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Strategies for Sustainable Corn Farming Development in Bima Regency

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Abstract: Bima Regency is one of the main centers of corn production in Indonesia, playing a significant role in food security and the local economy. However, the sustainability of corn farming in this region faces various challenges, particularly environmental degradation, carrying capacity issues, price fluctuations, and dependence on chemical inputs. This study aims to analyze corn production conditions over the past ten years, assess the sustainability of corn farming, and develop strategies for sustainable corn farming in Bima Regency. The methods used in this study include production data analysis for the 2015-2024 period, sustainability analysis using the Multidimensional Scaling (MDS) approach with Rapfish software, and strategy formulation using the SWOT method. The sustainability index for corn farming in Bima Regency was found to be 55,88, indicating a moderately sustainable level, with ecological and institutional dimensions posing the main challenges. The study highlights the science-based approach to sustainability, linking environmental science with the development of adaptive farming strategies. Based on the SWOT analysis, key strategies for corn development include climate risk mitigation through green infrastructure and adaptive cultivation, reducing dependence on chemical fertilizers with local organic fertilizers, and strengthening farmer group institutions and marketing. The implementation of these strategies is expected to enhance farmers' economic resilience, improve environmental conditions, and contribute to the long-term sustainability of corn farming in Bima Regency.

Keywords: Bima Regency; Corn; Development Strategy; MDS; Sustainability; SWOT Analysis

Introduction

Indonesia faces significant challenges in food management to meet basic human needs in a fair, equitable, and sustainable manner, as mandated by Law Number 18 of 2012 concerning Food (BAPPANAS, 2024). Factors such as climate change, limited production facilities, reduced agricultural land due to conversion, and extreme weather events like El Niño and La Niña hinder the achievement of national food security (Mahendra *et al*., 2022). These challenges are further compounded by continuous population growth, which is projected to reach 324 million by 2045, driving up national food demand (Central Statistics Agency, 2023).

Corn (Zea mays L.), a strategic commodity, plays a crucial role in supporting food security as it is a key raw material for animal feed and is increasingly used for bioenergy (Redi Prasetyo *et al.*, 2024). Despite its economic importance, domestic corn production is unable to meet national demand, with Indonesia still importing significant quantities (Ministry of Agriculture, 2024). In response, the government has prioritized corn production through the UPSUS PAJALE program, which has shown success in increasing corn harvest area and production in West Nusa Tenggara

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(NTB). However, expanding corn cultivation areas also raises environmental concerns, such as land degradation and disaster risks, particularly in areas with steep slopes (Shafiani, 2020). In Bima Regency, where corn production is a significant contributor to regional growth, flooding in 2025 underscored the vulnerability of the area's agricultural infrastructure (BPBD NTB, 2025).

This study aims to address the research gap by analyzing corn production conditions in Bima Regency over the last decade, assessing the sustainability of corn farming, and developing strategies for sustainable corn farming that consider economic, ecological, and social aspects. By doing so, it seeks to contribute to the development of strategies that balance increased productivity with environmental sustainability and resilience to climate impacts.

Method

Time and Place

This study was conducted in Bima Regency, West Nusa Tenggara Province, which is one of the areas with the highest corn harvest and production in the province. The research locations were selected purposively based on the category of corn harvest area, namely the subdistricts with the highest harvest area (Soromandi Subdistrict), medium harvest area (Mada Pangga Subdistrict), and lowest harvest area (Belo Subdistrict). The selection of these locations was done to obtain a representative picture of the variations in corn farming conditions in the Bima Regency area. The research activities were carried out from March to July 2025 (Figure 1).

Figure 1. Research Location

Research Desaign

This study used a quantitative descriptive design that aimed to describe and analyze the actual conditions of corn farming in Bima Regency in the context of sustainability and development strategies. A quantitative approach was used to measure sustainability conditions based on a number of multidimensional indicators, while a descriptive approach was used to systematically explain the results of observations, interviews, and secondary data.

Date Sources and Research Sample

The main data used are primary and secondary data. Primary data were obtained from direct interviews using questionnaires with key informants as well as observations at the research site. Key informants in this study were academics, prominent businesspeople, representatives of the Bima Regency Government, the Agriculture and Plantation Service, the Food Security Service, the Environment Service, and the Regional Planning and Development Agency, as well as representatives of the Farmers' Group from the subdistricts of Soromandi, Mada Pangga, and Belo. Secondary data consists of literature reviews and is accessed from various previous research journals, government regulations, and other credible documents.

The research sample was determined using purposive sampling techniques, taking into account variations in harvest area. The selected subdistricts were Soromandi, Mada Pangga, and Belo. The research variables included five dimensions of sustainability, namely ecological, social, economic, legal and institutional, and technological dimensions. Data collection was conducted through structured interviews, field observations, and documentation studies. The tools and materials used in the study included laptops, stationery, field vehicles, voice recorders, cameras, and various software.

Research Procedures

The research stages include (1) preparation, in the form of collecting secondary data from Statistics Indonesia, the Department of Agriculture, and related agencies; (2) field data collection, through observation, interviews, and questionnaires to obtain primary data; (3) sustainability and strategy analysis, through sustainability index calculations and development strategy formulation. Each stage is carried out systematically to ensure the accuracy and consistency of the data obtained..

Data Analysis

Sustainability Analysis

The sustainability of corn farming in Bima Regency will be analyzed using a modified *Multidimensional Scaling* (MDS) technique in the *Rapfish* program. MDS was chosen because it provides more stable results than other multivariate techniques, such as principal component analysis (Alder *et al*., 2001). With this approach, various dimensions of sustainability can be comprehensively evaluated, including environmental, social, economic, legal and institutional, and technological aspects (Kavanagh, 2004). Rapfish, although originally developed for the fisheries sector, is also effective in assessing agricultural sustainability, providing a more holistic and in-depth picture of the sustainability conditions of corn farming in Bima Regency. For the analysis of the dimensions of corn farming sustainability, the dimensions are as follows:

- Ecological Dimension, attributes analyzed include: vulnerability to drought, vulnerability to flooding, fertilizer use levels, average annual temperature, annual rainfall, soil fertility levels, and erosion risk levels.
- Social Dimension, consisting of seven attributes analyzed, namely population, corn farming households, formal education level, community empowerment efforts, agricultural extension activities, farmer participation in farmer groups, and social conflict conditions in the region.
- Economic Dimension: a number of attributes analyzed are corn prices, profits and comparisons assistance, and marketing locations.
- Legal and Institutional Dimension, covering several attributes analyzed, namely farmer groups or associations, marketing institutions, capital institutions, cooperation with surrounding areas, extension centers, and local regulations on sustainable agricultural cultivation systems.
- Technology Dimension: a number of attributes analyzed consist of road access to farmers' land, irrigation channels, corn farming extension, corn cultivation technology, corn seed technology, and post-harvest/threshing technology

Each dimension will be analyzed using *Root Mean Square* (RMS) values to assess its sensitivity to sustainability. This analysis procedure, as described by Fauzi and Anna (2005), consists of data collection, assessment using Excel, and MDS analysis using the *Alternating Least Squares Scaling* (ALSCAL) algorithm, followed by sensitivity analysis to identify the attributes that most influence the sustainability of corn farming in Bima Regency. Each attribute is given a score, which is then analyzed to determine the level of corn farming sustainability comprehensively based on the established dimensions. The index is divided into four categories, according to Fauzi and Anna (2005) as shown in Table 1.

Tabel 1. Sustainability status categories based on Rapfish index result

Index Value	Category
0 – 25	Not Sustainable
26 – 49	Less Sustainable
50 – 75	Fairly Sustainable
76 – 100	Very Sustainable

Source: Fauzi and Anna (2005)

SWOT Analysis (Strength, Weakness, Opportunity, Threat)

SWOT analysis in this study was used to formulate strategies for developing corn farming in Bima Regency. This method aims to systematically identify strengths, weaknesses, *opportunities*, and threats, thereby producing effective strategies for developing corn farming. According to Rangkuti (1998), SWOT analysis maximizes strengths and opportunities and minimizes weaknesses and threats. The stages in SWOT analysis begin with identifying internal and external factors that affect corn farming, followed by determining the supporting and inhibiting factors in achieving development goals.

The next step is to combine both internal and external factors to formulate an appropriate strategy. After that, a SWOT matrix is prepared to describe the interaction between internal and external factors. External factors are analyzed based on opportunities and threats, with weighting and assessment of their influence (Rangkuti, 2006). Meanwhile, internal factors are analyzed to identify strengths and weaknesses, which are also assessed based on their weight and influence on the sustainability of farming businesses. Based on this analysis, the strategy applied will be adjusted to the position in the SWOT quadrant to determine the best steps in optimizing potential and facing challenges (Rangkuti, 2006).

Descriptive Analysis of Tables and Graphs

The descriptive research method of tables and graphs is used to collect and compile data according to reality, then analyze it to provide an overview of the existing problems. The data obtained is presented in the form of tables, graphs, or diagrams such as bar, line, and circle diagrams, as well as measures of central tendency and data dispersion (Sugiyono, 2017). This study uses a quantitative approach, in which data is analyzed and presented in tables or graphs to facilitate understanding of the relationships between the variables under study. With this method, significant relationships between variables can be identified, resulting in conclusions that clarify the object under study.

Result and Discussion

Corn Production and Productivity in Bima Regency

Bima Regency is one of the main corn production centers in West Nusa Tenggara Province, which has a strategic contribution to national food security. This region is dominated by dry land with an annual rainfall of around 1,000-1,200 mm, which is suitable for sorn cultivation. The increase in corn production in this area is inseparable from government policies on land intensification programs, the use of superior varieties, and assistance with production facilities. Overall, the development of corn harvest area, productivity, and production over the last decade can be seen in Table 2, while the distribution of production between subdistricts is presented in Table 3, ad a comparison of the productivity levels of each subdistrict between 2015 and 2024 can be observed in Table 4. These three tables groeth and the contribution of each region to the total corn production in Bima Regency.

Tabel 2. Corn Harvest Area, Productivity, and Production in Bima Regency from 2015 to 2024

Year	Harvest Area (Ha)	Yield (Kw/Ha)	Production (Tons)
2015	25.541	66,16	168.976
2016	28.947	66,15	191.495
2017	43.653	68,06	297.097
2018	65.139	68,05	443.257
2019	76.952	65,61	504.877
2020	61.647	65,41	403.379
2021	63.149	75,21	474.947
2022	82.431	65,41	539.198
2023	88.959	65,26	580.558
2024	83.088	75,19	624.768

Source: Bima District Agriculture and Plantation Service 2025

Tabel 3. Corn Harvest Area and Production by Subdistrict in Bima Regency in 2015, 2020, and 2024

Subdistrict	2015		2020		2024	
	Harvest Area (Ha)	Production (Tons)	Harvest Area (Ha)	Production (Tons)	Harvest Area (Ha)	Production (Tons)
Ambalawi	300	1.980	2.550	16.453	3.695	27.562
Belo	5	33	7	43	151	1.100
Bolo	393	2.595	4.402	28.391	4.269	32.297
Donggo	5.471	36.192	8.337	55.622	7.552	57.666
Lambitu	503	3.323	4.505	29.508	3.003	22.603
Lambu	1.067	7.049	1.673	10.994	2.951	22.258
Langgudu	916	6.048	1.485	9.760	1.658	12.453
Madapangga	1.933	12.759	4.356	29.502	6.728	52.124
Monta	485	3.202	2.101	13.827	3.411	25.914
PalibeLo	465	3.069	1.698	10.654	3.490	25.426
Parado	200	1.320	3.569	22.292	2.396	17.374
Sanggar	8.624	57.178	5.323	35.528	10.119	77.724
Sape	1.254	8.278	1.492	9.361	5.324	38.843
Soromandi	1.226	8.104	9.479	62.305	10.941	82.203
Tambora	1.185	7.839	3.998	26.279	2.177	16.350
Wawo	378	2.497	1.457	9.576	6.505	49.330
Wera	245	1.615	3.129	19.399	7.331	53.013
Woha	1.191	7.874	2.113	13.887	1.387	10.527
TOTAL	25.541	168.976	61.674	403.379	83.088	624.768

Source: Bima Regency Agriculture and Plantation Service 2025 (processed)

The results of the study show that corn production in Bima Regency has increased significantly during the 2015–2024 period. Total production rose from 168,976 tons to 624,768 tons, while productivity increased from 6.6 tons per hectare to 7.5 tons per hectare. This increase demonstrates the success of land intensification strategies and the use of superior varieties by farmers. However, production still fluctuates in certain years due to climate anomalies, particularly floods and droughts that affect the harvest area. These results are in line with the report by the Central Statistics Agency (BPS, 2024) and the study by Ruminta *et al.* (2023), which state that extreme climate conditions have a direct impact on corn yields in dry climate regions.

The Soromandi sub-district is the area with the highest contribution to total production, reaching 82,203 tons in 2024, followed by Donggo and Sanggar. Conversely, Belo District has the lowest harvest area and production due to land use allocation for horticulture. Differences in production between districts are influenced by land availability and the level of agricultural technology adoption. Increased productivity in various regions is supported by the use of hybrid varieties such as Bisi-18, Pioner-27, and NK-212, which are highly resistant to drought. Research by Ariningsih *et al.* (2021) and Anisya *et al.* (2024) confirms that the use of superior hybrid varieties can increase yields by 20-30% compared to local varieties in drylands.

Tabel 4. Corn productivity levels bu subdistrict in Bima Regency in 2015 and 2024

Subdistrict	2015 Productivity (Kw/Ha)	2024 Productivity (Kw/Ha)
Ambalawi	66.01	74.60
Belo	66	72.91
Bolo	66.02	75.65
Donggo	66.15	76.36
Lambitu	66.07	75.27
Lambu	66.07	75.43
Langgudu	66.03	75.13
Madapangga	66.02	77.47
Monta	66.02	75.98
PalibeLo	66.01	72.85
Parado	66.02	72.51
Sanggar	66.30	76.81
Sape	66.02	72.96
Soromandi	66.10	75.13
Tambora	66.15	75.11
Wawo	66.07	75.83
Wera	66.02	72.31
Woha	66.09	75.89
TOTAL	66.16	75.19

Sumber: Bima District Agriculture and Plantation Service 2025 (processed)

In addition to plant genetics, increased productivity is also linked to improved agronomic management and institutional support for agriculture. Government programs such as UPSUS PAJALE and GRATIEKS encourage farmers to use certified seeds and balanced fertilizers, thereby increasing input efficiency. A study by Prabowo *et al.* (2023) shows that government intervention through the distribution of production facilities and technical assistance has a positive impact on the efficiency of corn farming in eastern Indonesia. However, on the other hand, increased intensification without conservation practices can cause long-term land degradation, as warned by Setyowati *et al.* (2022), who found a decline in soil organic matter content in monoculture corn fields in NTB.

In general, the increase in corn production in Bima Regency reflects the success of land management and the improvement of farmers' technical capacity. However, the sustainability of these results is still influenced by climate variability, limited irrigation infrastructure, and cultivation practices that are not yet fully environmentally friendly. Strengthening farmer institutions, applying soil conservation technologies, and diversifying farming businesses are needed as adaptive strategies to cope with climate change.

The results of this study show that corn production and productivity in Bima Regency have increased significantly in the last ten years, despite environmental constraints and infrastructure . The practical implication is the need for sustainable policies that balance production with natural resource conservation. Increasing farmer capacity, developing adaptive varieties, and improving extension systems will be determining factors in maintaining the sustainability of corn production in the future.

Analysis of Corn Farming Sustainability

Ecological Dimension

The results of the ecological sustainability analysis show a value of 49.35, as shown in Figure 2. This value falls into the "less sustainable" category, indicating that the corn cultivation system in Bima Regency still faces several environmental constraints that could threaten its long-term sustainability.

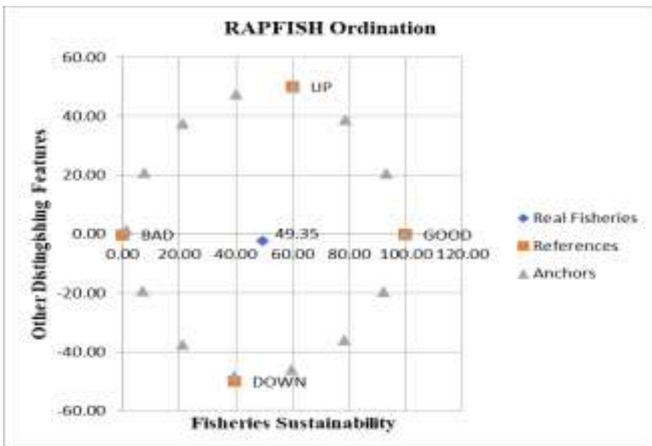

Figure 2. Ecological Dimension Sustainability Index

The results of the leverage analysis (Figure 3) show the three most sensitive attributes, namely fertilizer use (1.98), flood vulnerability (1.82), and erosion hazard level (1.74). The first attribute, fertilizer use, has the greatest influence on ecological sustainability. Excessive use of chemical fertilizers can reduce soil quality and cause microbiological imbalances. This is in line with the findings of Li *et al.* (2023), who reported that increasing nitrogen fertilizer doses can alter the structure of soil microbial communities and reduce natural biochemical activity. Similar research by Zeng *et al.* (2025) also shows that high doses of inorganic nitrogen reduce microbial diversity and decrease soil ecosystem stability. Conversely, consistent use of organic fertilizers can improve soil fertility and increase nitrogen uptake by plants, as reported by Maryani *et al.* (2025) in a study of the Parangtritis coastal sandy soil.

The second attribute is vulnerability to flooding, which is a major limiting factor in corn land management in Bima Regency. Seasonal flooding in 2020 and 2024 resulted in a significant decline in planting area in several subdistricts. This condition is similar to the findings of Fischer *et al.* (2021), which explain that increased extreme rainfall due to tropical climate change can reduce corn yields by up to 30 percent, especially in drylands. Thus, the implementation of adaptive drainage and water conservation systems is a must in agricultural development in flood-prone areas such as Bima.

The third attribute is the level of erosion hazard, which contributes significantly to long-term productivity decline. Dryland erosion in Bima generally occurs on slopes with a gradient of more than 30°, due to deforestation and cultivation practices without conservation measures. Loss of topsoil leads to a decrease in organic matter content and water absorption capacity. Octavia (2023) asserts that a planned agroforestry system can reduce soil loss by up to 40 percent compared to a monoculture system. Therefore, the implementation of conservative agricultural practices such as terracing, crop rotation, and cover cropping is highly recommended to maintain ecological sustainability.

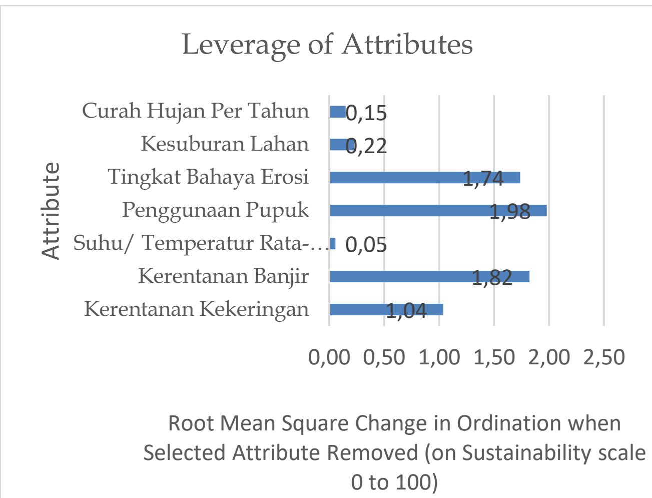

Figure 3. Analysis of Ecological Dimension Leverage

In addition to these three factors, the decline in biodiversity due to corn monoculture systems is also a concern. A study by Kamila *et al*. (2024) shows that long-term monoculture practices can reduce soil biodiversity by up to 25 percent, thereby increasing dependence on chemical pesticides. Diversifying cropping patterns, such as intercropping with legumes or agroforestry systems, has the potential to improve the balance of agricultural ecosystems and maintain long-term productivity.

In general, the results of this study indicate that the ecological sustainability of corn farming in Bima Regency is still in the poor category, with the main challenges being land degradation, erosion, and seasonal flooding. There is a need for local policies that emphasize the application of conservative agricultural practices, such as the use of organic fertilizers, agroforestry systems, and community-based flood control infrastructure. The implication of these findings is that the success of increasing corn production in the future will greatly depend on the ability of farmers and local governments to manage natural resources in an adaptive and sustainable manner.

Economic Dimension

The results of the economic sustainability analysis show a value of 71.08, as shown in Figure 4. This value falls into the "sufficiently sustainable" category.

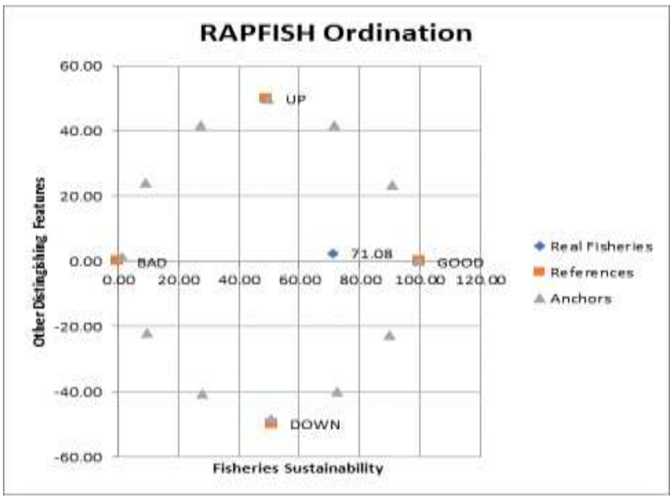

Figure 4. Economic Dimension Sustainability Index

Based on the results of leverage analysis in the economic dimension, there are three attributes that are most sensitive in the development of corn farming in Bima Regency. The first attribute is Corn Price, with a leverage value of 7.30, which indicates that fluctuations in corn prices greatly affect the economic sustainability of farmers. Unstable corn prices have a direct impact on farmers' incomes, so business sustainability is highly dependent on market stability. Research by Fadhilah *et al.* (2025) shows that corn price volatility affects farmers' ability to make profits and maintain production incentives. The second attribute is Government Assistance, with a leverage value of 6.81, which emphasizes the vital role of government support in improving the economic resilience of corn farmers. Targeted assistance can reduce production costs and encourage increased productivity, thereby supporting the sustainability of farming businesses. Research by Prasetyo and Kadira (2024) found that targeted fertilizer and seed assistance significantly reduced the likelihood of low yields. The third attribute is Land Tenure Status, with a leverage value of 6.31, which indicates the importance of land tenure security in providing a sense of security in investing, increasing opportunities to obtain assistance, and strengthening the position of farmers. Research by Purnamasari (2023) highlights that land size is a crucial factor in agricultural technical efficiency, and uncertainty regarding land status can hinder the development of farming businesses. The leverage results for the economic dimension are shown in Figure 5.

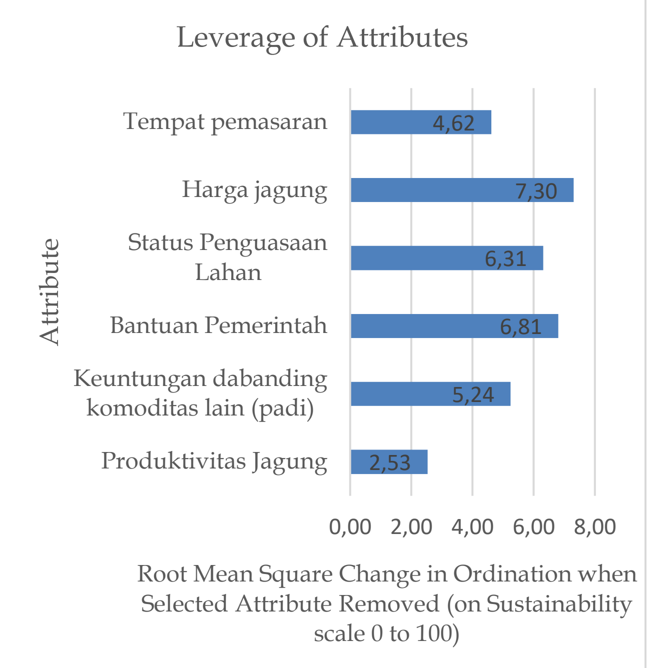

Figure 5. Leverage Analysis of the Economic Dimension

Social Diemension

The results of the social sustainability analysis yielded a value of 67.35, as shown in Figure 6. This value falls into the "sufficiently sustainable" category.

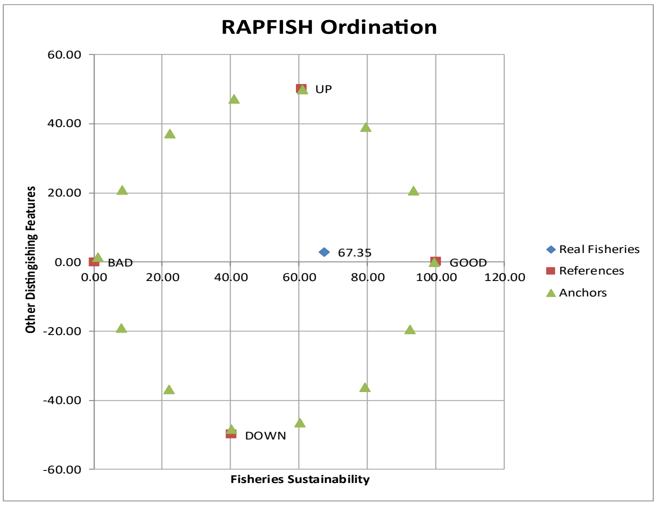

Figure 6. Social Dimension Sustainability Index

Based on the results of leverage analysis in the social dimension, there are three attributes that are most sensitive in the development of corn farming in Bima Regency. The first most sensitive attribute is Community Empowerment, with a leverage value of 10.22. This attribute confirms that the success of corn farming is not only determined by technical factors, but also greatly depends on the extent to which the community is involved in the development process. Good empowerment will strengthen farmers' capacity, increase independence, and encourage active participation in maintaining the sustainability of corn farming (Abbas *et al.*, 2023). The second attribute is Corn Farming Extension, with a leverage value of 8.76, which shows the importance of the role of extension in improving farmers' knowledge and skills. Intensive and targeted extension can help farmers apply new technologies, manage land sustainably, and increase farming productivity and efficiency. Research by Purnamasari *et al.* (2023) supports this, finding that improving the quality and intensity of extension will increase the application of modern technologies in sustainable agriculture. The third attribute is the Number of Corn Farming Households, with a leverage value of 5.49, indicating that the number of households dependent on corn farming greatly influences social sustainability in the study area. The more households involved, the greater the socioeconomic impact. This finding is in line with research by Prasetyo *et al.* (2021), which states that the greater the number of households that depend on agriculture, the greater the potential social impact of the agricultural sector on socio-economic stability in the region. The results of the social dimension leverage are shown in Figure 7.

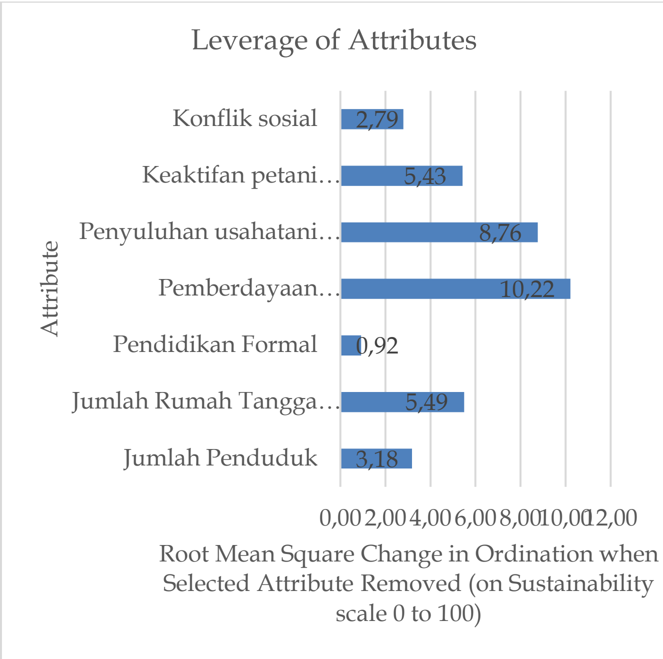

Figure 7. Analysis of Social Dimension Leverage

Legal and Institutional Dimension

The results of the legal and institutional sustainability analysis show a value of 35.78, as shown in Figure 8. This value falls into the "less sustainable" category.

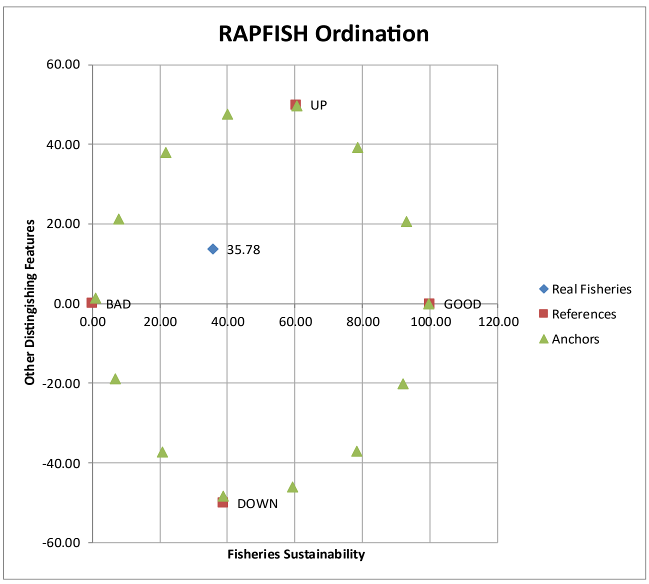

Figure 8. Legal and Institutional Dimension Sustainability Index

Based on the results of leverage analysis in the legal and institutional dimensions, there are three attributes that are most sensitive in the development of corn farming in Bima Regency. The first attribute is Marketing Institutions, with a leverage value of 6.59. This attribute shows that the existence of marketing institutions greatly influences the sustainability of corn farming. A strong marketing institution can help farmers expand market access, stabilize prices, and increase bargaining power, thereby contributing directly to the sustainability of corn farming. Collaboration between the government, the private sector, and farmer organizations in forming a strong support ecosystem is also key to ensuring the stability and growth of the corn farming sector as a whole (Anisya *et al.*, 2024). The second attribute is the Agricultural Extension Center (BPP), with a leverage value of 5.57, which confirms the importance of the BPP's role in supporting technology transfer, providing technical assistance, and facilitating farmers' access to agricultural information and innovation. The function of BPP as a center for information and technical assistance is vital in improving farmers' capabilities, particularly in the adoption of innovations and sustainable agricultural practices (Ariningsih *et al.*, 2021). The third attribute is Capital/Financial Institutions, with a leverage value of 5.11, which shows that farmers' access to financial institutions is crucial to the smooth running of corn farming. Access to adequate financial capital, either through formal banking institutions or microfinance schemes, is an essential prerequisite for supporting farmers' investment in new technologies, productivity improvements, and business risk mitigation (Ekayani *et al.*, 2025). The leverage results for the legal and institutional dimension are shown in Figure 9.

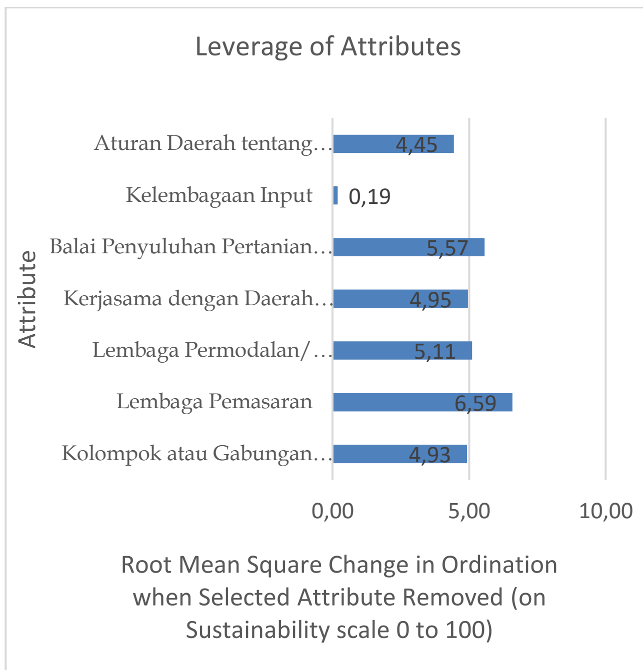

Figure 9. Analysis of Legal and Institutional Leverage

Technology and Infrastructure Dimension

The results of the analysis of the sustainability of technology and infrastructure show a value of 50.86, as shown in Figure 10. This value falls into the "sufficiently sustainable" category.

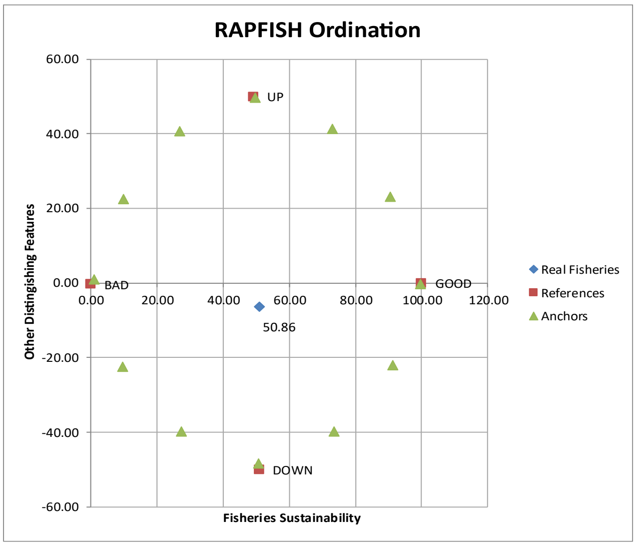

Figure 10. Sustainability Index for the Technology and Infrastructure Dimension

Based on the results of leverage analysis in the dimensions of technology and infrastructure, there are three sensitive attributes in the development of corn farming in Bima Regency. The first attribute is Corn Seed Technology, with a leverage value of 7.00, which indicates that the availability of high-quality seeds greatly affects the sustainability of farming. High-quality seeds can increase crop productivity and resistance to pests and diseases, which in turn increases the resilience of the corn farming system (Sihombing, 2023). The second attribute is Irrigation Channels, with a leverage value of 6.65, which confirms the importance of a good irrigation system in maintaining the smooth cultivation of corn. Adequate irrigation can reduce the risk of crop failure due to drought and increase the stability of corn production throughout the season (Prayitno *et al.*, 2022). The third attribute is Corn Farming Extension, with a leverage value of 5.31, which illustrates the importance of knowledge and technology transfer to farmers. Effective extension helps farmers understand modern cultivation techniques and adapt to climate change, thereby increasing the efficiency and resilience of corn farming (Farda *et al.*, 2024). The leverage results for the technology and infrastructure dimensions are shown in Figure 11.

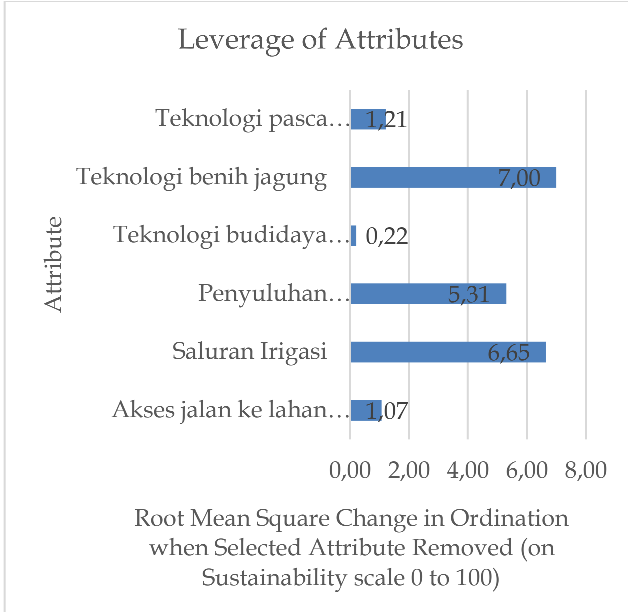

Figure 11. Analysis of Leverage in the Dimensions of Technology and Infrastructure

Based on the analysis of the sustainability of corn farming in Bima Regency using the five dimensions above, in order from least sustainable to fairly sustainable, namely the legal and institutional dimension (least sustainable), the ecological dimension (least sustainable), the technology and infrastructure dimension (fairly sustainable), the social dimension (moderately sustainable), and the economic dimension (moderately sustainable). The sustainability index values of these five dimensions can be visualized in the form of a sustainability diagram presented in Figure 12.

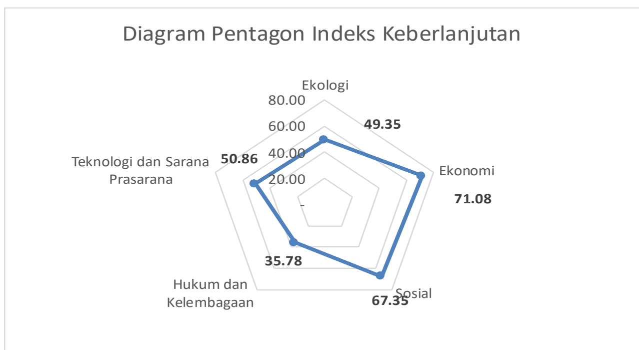

Figure 12. Sustainability Diagram of Corn Farming Development in Bima District (primary data processed in 2025)

SWOT Analysis

The analysis was conducted by identifying and evaluating strategic internal factors (internal factor evaluation), which include strengths and weaknesses, as well as strategic external factors (external factor evaluation), which include opportunities and threats. The results of the identification and scoring of internal factors (strengths and weaknesses) and external factors (opportunities and threats) are show in Table 5 and Table 6.

Table 5. *Internal Evaluation Matrix* (EFE) for Corn Business Development in Bima Regency

Internal Factors	Score
Strengths	
Availability of high-quality corn seeds that can increase productivity.	0.34
Active agricultural extension support.	0.23
The exixtence of BPP (Agricultural Extension Center) and marketing institutions that support farmers.	0.36
Annual rainfall potential that is relatively supportive of corn growth.	0.18
Community and corn farmer participant in continuously developing farmer groups..	0.17
Subtotal	1.28
Weaknesses	
High corn price fluctuations, impacting farmers' income.	0.33
Frequent flooding and droughts	0.33
Roas access to land is still limited in some areas.	0.15
Limited capital and access to financial institutions.	0.22
High dependence on chemical fertilizers, which can reduce soil quality.	0.33
Subtotal	1.35
Total	(Difference = -0.07)

Table 6. *External Evaluation Matrix* (EFE) for Corn Business Development in Bima Regency

External Strategy Factors	Score
Opportunities	
Government support in the form of agricultural input subsidies and direct assistance.	0.55
Opportunities for strengthening through inter-regional cooperation in corn marketing.	0.23
Increased outreach and community empowerment to strengthen farmer capacity.	0.22
A large market potential with increasing demand for corn for both food and feed.	0.32
Development of post-harvest technology (drying, threshing) that can reduse losses.	0.29
Subtotal	1.60
Threats	
Unpredictable climate change, affecting rainfall and temperature.	0.40
Competition with other commodities that are more profitable for farmers.	0.20
Social conflicts over land ownership or use.	0.14
External Strategy Factors	Score
Opportunities	
Uncertainty of regional regulations in supporting sustainable agricultural systems.	0.22
High dependence on government assistance, which is risky if subsidies are reducesd.	0.53
Sub Total	1.48
Total	(Difference = 0.12)

Based on the result of *the Internal Factor Evaluation* (IFE) with a score of -0.07 and *the Exterrnal Factor Evaluation* (EFE) with a score of 0.12, the strategy for corn farming development is in quadrant III (Figure 13).

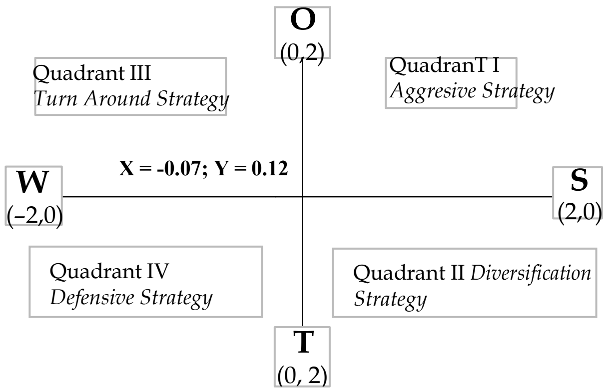

Figure 13. Position of the strategy in cron farming development in Bima Regency

This position indicates that the corn farming strategy in Bima Regency in the SWOT Matrix is in *a turn around* strategy. This is because corn farming faces quite dominant internal weaknesses, such as high dependence on chemical fertilizers, unsustainable land management, limited access to capital, and inadequate road infrastructure, while also facing external threats in the form of unpredictable climate change, corn price fluctuations, and regional regulatory uncertainty. These conditions place corn farming in a vulnerable position, so the necessary strategic step is to maintain business sustainability by focusing onrisk management.

Internal and Exsternal Factor Strategy SWOT

Based on the results of the SWOT analysis, the strategy for developing corn farming in Bima Regency was formulated by addressing internal weaknesses and taking advantage of external opportunities, namely:

1. Reducing dependence on chemical fertilizers by encouraging the use of local organic fertilizers with policy support from the local government, so that farmers are more independent when chemical fertilizer subsidies are reduced.
2. Conservation-based land management aimed at

maintaining soil fertility, protecting the environment, and ensuring long-term land productivity without damaging ecosystem functions.
3. Expanding inter-regional cooperation for corn marketing so that price fluctuations, which are an internal weakness, can be reduced with a more stable market guarantee.
4. Strengthening farmers' access to capital through farmer group-based microfinance institutions, so that farmers have financial reserves to deal with climate and price risks.

Determining Corn Farming Development Strategies

Based on the results of the SWOT analysis, the corn farming development program in Bima Regency is planned with a focus on the following three priority programs:

1. *Flood and Drought Risk Mitigation*
- Rehabilitating land through reforestation programs and implementing agroforestry practices that combine corn crops with perennial plants such as teak, gamal, and fruit trees to increase water absorption and reduce erosion.
- Building green infrastructure, such as village reservoirs and solar-powered water pumps, as well as simple drainage systems to reduce the impact of flooding and provide water reserves during the dry season.
- Encouraging the use of adaptive cultivation techniques such as intercropping and organic mulching to maintain soil fertility despite extreme weather conditions.

2. *Reducing Dependence on Chemical Fertilizers*
- Developing organic fertilizers based on agricultural and livestock waste, and optimizing the use of government subsidies to encourage the use of local organic fertilizers.
- Conducting environmentally friendly extension programs aimed at reducing the use of chemical fertilizers, which can degrade soil quality and improve soil fertility in the long term.
- Introducing sustainable agricultural technologies to increase farmers' independence in managing their land and reduce dependence on environmentally unfriendly agricultural inputs.

3. *Srengthening Farmer Group Institutions*
- Establishing corn cooperatives to strengthen farmer solidarity and overcome corn price fluctuations through collective pricing mechanisms.
- Enhancing farmers' institutional capacity through training in farm management, market access, and legal and policy assistance so that farmers have a stronger bargaining position.
- Developing inter-regional marketing networks to expand markets and maintain corn price stability, as well as strengthening relationships with financial institutions to increase access to capital for farmers.

Conclusion

Based on the analysis results, corn production in Bima Regency has increased significantly over the last ten years, with harvest area more than doubling and productivity per hectare improving. This increase in production has been driven by favorable corn prices compared to other commodities, along with support from government programs. Based on the MDS Rapfish analysis, the sustainability of corn farming in Bima Regency is categorized as moderately sustainable with a score of 55.88. Although progress has been made, several sustainability dimensions, such as ecology and institutions, still require attention. The local government has implemented supportive policies, such as fertilizer subsidies and high-quality seed assistance, but future policies should focus more on managing climate crisis risks, reducing dependence on chemical fertilizers, and strengthening farmer institutions. Risk mitigation strategies, such as agroforestry, farmer group empowerment, cooperation with the private sector, and the development of post-harvest technology, can enhance the resilience and sustainability of corn farming in Bima Regency. This research contributes to the development of applied science and contextual science education, particularly in providing practical insights for sustainable agricultural practices and fostering environmental awareness among students.

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Author's Contribution

The author played an active and important role in this scientific writing, from initiating the idea, designing the research, collecting and analyzing data, drafting the manuscript, writing the article, to revising it. The supervisor plays an active role in supporting the theoretical framework and research methodology, providing input and guidance during the writing and revision process, and helping to ensure that the writing meets academic standards.

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Conflict of Interest

The author declares that there are no conflicts of interest in this

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