadi, 2021) [33]. These strategies not only preserve natural resources but also ensure long-term productivity. The environmental dimension in sustainable agribusiness management of corn is a critical aspect that supports ecosystem conservation while sustaining production.

As a major food crop, corn has a significant ecological footprint, necessitating a management strategy aligned with environmental sustainability principles. Key aspects of this dimension include:

- **Natural Resource Conservation**

Land use for corn cultivation must consider the land's carrying capacity to minimize degradation, such as soil erosion and fertility decline. Cultivation techniques like crop rotation, cover cropping, and organic fertilization offer solutions to maintain soil quality and reduce reliance on excessive chemical inputs.

- **Water Management**

Water management is a critical component of the environmental dimension. Corn production often requires intensive irrigation, which can deplete groundwater and pollute water bodies through fertilizer and pesticide runoff. The use of precision irrigation technologies-such as drip irrigation—and water conservation practices, including reservoirs and organic mulching, can optimize water use while protecting aquatic ecosystems.

- **Agricultural Waste Management**

Biomass residues from corn, such as stalks and leaves, are often burned, contributing to greenhouse gas emissions and air pollution. To address this, corn waste can be utilized as raw materials for animal feed, compost, or biomass energy, creating a more closed-loop and environmentally friendly material cycle.

- **Carbon Emission Reduction**

Reducing carbon emissions remains a major challenge in sustainable agribusiness. Activities ranging from land preparation to product distribution contribute significantly to the carbon footprint. The use of low-carbon technologies such as eco-friendly transportation and agroforestry-based farming practices can help curb emissions.

- **Biodiversity Conservation**

Biodiversity conservation is essential for maintaining ecosystem balance. Prolonged monoculture of corn can threaten local habitats and reduce the populations of surrounding species. Therefore, sustainable approaches like intercropping systems and the protection of conservation areas near farmland are necessary to preserve biodiversity.

The environmental dimension in corn agribusiness aims not only to mitigate negative ecological impacts but also to ensure that production systems remain viable without depleting natural resources for future generations. By integrating environmentally sound practices, the corn commodity can continue to deliver economic benefits while maintaining ecological balance.

c. Social Dimension

The social dimension in the strategic management of sustainable corn agribusiness plays a vital role in fostering harmonious relationships among stakeholders along the agribusiness value chain, while also enhancing the welfare of communities surrounding the production ecosystem. The success of sustainable corn agribusiness is not solely determined by economic and environmental aspects but also by its social impacts.

Empowering farmers through technical training, the formation of farmer groups, and access to microfinance can significantly improve their well-being (Bahua, 2018) [34]. Strengthening local capacities will create broader social impacts. Key aspects of the social dimension include:

- **Improving Farmer Welfare**

As primary actors in the production system, corn farmers often face challenges such as limited access to capital, technology, and markets. Efforts to improve farmer welfare can be pursued through mentoring programs, technical training, and access to modern agricultural technology and inclusive financing schemes. This enables farmers not only to increase productivity but also to achieve more stable incomes.

- **Empowerment of Local Communities**

Corn is commonly cultivated in rural areas where agribusiness can positively impact local livelihoods. Through the establishment of cooperatives or farmer groups, communities can gain better market access, share knowledge, and strengthen their bargaining position within the agribusiness value chain. Empowerment programs may also involve youth to ensure future sustainability of corn agribusiness.

- **Social Justice and Inclusivity**

A sustainable agribusiness approach must ensure that all parties including vulnerable groups such as women, farm laborers, and indigenous communities benefit equitably from corn agribusiness activities. Applying the principles of equity and fairness within this management strategy can help reduce socio-economic disparities in surrounding communities.

- **Social Conflict and Its Resolution**

In some cases, corn cultivation can lead to conflicts over land access, natural resource use, or economic benefit distribution. Therefore, mediation mechanisms involving stakeholders such as government, local communities, and agribusiness actors are needed to manage potential conflicts constructively and fairly.

- **Strengthening Stakeholder Relationships**

Fostering strong relationships among stakeholders in the corn value chain is key to sustainable agribusiness success. Positive relations among farmers, cooperatives, government, agribusiness firms, and consumers enhance coordination, facilitate information flow, and promote collaboration to create a more resilient and integrated agribusiness system.

By emphasizing the social dimension, corn agribusiness can provide not only economic contributions but also serve as a catalyst for positive social change. This approach generates broad social impacts, such as improved quality of life, poverty reduction, and strengthened community solidarity, thereby ensuring that corn agribusiness remains truly sustainable in all aspects.

4. Conclusion

Corn plays a strategic role in the economy of Sumbawa Island, both as a food commodity, animal feed, and industrial raw material. This significant potential is supported by favorable geographical conditions and government policies that encourage the development of corn agribusiness through various programs. However, challenges such as land degradation, dependence on chemical inputs, and limited access to markets and technology persist. Sustainable agribusiness strategies include product diversification, the use of organic fertilizers, strengthening farmers' capacities through training and access to financing, as well as multi-

stakeholder collaboration. These elements are crucial in creating synergy between the government, farmers, and the private sector.

The management strategy approach for sustainable agribusiness in corn commodities on Sumbawa Island must encompass three key dimensions: economic, environmental, and social. These dimensions must work together to ensure the sustainability of production and generate broad positive impacts for both society and the environment. This comprehensive approach forms a resilient, inclusive, and sustainable corn agribusiness system. By harmoniously integrating these three dimensions, corn agribusiness can make a significant contribution to the economy, protect the environment, and improve the quality of life for the community.

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