



# Strategy for Developing Sustainable Dryland Farming Systems in the Buffer Zone of the Mandalika Special Economic Zone, Indonesia

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**Abstract:** The Mandalika Special Economic Zone (KEK) buffer zone in West Nusa Tenggara Province, Indonesia, has a dryland farming system that supports tourism activities. This study aims to examine the existing conditions of the role of dryland farming systems in the area around the Mandalika SEZ as a buffer zone and develop strategies for developing dryland farming systems in the buffer zone to ensure sustainability. The analytical tools used in the study include descriptive analysis, SWOT analysis, and AHP analysis. The results show that the existing conditions of the Mandalika SEZ buffer zone related to sustainable dryland farming systems play a significant social and economic role. Meanwhile, the AHP results prioritize the SWOT groups as follows: strengths (54.3%), opportunities (26.2%), weaknesses (12.7%), and threats (6.8%); with the most important factor being farmer resilience in dryland farming. The recommended Grand Strategy is to optimize farmer potential through agricultural land expansion, diversification, and mixed farming, support from Village Cooperatives, and increasing the role of agricultural extension.

**Keywords:** Buffer zone; Development strategy; Dryland; Mandalika SEZ; Sustainable

## Introduction

The Mandalika area in West Nusa Tenggara Province was designated a Special Economic Zone (SEZ) pursuant to Government Regulation No. 52 of 2014. The Mandalika SEZ is one of 10 priority tourist destinations in Indonesia with great tourism potential. The development of the Mandalika SEZ has facilitated the broader and more equitable development of other infrastructure, particularly transportation facilities and basic services supporting SEZ activities (DPMPTSP NTB, 2020). Special Economic Zones play an essential role in the economic development of developing countries, serving as catalysts for regional economic growth (Aung et al., 2022; Hazakis, 2014). SEZs in Vietnam have absorbed labor and facilitated the transition of workers from the agricultural to the industrial sector (Tafese et al., 2025), whereas, according to Knoerich et al. (2021) and Darmastuti et al. (2018),

SEZs in China have attracted investors, thereby driving regional economic growth. Although they have not yet fully absorbed the available labor force, Heriyanto et al. (2021) reported that the Mandalika SEZ has created significant employment opportunities in the tourism sector and contributed to local revenue.

The Mandalika SEZ was established to accelerate equitable economic development, with a focus on strengthening the surrounding regions and villages and achieving financial independence in strategic domestic sectors (Danareksa Research Institute, 2023). The Ministry of Agrarian Affairs and Spatial Planning/National Land Agency has designated four Sub-Development Areas (SP) around the Mandalika SEZ, namely SP-1 (Marine Tourism Area), SP-2 (Minapolitan Area), SP-3 (Cultural Tourism Area), and SP-4 (Urban Area, Outlets and Handicraft Industry) (DPU Propinsi NTB, 2015). Thus, the development of dryland farming systems, which has the most

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tremendous potential in the area surrounding the Mandalika SEZ, is not prioritized. In fact, the area surrounding the Mandalika SEZ functions as a buffer zone that supports SEZ development while remaining connected to the zone's economy. This buffer zone is prepared to support investment development in the tourism sector, industrial activities, exports and imports, and high-value economic activities. According to Sa'di (2024), the buffer zone also plays a vital role as a significant source of income and a supporter of food security for the local community. This condition is in line with findings that food security is closely related to community capacity and scientific literacy in managing natural resources (Fauziyah et al., 2021). However, the productivity of dryland agriculture is relatively low, resulting in low living standards and poverty among farmers (Ayu et al., 2023, 2024). According to Awwalunnisa (2021), the majority of poor people are engaged in dryland farming. Low dryland agricultural income and increasing demand for land for economic development in the Mandalika SEZ buffer zone of Central Lombok Regency have led to high levels of land conversion. According to Yudha et al. (2024), the land being converted is generally productive agricultural land for food crops. Efforts to improve productivity on marginal land can be carried out through appropriate technological innovations and the utilization of organic inputs (Hayati et al., 2025). In addition, local natural resources have significant economic value and can contribute directly to community income when managed sustainably (Aminah et al., 2025).

Farmers who experience land conversion have limited skills to access employment opportunities outside of agriculture. Estriani (2019) found that the establishment of tourism businesses in the Mandalika SEZ is not economically beneficial to the buffer zone community. For this reason, Hizmi et al. (2023) suggest enhancing the local community's skills to facilitate its transition to the tourism sector. However, this contradicts the existing potential of the buffer zone community, which is predominantly dryland farmers. One adverse external effect of the Mandalika SEZ is increased unemployment in the buffer zone (Widianto, 2021; Suryade et al., 2022), as most community members earn their living as dryland farmers. In this context, strengthening human resource capacity through the development of critical, creative, and metacognitive skills is essential to improve adaptability (Jumanto et al., 2024; Oktavia et al., 2025). Moreover, the integration of digital technology and innovation is important for increasing productivity and efficiency across sectors (Kusuma et al., 2025). Therefore, the development of the SEZ does not shift the agricultural sector's role as a source of farmers' livelihoods; instead, it integrates it

into the buffer zone through the development of a sustainable dryland farming system. Sustainable agriculture is the primary approach to agricultural development to address global challenges in food production, environmental degradation, and farmer welfare, particularly in marginal lands, including drylands (Kementerian Pertanian RI, 2025; Kusuma et al., 2024; Quirinno et al., 2024). Environmental sustainability must be supported by environmental literacy in resource management (Rianty et al., 2024), environmentally friendly approaches such as green chemistry (Sari & Atun, 2023), and environmental education based on local potential (Khasanah et al., 2025). In addition, understanding plant growth processes and strengthening science process skills are important factors in improving agricultural productivity (Hasan, 2024). The goal is to increase the production and income of dryland farmers sustainably. Increased income will contribute more significantly to living standards (UNDP, 2020; Wang et al., 2023).

This study aims to analyze the role of the areas surrounding the Mandalika SEZ as a buffer zone, assess the existing conditions of dryland farming, and develop strategies for sustainable dryland farming systems in that buffer zone.

## Method

The research was conducted in the buffer zone of the Mandalika Special Economic Zone (SEZ) in Indonesia. The study employed a descriptive-exploratory design, and data were collected through surveys, observations, and in-depth interviews (Nazir, 2014; Sugiyono, 2006). The farmer respondents were determined using cluster sampling based on their distance from the Mandalika SEZ, namely cluster A (the closest zone, Sengkol Village area); cluster B (the middle zone, Segala Anyar Village and Sengkol Village areas), and cluster C (the far zone, Kawo Village and Tanaq Awu Village areas); there were 10 respondents per cluster, including religious leaders, community leaders, youth representatives, the head of the farmer group, and women farmers. In total, there are 30 key informants. In addition, there were three stakeholder respondents from the Central Lombok Regency Agriculture Department, the Central Lombok Regency Food Security Department, and the Central Lombok Regency Environment Department.

The research variables included the role of the buffer zone around the Mandalika SEZ from an ecological, economic, social, legal, and institutional technology perspective, variables measuring the existing conditions of dryland agriculture (cropping patterns, income, and poverty levels of farmers); as well

as internal strategic factors and external strategic factors of the dryland agriculture system in the buffer zone. The data were analyzed descriptively and quantitatively for income and poverty levels, while the buffer role and strategic factors of the dryland farming system were analyzed using mixed methods. To Analyzed buffer role of Mandalika SEZ using descriptive, then the

formulation of a development strategy for the dryland farming system in the Mandalika SEZ buffer zone uses SWOT analysis (strengths, weaknesses, opportunities, and threats) with the framework shown in Figure 2 (Rangkuti, 2004; Muharto, 2020; The University of Kansas, 2025) and AHP (Analytic Hierarchy Process).

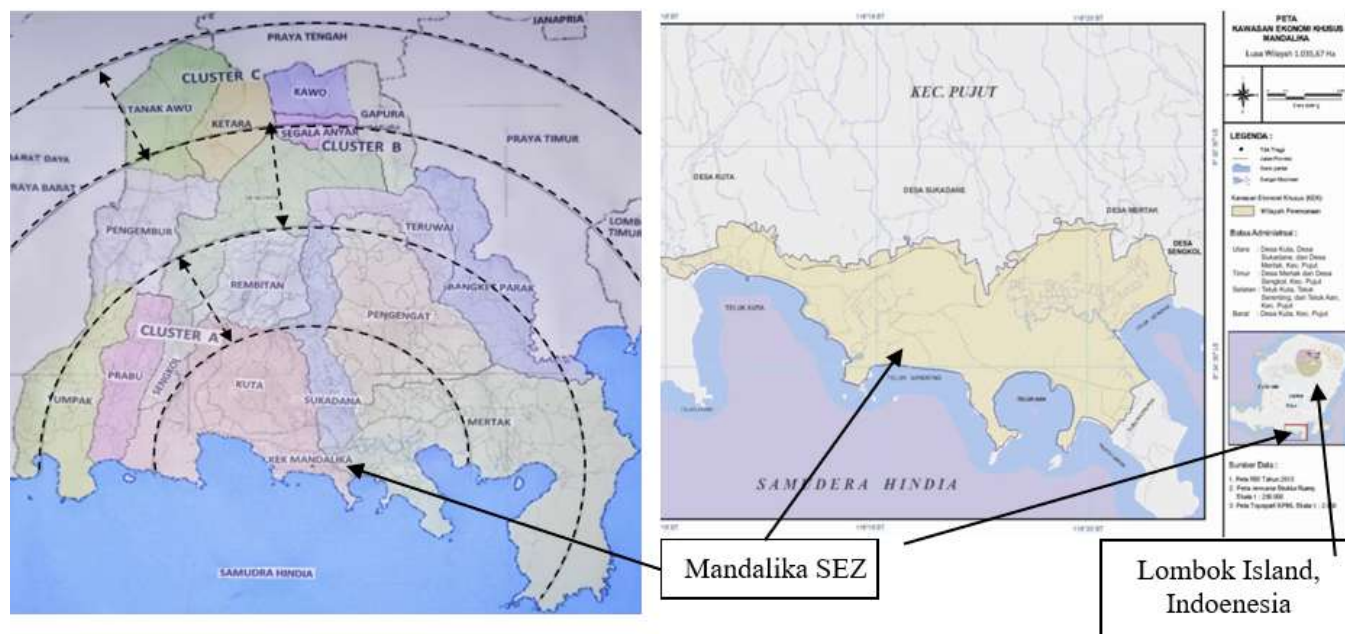


Figure 1. Research Location (Mandalika SEZ Buffer Zone)

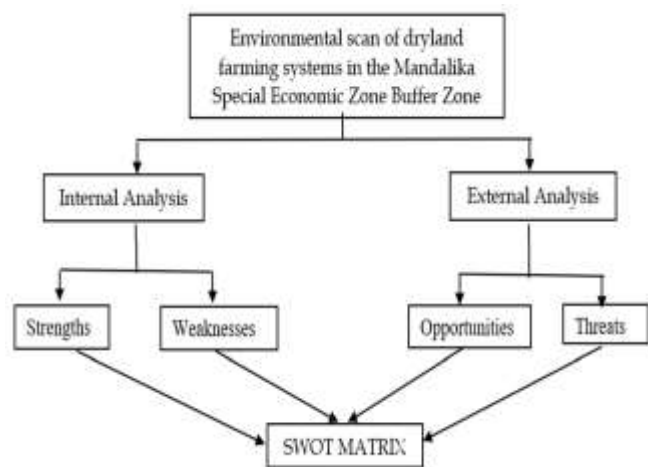


Figure 2. SWOT analysis framework

SWOT analysis provides a basic framework for situational analysis in decision-making, whereas AHP is used to rank SWOT factors. The AHP technique uses pairwise comparisons among factors to determine the relative importance of variables at each level of the hierarchy and to support decision-making among alternatives. The purpose of applying this combined method is to improve the quantitative aspects of

strategic planning (Sharma et al., 2008; Tuzmen, 2011; Saaty & Vargas, 2013). The hierarchical representation of the SWOT structure is shown in Figure 3 (Osuna & Aranda, 2007; Gallego-Ayala & Juizo, 2011).

Priority order or importance ranking based on eigenvalues. The priority mechanism is achieved by assigning numbers from a comparison scale (see Table 1) developed by Saaty (1980) to represent the relative importance of the criteria.

A comparison scale is used to perform pairwise comparisons and determine the relative importance of each pair of SWOT factors. The results of pairwise comparisons on  $n$  criteria are summarized in an evaluation matrix ( $n \times n$ )  $A$ , where each element  $a_{ij}$  ( $i, j = 1, 2, \dots, n$ ) is the result of dividing the criteria weights. Using the obtained aggregate matrix, the weight vector (or priority) can be determined. The matrix is considered consistent in SWOT factor comparisons when the consistency ratio is no more than 10%. The formula is  $CR = \frac{CI}{RI}$ , and  $(CI = \frac{\lambda_{max} - n}{n - 1})$ ; where  $\lambda_{max}$  is the highest eigenvalue in the matrix,  $n$  is the number of groups,  $CI$  is the consistency index, and  $RI$  is the random index (Dehghanimohammadabadi & Kabadayi, 2020; Kou et al., 2012).

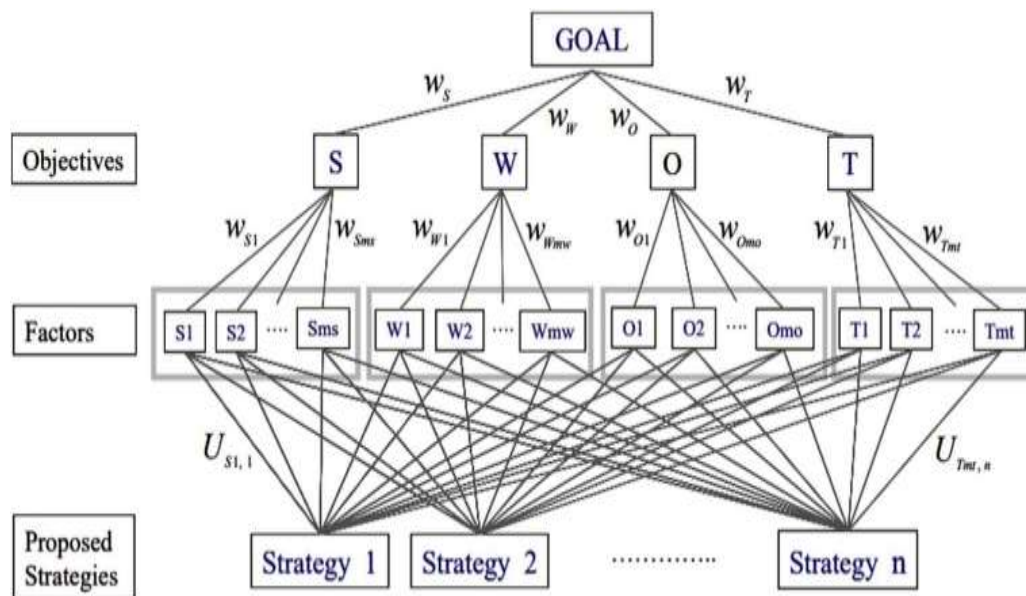


Figure 3. Hierarchical Structure of the SWOT Matrix (Osuna & Aranda, 2007; Gallego-Ayala & Juizo, 2011)

Table 1. Pairwise

Comparison scale	Importance, Explanation
1	Two criteria contribute equally to the objective
3	Experience and judgment slightly favor one over the other
5	Experience and judgment strongly favor one over the other
7	The criterion is strongly favored, and its dominance is demonstrated in practice
9	The importance of one over another is affirmed at the highest

Possible level 2, 4, 6, 8. Used to represent a compromise between the priorities listed above.

Table 2. Mean Random Consistency Index (RI)

n	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.48

Source: (Saaty & Vargas, 2013).

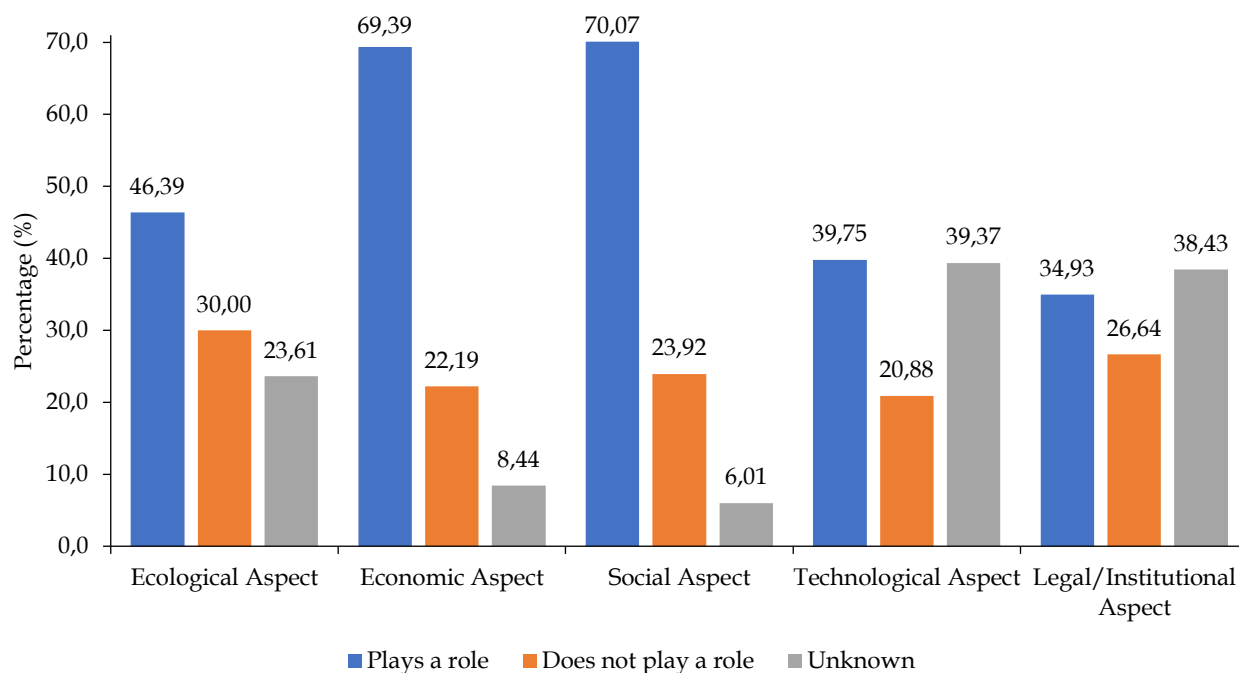
## Result and Discussion

### Existing Conditions Mandalika SEZ Buffer Zone

The Mandalika Special Economic Zone (SEZ) is a strategic policy of the Indonesian government, primarily aimed at developing economic growth centers and promoting equitable national development, with a focus on marine tourism (National Council for Special Economic Zones of Indonesia, 2024). The development of the Mandalika SEZ may impact the surrounding areas, which functionally serve as buffer zones. Administratively, this buffer zone includes the Pujut District of Central Lombok Regency and is located between 116°23.5' and 116°24' East Longitude and 8°56' and 8°57' South Latitude.

The most tremendous potential of this buffer zone lies in dryland agriculture, which is vulnerable to climate change and constrained by limited access to irrigation water, capital, and technology. Generally, agricultural land in the buffer zone of the Mandalika SEZ is used for food crops with a maximum planting frequency of twice a year. Many farmers develop rice-soybean-fallow, rice-corn-fallow, or rice-green bean-fallow cropping patterns. The average annual income from these farming activities is IDR 8,166,507.91, accounting for 41.12% of the total income of farming households. Farmers in the buffer zone are generally classified as poor according to the Sajogyo Poverty Criteria, as their per capita income per year is Rp 6,649,888.33, which is equivalent to 441.85 kg of rice per capita per year. To be classified as non-poor, the minimum annual per capita income must be equivalent to 480 kg of rice (Sumodiningrat et al., 2002).

Buffer zones in the context of Special Economic Zones serve to separate and protect SEZ areas from surrounding areas, both physically and administratively. The objectives are to create an environment conducive to economic activity and investment within the SEZ, while minimizing the negative impact of the SEZ on the environment and communities in the buffer zone (Danareksa Research Institute, 2023). The buffer zone supports and strengthens the sustainability of ecological, economic, social, technological, legal, and institutional aspects (Sushanti et al., 2022; Suryade et al., 2022). Research findings on the existing role of the Mandalika SEZ buffer zone are shown in Figure 4.



**Figure 4.** Existing conditions of the multi-aspect role of the Mandalika SEZ buffer zone

A total of 46.39% of respondents stated that the buffer zone has played an ecological role, namely, preserving natural resources and coastal ecosystems, mitigating the negative impacts of the SEZ, and supporting sustainable ecotourism. However, 30% of respondents reported that this role has not been realized, and 23.61% were unaware of the role's existing conditions.

Economically, 69.39% of respondents stated that the buffer zone has played a significant role. The zone has supported local economic activities and maintained the sustainability of dryland farming, increased investment in sustainable tourism and the marine economy, and provided labor for new businesses in the Mandalika SEZ, as well as agricultural products. According to 22.19% of respondents, this role has not been realized, whereas the remainder are unaware of it. One environmentally friendly way to increase dryland productivity is through the use of vesicular arbuscular mycorrhizal biofertilizers (Sukmawati et al., 2023). This is an alternative for improving soil and plant quality, which can significantly increase production and farmer income.

The role of the buffer zone in social terms is considered favorable by 70.07% of respondents, although 23.92% disagree and 8.44% are unaware of this role. The social dimension aims to preserve local culture/dryland farming traditions, reduce the potential for social conflict, and provide social services that support community welfare in the buffer zone.



**Figure 5.** Condition of dryland agriculture in the Mandalika Special Economic Zone buffer zone after rice harvest



**Figure 6.** Cooperation and discussion between farmers on their agricultural land

The buffer zone is also expected to play a role in the development of environmentally friendly technologies, particularly those for managing natural resources that support sustainable tourism. According to 39.75% of respondents, this role has been realized; 39.37% stated the opposite; and 20.88% were unaware of this role.

From a legal and institutional perspective, the Mandalika SEZ buffer zone is expected to serve as a legal boundary with the core area (Mandalika SEZ), as a zone for the implementation of regulations on environmental protection and local community resources, and as a zone for coordination between central and regional government agencies and other stakeholders to support participatory governance of local communities in SEZ development policies. A total of 34.93% of respondents reported that the role of the legal and institutional aspects had been realized, 38.43% reported that it had not yet played a role, and 26.64% were unaware of this role.

*Strategic Factors of the Agricultural System in the Buffer Zone and SWOT Matrix*

Internal and external strategic factors influencing the compilation of the strengths and weaknesses of the dryland agricultural system in the buffer zone are

presented in the IFAS table (Table 3). In the IFAS table, the weight indicates the factor's importance for the success of dryland agricultural development in the buffer zone; the total weight is 1. The rating indicates the strength of the factor on a scale of 1-4, where 4 indicates a significant strength, 3 indicates a minor strength, 2 indicates a minor weakness, and 1 indicates a major weakness (Rangkuti, 2004; Muharto, 2020).

The total score for all IFAS factors is 2.84, indicating that the internal factors of the farming community in the buffer zone are rated as fairly strong (scale: 1-4), with internal strengths outweighing weaknesses. The strength factor is weighted at 0.60, yielding a total score of 1.98, with the main strengths being the ease of land access and the resilience of farmers in dryland farming. Easy access to land will facilitate farm management. At the same time, the high resilience of dryland farmers is a major contributor to the economies of most communities in the buffer zone.

The weakness factor has a weight of 0.40 and a total score of 0.88. This indicates several weaknesses in dryland farming that must be addressed, including remarkably low farm productivity and limited knowledge of rainwater conservation technologies to extend their availability through the dry season.

**Table 3.** IFAS matrix (Internal Factors Analysis Strategic)

Internal Strategy Factors	Weight	Rating	Score
<b>Strengths:</b>			
Experience in dryland farming (S1)	0.10	3.47	0.35
Cooperation among farmers/ mutual assistance (S2)	0.10	2.27	0.23
Resilience of dryland farmers in farming (S3)	0.15	3.70	0.56
Location of agricultural land/ accessibility (S4)	0.15	3.77	0.57
Productive age and innovative farmers (S5)	0.10	2.63	0.26
Total Strengths	0.60		1.96
<b>Weaknesses:</b>			
Low agricultural productivity (W1)	0.10	2.80	0.28
Strong belief that chemical farming is beneficial (W2)	0.05	1.6	0.08
Lack of capital for optimal farming (W3)	0.10	1.77	0.18
Lack of knowledge for rainwater conservation (W4)	0.10	2.80	0.28
Lack of information on beneficial plants (W5)	0.05	1.30	0.07
Total Weakness	0.40		0.88
Total Internal Factors	1.00		2.84

External strategic factors for identifying opportunities and threats for dryland farming systems in the buffer zone are presented in the EFAS table (Table 4). The aggregate score for external factors is 1.98, indicating that dryland farming is in a moderate position, as efforts are already underway to capitalize on opportunities and mitigate threats. There are three main opportunities to support the development of dryland agriculture in the Mandalika SEZ buffer zone: the area's potential for such growth and the market. Potential for its products and for crop diversification and mixed

farming. The opportunity score is 1.70 out of a total opportunity weight of 0.80.

The main threat to agricultural development in the Mandalika SEZ buffer zone is the impact of climate change. In addition, price fluctuations are very detrimental to farmers. This is due to ineffective marketing institutions. The total threat score is 0.29.

Based on the IFES Matrix and Matrix, the value of the internal strategy factor (X) is 2.84, and the value of the external strategy factor (Y) is 1.98; the strategy is in quadrant I and is an aggressive strategy (Strengths -

Opportunities strategy) (Rangkuti, 2004; Muharto, 2020). The aggressive strategy shown in Figure 7 leverages the strengths of the dryland farming system to maximize available opportunities. Details of alternative strategies

for developing the dryland farming system in the buffer zone, based on the SWOT analysis, are presented in Table 5.

**Table 4.** EFAS matrix (External Factors Analysis Strategic)

External Strategic Factors	Weight	Rating	Score
<b>Opportunities</b>			
Potential of the region for agricultural land expansion (O1)	0.25	2.57	0.64
Market/consumer potential for dryland agricultural products (O2)	0.20	2.93	0.59
Potential for crop diversification and/or mixed farming (O3)	0.15	1.77	0.27
There are BumDes and other agro-industry supporters (O4)	0.15	1.00	0.15
There are agricultural extension agencies at the subdistrict level (O5)	0.05	1.03	0.05
<b>Total Opportunities</b>	<b>0.80</b>		<b>1.70</b>
<b>Threats</b>			
Government policies supporting agricultural land conversion (T1)	0.03	1.17	0.04
Agricultural marketing institutions are not yet effective (T2)	0.03	1.77	0.05
Fluctuations in agricultural product prices are detrimental to farmers (T3)	0.04	1.50	0.06
Land degradation due to continuous chemical inputs (T4)	0.04	1.23	0.05
Impact of climate change (T5)	0.06	1.53	0.09
<b>Total Threat</b>	<b>0.20</b>	<b>5.67</b>	<b>0.29</b>
<b>Total External Factors</b>	<b>1.00</b>		<b>1.98</b>



**Figure 7.** SWOT matrix strategy diagram

**Table 5.** Dryland farming development strategy in the Mandalika SEZ buffer zone

IFAS	STRENGTHS (S): Experience in dryland farming; Farmer cooperation/mutual assistance; Farmers' resilience in farming; Easily accessible land location; and Productive age and innovative nature.	WEAKNESSES (W): Low agricultural productivity; Strong belief in the benefits of chemical agriculture; Lack of capital for farming on dry land; Lack of knowledge about rainwater conservation technology; and Lack of information about profitable commodities.
EFAS	STRATEGY S-O: Optimizing the potential of farmers (experienced, resilient, productive age, innovative) for land expansion, crop diversification/mixed farming; supporting BumDes/cooperatives (capital, input-output), enhancing the role of agricultural extension workers (S1, S3, S5, O1, O2, O3, O4, O5); Formation of dryland farmer groups to strengthen farmers' bargaining position in marketing their harvests throughout the year (S2, S3, O1, O2); and Developing the role of the younger generation in digital marketing of	W-O STRATEGY: Agricultural extension to increase land productivity organically through crop diversification, mixed farming, and rainwater management (W1, W2, W4, W5, O1, O2, O3, O5); and Establishing partnerships between farmers and capital owners and BumDes/cooperatives (W3, O2, O4).

THREATS (T): Government policies supporting land conversion; Marketing institutions are not yet effective; Price fluctuations that harm farmers; Land degradation due to intensive chemical inputs; and Impact of climate change.	agricultural products (S5, O2). S-T STRATEGY: Leveraging farmers' potential (experience, resilience, cooperation, productive age, innovation) for environmentally friendly agricultural development, addressing land degradation, reducing land conversion, strengthening bargaining power (S1, S2, S3, S5, T1, T2, T3, T4); and Developing agricultural product markets and agrotourism for easily accessible locations (S3, S4, S5, T1, T5).	W-T STRATEGY: Developing market-oriented organic agriculture with land water conservation (rainwater) to improve productivity and anticipate land conversion (W1, W2, W4, W5, T1, T2, T3, T4); and Development of a digital marketing system (W3, T2, T3, T5).
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*Determination of SWOT Strategy Priorities Using AHP*

SWOT analysis does not systematically determine the relative importance of criteria. To overcome this shortcoming, the SWOT framework was converted into a hierarchical structure, and the model was integrated and analyzed using the AHP with its eigenvalue calculation method. This was done to assess SWOT factors and equalize their intensity systematically (Kangas et al., 2001; Osuna & Aranda, 2007).

The use of AHP analysis for the SWOT Matrix began with pairwise comparisons of SWOT Groups, using a 1-9 scale (Saaty, 1980). Table 6 shows the results of pairwise Comparisons of SWOT factors and their eigenvalues, which indicate the degree of importance or order of priority in the SWOT Group, with the highest for Strengths and the lowest for Weaknesses. The results of the pairwise comparisons for these SWOT factors have a consistency ratio of 0.07, which is below the maximum value set in AHP analysis, namely 0.1 (10%).

Next, the elements of the SWOT matrix are compared in pairs, considering each SWOT group and the number of iterations required to obtain the maximum eigenvalue and a consistency ratio of less than 10%. The results of the pairwise comparison of each matrix element in each SWOT group are shown in Table 7 for the Comparison Matrix of Strengths Group, Table 8 for the Comparison Matrix of Weaknesses Group,

Table 9 for the Comparison Matrix of Opportunities, and Table 10 for the Comparison Matrix of Threats.

In Table 7, the highest degree of importance or priority value is S3, namely the resilience of farmers in farming on dry land, and the lowest is S2, namely cooperation between farmers. The CR value is 0.08. In Table 8, the highest eigenvalue (degree of importance) is W1 (low agricultural productivity), and the lowest is W5 (lack of information about profitable commodities).

**Table 6.** Pairwise comparisons of SWOT factors

SWOT Groups	S	W	O	T	Importance Degree of SWOT Groups	Priority order
S	1.00	5.00	3.00	5.00	0.543	1
W	0.20	1.00	0.33	3.00	0.127	3
O	0.33	3.00	1.00	4.00	0.262	2
T	0.20	0.33	0.25	1.00	0.068	4
CR = 0.07						

In Table 9, the highest eigenvalue (degree of importance) is O2, namely market potential for dryland agricultural products, and the lowest is O5, namely the existence of extension institutions at the subdistrict level. Table 10 for the Comparison Matrix of Threats shows that the highest eigenvalue or degree of importance is T5, namely the impact of climate change, and the lowest is T4, namely the degradation of agricultural land as a result of intensive use of chemical fertilizers in the long term. The CR value is 0.07.

**Table 7.** Comparison matrix of strengths group

Strengths	S1	S2	S3	S4	S5	Importance Degrees	Rank
S1 Experience in dryland farming	1.00	4.00	0.20	5.00	3.00	0.226	2
S2 Cooperation among dryland farmers	0.25	1.00	0.20	0.50	0.33	0.054	5
S3 Farmers' resilience in farming	5.00	5.00	1.00	7.00	5.00	0.549	1
S4 Easily accessible location	0.20	2.00	0.14	1.00	1.00	0.075	4
S5 Innovative farmers of productive age	0.33	3.00	0.20	1.00	1.00	0.096	3
CR = 0.08							

**Table 8.** Comparison matrix of weaknesses group

Weaknesses	W1	W2	W3	W4	W5	Importance Degrees	Rank
W1 Low agricultural productivity	1.00	3.00	3.00	5.00	6.00	0.457	1
W2 Belief that chemical farming is beneficial	0.33	1.00	3.00	3.00	5.00	0.258	2
W3 Lack of capital for farming	0.33	0.33	1.00	3.00	2.00	0.142	3
W4 Lack of knowledge about rainwater conservation technology	0.20	0.33	0.33	1.00	3.00	0.089	4
W5 Lack of information on profitable commodities	0.17	0.20	0.50	0.33	1.00	0.053	5
CR = 0.07							

**Table 9.** Comparison matrix of opportunities group

Opportunities	O1	O2	O3	O4	O5	Importance Degrees	Rank
O1 Potential of the region for agricultural expansion	1.00	0.30	3.00	3.00	5.00	0.260	2
O2 Market potential for dryland agricultural products	3.00	1.00	3.00	4.00	7.00	0.451	1
O3 Potential for diversification and mixed farming	0.33	0.33	1.00	3.00	3.00	0.152	3
O4 There are cooperatives supporting agroindustry	0.33	0.25	0.33	1.00	3.00	0.091	4
O5 There is an extension agency in the subdistrict	0.20	0.14	0.33	0.33	1.00	0.056	5

CR = 0.06

**Table 10.** Comparison matrix of threats group

Threats	T1	T2	T3	T4	T5	Importance Degrees	Rank
T1 Policies that support land use change	1.00	0.20	0.30	1.00	0.20	0.061	4
T2 Marketing institutions are not yet optimal	5.00	1.00	0.33	3.00	0.20	0.150	3
T3 Product price fluctuations harm farmers	3.00	3.00	1.00	4.00	0.30	0.236	2
T4 Land degradation due to chemical inputs	1.00	0.33	0.25	1.00	0.14	0.056	5
T5 Impact of climate change	5.00	5.00	3.00	7.00	1.00	0.497	1

CR = 0.07

**Table 11.** Global weight score of the SWOT group with AHP analysis

SWOT Group	Group Weight	SWOT Factors	Local Weight	Global Weight
Strengths	0.543	S1 Experience in dryland farming	0.226	0.123
		S2 Cooperation among farmers	0.054	0.029
		S3 Farmers' resilience in farming	0.549	0.298
		S4 Easily accessible location	0.075	0.041
		S5 Innovative farmers of productive age	0.096	0.052
Weaknesses	0.127	W1 Low agricultural productivity	0.457	0.058
		W2 Belief that chemical farming is profitable	0.258	0.033
		W3 Lack of capital for farming	0.142	0.018
		W4 Lack of knowledge about rainwater conservation	0.089	0.011
		W5 Lack of information on profitable commodities	0.053	0.007
Opportunities	0.262	O1 Regional potential for agricultural expansion	0.260	0.068
		O2 Market potential for dryland agricultural products	0.451	0.118
		O3 Potential for diversification and mixed farming	0.152	0.040
		O4 There are cooperatives supporting agroindustry	0.091	0.024
		O5 There are extension agencies in the sub district	0.046	0.012
Threats	0.068	T1 Policies that support land use conversion	0.061	0.004
		T2 Marketing institutions are not yet optimal	0.150	0.010
		T3 Product price fluctuations harm farmers	0.236	0.016
		T4 Land degradation due to intensive chemical input	0.056	0.004
		T5 Impact of climate change	0.497	0.034

Based on the data in Table 6, Table 7, Table 8, Table 9, and Table 10, the global weight score of the SWOT group was compiled using AHP analysis in Table 11. The global score indicates the relative priority of each SWOT factor compared with the others. The results of the AHP analysis in Table 11 show the weight of each SWOT group, which is the priority ranking of each group, as follows: Strengths 54.3%; Opportunities 26.2%; Weaknesses 12.7%; and Threats 6.8%. The most crucial factor in the SWOT analysis based on the AHP analysis results is "the resilience of farmers in farming on dry land from the strengths group". This is the most crucial factor to consider, with an overall priority value of 29.8%. The three other important factors, in descending order, are: farming experience in drylands from the strengths group (priority value of 12.3%); market

potential for dryland agricultural products from the opportunities group (priority value of 11.8%); and regional potential for agricultural land expansion (priority value of 6.8%). Using the calculated SWOT factor priorities, an approach to developing a dryland agricultural system can be formulated as a series of strategic alternatives ranked by priority.

*Determination of Grand Strategy*

The strategy derived from the SWOT analysis is aggressive, leveraging the strengths and opportunities of the buffer zone agricultural system, and does not yet account for the priority aspects of the strengths and weaknesses. Additionally, the SWOT strategy also does not consider the role of opportunities and threats to the development of the dryland agricultural system in the

buffer zone. Using AHP analysis in Table 11 can address these shortcomings by determining the overall priority order of SWOT factors, thereby enabling a broader spectrum of policy and Grand Strategy decisions for the development of the dryland agricultural system in the Mandalika SEZ buffer zone. Further details are provided in Table 12. The AHP technique, when combined with SWOT, as described by Nguyen & Truong (2022), can facilitate policymakers' decision-making through multi-criteria analysis, as in this study.

The grand strategy in Table 12 is the strategy with the most significant total global weight, namely the strategy of "optimizing the potential of farmers (experienced, resilient, productive age, innovative) for land expansion, crop diversification/mixed farming;

supporting BumDes/cooperatives (capital, input-output), increasing the role of agricultural extension workers", which is the S-O strategy. The second-priority strategy is to leverage the potential of farmers (experience, resilience, cooperation, productive age, innovation) for environmentally friendly agricultural development, to overcome land degradation, reduce conversion, and strengthen farmers' bargaining position; it is an S-T strategy. The third priority strategy is the strategy of "forming farmer groups for farmers in the same area to strengthen farmers' bargaining position in marketing their harvest, which is an S-O strategy. Other strategies for developing the agricultural system in the buffer zone are listed in full in Table 12.

**Table 12.** Determination of priority strategies based on total global weights factors strategy results of SWOT analysis

Details of Strategies and SWOT Strategy Factors	Global Weights	Rank Priority
<b>Strengths - Opportunities Strategy:</b>		
Optimizing the potential of farmers (experienced, resilient, productive age, innovative) for land expansion, crop diversification/mixed farming; support for BumDes/ Cooperatives (capital, input-output), enhance the role of agricultural extension workers (S1, S3, S5, O1, O2, O3, O4, O5)	0.735	1
Formation of dryland farmer groups to strengthen farmers' bargaining position in marketing their harvest throughout the year (S2, S3, O1, O2)	0.514	3
Developing the role of the younger generation in the digital marketing of agricultural products (S5, O2)	0.170	7
<b>Weaknesses - Opportunities Strategy:</b>		
Agricultural extension to increase land productivity organically through crop diversification, mixed farming, and rainwater management (W1, W2, W4, W5, O1, O2, O3, O5)	0.347	5
Establishing partnerships between farmers and capital owners and BumDes/cooperatives (W3, O2, O4)	0.160	6
<b>Strengths-Threats Strategy:</b>		
Utilize the potential of farmers (experience, resilience, cooperation, productive age, innovation) for environmentally friendly agricultural development, overcome land degradation, reduce conversion, strengthen bargaining position (S1, S2, S3, S5, T1, T2, T3, T4)	0.537	2
Developing agricultural product markets and agrotourism for easily accessible locations (S3, S4, S5, T1, T5)	0.429	4
<b>Weaknesses-Threats Strategy:</b>		
Market-oriented organic agriculture development with land water conservation (rainwater) to improve productivity and anticipate land conversion (W1, W2, W4, W5, T1, T2, T3, T4)	0.109	8
Development of a digital marketing system (W3, T2, T3, T5)	0.078	9

**Conclusion**

The existing condition of the Mandalika Special Economic Zone buffer zone related to the sustainable dryland farming system to support tourism activities can play a high social and economic role, but it plays a less significant role in ecology, technology, and legal and institutional aspects, thus threatening the sustainability of the agricultural system. The first priority grand strategy for the development of the dryland farming system in the Mandalika Special Economic Zone buffer zone is the Strengths-Opportunities strategy, namely optimizing the potential of farmers (experienced,

resilient, productive age, innovative) for land expansion, crop diversification/mixed farming with the support of cooperatives, and increasing the role of agricultural extension workers. The strategy with the second priority order is the Strengths-Threats (ST) strategy, namely, utilizing the potential of farmers to develop environmentally friendly agriculture, overcome land degradation, reduce land conversion, and strengthen the bargaining position of farmers. To maintain the agricultural system in the Mandalika SEZ buffer zone and strengthen its buffering role, it is recommended that decision-makers comprehensively consider internal and external factors—including strengths, weaknesses,

opportunities, and challenges—in their development strategies. Future research should examine multidimensional indicators of this buffering role for a more comprehensive evaluation of the SEZ's impact on sustainability, agricultural development and the welfare of dryland farmers.”

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#### Author Contributions

Conceptualization, investigation, resources, data curation, visualization, formal analysis, C.A. and S.; methodology, C.A., S., T., and H.; writing and editing of the original draft, C.A.; review, S., T., and H. All authors have read and approved the published version of the manuscript.

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The authors declare no conflict of interest in this research.

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