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Agribusiness System and Maize Agriculture Development Strategy in Palolo District Sigi Regency

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Abstract: Maize productivity in Palolo District only reaches 4.8 tons/ha, far below the national average. Suboptimal cultivation techniques, limited access to superior seeds, and the use of fertilizers and pesticides that are not in accordance with the recommendations. Farmers' limited knowledge of modern agricultural practices and lack of access to technology and training also affect production yields. A synergistic agribusiness system ensures integration between the upstream and downstream sectors. The purpose of this study is to analyze the success of the maize agribusiness system and formulate a strategy for the development of the maize agribusiness system. The sampling technique is purposive sampling. The analysis method uses agribusiness index, SWOT analysis and AHP. As a result of the calculation of the agribusiness system index, the value obtained is 11.4 from the maximum value of 17.4 or 65.5%. It shows that the maize agribusiness system is running well, in a good value interval (8.71-17.40). As a result of the SWOT and AHP analysis, there are four main strategies for the development of maize agribusiness: Improving farmers' skills through training and mentoring the latest agricultural technology (weight 0.225), optimizing land use and maximizing production (weight 0.219), increasing maize productivity with active extension and technological innovation (weight 0.137), increasing productivity and availability of facilities through the adoption of sustainable agricultural practices and environmentally friendly technology (weight 0.106).

Keywords: Agribusiness System; Maize; Productivity Improvement, Strategy

Introduction

In much of the world, development policies, export-oriented agricultural models are seen as the most efficient and promising way for rural prosperity and food security for the world's growing population (Mamonova et al., 2023). Maize (Zea mays) is a strategic commodity in the global economy, not only as a staple food source but also as a key raw material in the animal feed (Nigeria, 2021) and bioenergy industries (Tamburaka & others, 2020; Wang & Hu, 2021).

Maize (Zea mays) is a major cereal crop grown around the world. Maize is the second most traded agricultural commodity (Shimada et al., 2021). and has various benefits, namely as animal feed, human food, and energy source (Tamburaka & others, 2020). Global demand is expected to increase by 50 percent by 2050 compared to today (Chekole & Ahmed, 2023). In various countries, including Indonesia, maize contributes to an increase in Gross Domestic Product (GDP), an increase in the country's exports and foreign exchange, strengthening the agricultural sector, job creation,

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poverty alleviation, and a source of income (Coker et al., 2018; Motsi et al., 2022; Neglo et al., 2021).

Central Sulawesi Province is one of the maize producers in Indonesia. Maize crop production in Central Sulawesi is supported by various districts that are the largest producers, one of which is Sigi Regency, Palolo District. In the last two years, maize production has increased significantly. However, maize productivity in Palolo District is still relatively low, only around 4.8 tons per hectare, far from the high yield potential of 8-12 tons per hectare (Arifin, 2019). Low productivity is due to various factors such as: planting techniques (Ngairangbam et al., 2024), climate change (Waqas et al., 2021), low technology, limited capital, and suboptimal post-harvest management. To support the development of maize, better technologies are needed, such as hybrid and composite varieties, seed production technology, and efficient cultivation and post-harvest technology. In addition, policies that support investment, financial institutions, technology support, improving the quality of human resources, as well as marketing and regulatory support need to be strengthened. The involvement of the government and other parties in providing the needed services, such as capital assistance, technology, and extension, is critical to the success of maize agribusiness.

In achieving maximum productivity and increasing farmers' income, the implementation of the agribusiness system must be carried out synergistically and mutually reinforcing between subsystems. Farming activities require adequate production facilities, the use of superior seeds, and adequate knowledge and experience. In addition, activities outside of farming such as processing and marketing must also run in an integrated manner in order to be called a successful agribusiness (Abriani et al., 2022; Wahid et al., 2024)

Our research focuses on the success of the maize agribusiness system and development priority strategies that can be implemented in Palolo District, Sigi Regency and its surroundings. The findings of this study are expected to be a reference for policy makers, farmers, and other related parties in formulating more effective and sustainable development strategies, so as to increase the productivity and welfare of maize farmers.

Method

The techniques used in taking samples are *Purposive sampling* that is, selecting a sample from a population based on certain considerations, both expert considerations and scientific considerations (Juliandi et al., 2014). Sample farmers were selected from 5 villages as many as 86 people who are members of the farmer group with the highest land area in Palolo District. Sample of key informants (key informant) Using the Snowball Sample Method (snowball sampling), that is Stakeholders consisting of: Head of the Food Crops, Horticulture, and Plantation Service (DISTANHORBUN) of Sigi Regency, Head of TPHP, Head of BPP, Academics, agricultural extension workers and traders. Overall the number of samples in this study is 93 people.

Maize Agribusiness System Index

To analyze the success of the agribusiness system in this study, the agribusiness system index is used through five subsystems, namely the production facilities subsystem, the farming subsystem, the post-harvest processing subsystem, the marketing subsystem, and the supporting services subsystem. The measurement of the agribusiness index refers to the Struges formula in (Abriani et al., 2022).

$$a = \frac{b-c}{d} \quad (1)$$

Information:

a = Class interval
b = Highest score
c = Lowest value
d = Number of classes (2; not good and good)

Where each indicator is given a value, are then classified. The assessment of the subsystem index of production facilities is (0.00-8.00) not good and (8.01-16.00) good. The index of the farming subsystem is (0.00-9.50) not good and (9.51-19.00) good. The index of the post-harvest subsystem was (0.00-2.00) not good and (2.01-4.00) good. The marketing subsystem index is (0.00-2.00) not good and (2.01-4.00) good. The index of the supporting services subsystem is (0.00-11.00) not good and (11.01-22.00) good. The assessment of all indicators was weighed using the formula in the study (Soegiri, 2009), the closer to the maximum value, the better the maize agribusiness system in Palolo District, Sigi Regency.

$$i = \frac{\sum_{i=1}^{n} x_i w_i}{\sum_{i=1}^{n} w_i}$$

$$i = \frac{(16x16) + (19x19) + (4x4) + (4x4) + (22x22)}{16 + 19 + 4 + 4 + 22}$$

$$i = 17{,}4$$

Information:

i = Weighted index
x_i = Weighted value of the agribusiness index of the i subsystem
w_i = *The weighted maximum value of the agribusiness index of the i subsystem*
n = amount of data

Maize Agribusiness System Development Strategy

To determine the strategy for developing a maize agribusiness system, SWOT and AHP analysis methods are used.

SWOT Analysis

SWOT analysis systematically identifies various factors to formulate a strategy. This analysis is based on logic that can maximize strenght (S) and opportunity(O), but can simultaneously minimize weakness (W) and threath (T).

AHP Analysis

AHP is a method of solving a complex and unstructured problem into its components, then arranging the components in a hierarchy, inserting numerical values in place of human perception in making relative comparisons and finally producing a synthesis that determines the order and priority values of these components. AHP is used to determine potential strategic priorities in the development of maize agribusiness systems obtained from SWOT analysis. The recommended strategies are then grouped into alternatives in the AHP hierarchy structure to be further processed in determining the priority of alternative strategies (Saaty, 2001). The results of the interview from the AHP questionnaire in the field will be calculated using the Member's Choice 11.

Result and Discussion

Maize Agribusiness System Index

1. Production Facilities Sub System Index

The production facilities sub-system in an agribusiness system includes the provision of various inputs required in maize cultivation activities. These inputs include land, seeds, fertilisers, pesticides, labour, and agricultural tools and machinery used in the maize farming process. The procurement of production inputs in maize farming in Palolo sub-district comes from agricultural shops and assistance provided by the government. The results of the measurement of the weighted agribusiness system index of the production facilities sub system of maize farming in Palolo District, Sigi Regency can be seen in Table 1.

Table 1. Maize Farming Production Facilities Sub System Index

Indicators	Assessment	Maximum Value	Results
Land	0 = not available 1 = available	1	1.00
Seed	0 = available, non-hybrid 1 = available, hybrid	1	0.97
Time of availability of inputs	0 = after the planting season 1 = before planting season	1	1.00
Organic fertiliser	0 = not available 1 = available	1	0.00
Urea fertiliser	0 = not available 1 = available	1	1.00
NPK fertiliser	0 = not available 1 = available	1	1.00
Insecticide	0 = not available 1 = available	1	1.00
Herbicide	0 = not available 1 = available	1	1.00
Fungicide	0 = not available 1 = available	1	0.00
Agricultural input tools and machinery	0 = not available 1 = available	1	1.00
Production input storage	0 = not available 1 = available	1	1.00
Storage of inputs	0 = not available 1 = available	1	0.23
	Total	12	9.20

The results of the measurement of the agribusiness system index in the production facilities sub-system of maize farming have been assessed quite well, with a weighted score of 9.20 out of a maximum score of 12. This shows that most of the important production facilities are available, but there are some shortcomings, such as the seeds used almost completely consist of hybrid varieties (97%), but there are still a few who use non-hybrid (3%), this is due to cost factors. The use of organic fertilisers and fungicides is not done by farmers, as seen from the average score of 0, on both indicators. This is due to farmers' unwillingness to use organic fertiliser because the crop productivity achieved by organic fertiliser is low and it requires very large quantities to be transported and stored (E. et al., 2024). Farmers do not feel the need to spend extra money on fungicides, as they use hybrid maize varieties that have high genetic resistance to fungal diseases. Storage facilities for production inputs are very limited as they require a significant amount of money to build.

2. Farming Sub System Index

The success of farming activities is very important because it can provide information on whether the activities carried out by farmers make a profit and are worth continuing (Prayuginingsih et al., 2023). The farming sub-system includes coaching and farming development activities in order to increase primary agricultural production (Buru, n.d.). The results of the measurement of the weighted agribusiness system index in the maize farming sub-system in Palolo sub-district, Sigi district can be seen in Table 2.

Table 2. Maize Farming Subsystem Indeks

Indicators	Assessment	Maximum Value	Results
Land use	0 = land used 1 = partially used 2 = used all	2	2
Seed use	0 = not as recommended 1 = as recommended	1	1
Use of organic fertiliser	0 = not as recommended 1 = as recommended	1	0
Use of urea fertiliser	0 = not as recommended 1 = as recommended	1	0
Use of NPK fertiliser	0 = not as recommended 1 = as recommended	1	0
Use of insecticides	0 = not as recommended 1 = as recommended	1	0
Use of herbicides	0 = not as recommended 1 = as recommended	1	1
Fungicide use	0 = not using 1 = use	1	0
Planting activities	0 = not on time 1 = on time	1	1
Planting activities	0 = does not follow cultivation recommendations 1= following cultivation recommendations	1	0
Fertilisation activities	0 = does not meet the 5 T criteria (right type, quality, time, dose, method) 1 = partially fulfils the 5 T criteria 2 = fulfils the 5 T criteria	2	1
HPT control activities	0 = not as recommended 1 = as recommended	1	1
Weeding activities	0 = Not every day 1 = every day	1	0
Harvesting time	0 = <100 days after planting 1 = >100 days after planting	1	1
Personal protective equipment (PPE)	0 = not using at all 1 = partially used 2 = complete	2	1
Productivity	0 = < 5 tonnes/ha 1 = > 5 tonnes/ha	1	0
	Total	19	9

The results of the calculation show that the index of the maize farming sub-system is 9 out of a maximum score of 19, indicating that the farming sub-system in Palolo Sub-district, Sigi District, has been running well (good value interval 0.00-9.50). The results of this study are in line with research conducted by (Abriani et al., 2022). The use of organic fertilisers and fungicides is 0 because no farmers use them. Similarly, the use of urea, NPK fertiliser, insecticides, and planting and weeding activities are worth 0 because they are not in accordance with the recommendations and good maize cultivation techniques. The fertiliser activity is only worth 1 because it only partially fulfils the 5T criteria (right type, quality, time, dose, method). The use of PPE is also not optimal, as only some farmers and labourers use complete PPE when working. In addition, maize productivity is less than optimal with a score of 0, as it is still below the national productivity standard (5.89 tonnes/ha) (Bps.go.id, 2024), which only reached 4.4 tonnes per hectare.

3. Post Harvest Sub System Index

The indicators of the post-harvest subsystem measured include drying, moisture content, crop storage and maize picking. Each of these indicators is crucial to ensure the quality and shelf life of maize after harvest. The results of the measurement of the weighted agribusiness system index of the post-harvest maize subsystem in Palolo District, Sigi Regency can be seen in Table 3.

Table 3. Post Harvest Sub System Index

Indicators	Assessment	Maximum Value	Results
Drying	0 = not using machine 1 = using machine	1	0
Moisture content	0 = >18.5 % 1 = <18.5%	1	1
Storage of harvest	0 = moist 1 = not humid	1	1
Piping	0 = not using machine 1 = using machine	1	1
	Total	4	3

Based on the measurement of the agribusiness system index in the maize post-harvest sub-system, it shows that the system is considered quite good, but still has not reached its maximum potential. The weighted score is 3 out of a maximum score of 4. Farmers in Palolo Sub-district generally do not use drying machines to dry maize. Drying is done traditionally. The maize moisture content of 16-18.5% indicates that the drying process is done well, even without the use of machines. Maize storage is also done well. Farmers ensure that the maize is stored in a non-damp condition, which is important to prevent damage and maintain the quality of the maize kernels. However, this storage process does not last long as farmers usually sell their maize as soon as it is dry to local traders in Palolo sub-district. This reduces the risk of long-term storage and ensures the maize remains in prime condition. The use of threshing machines shows that farmers are using a more efficient technology to separate the maize kernels from the cobs.

4. Marketing Sub System Index

In the activities of the agricultural marketing sub-system, there are several important indicators that are measured to assess the effectiveness and efficiency of marketing. Some of the indicators that can be measured can be seen in Table 4.

Table 4. Marketing Subsystem Index

Indicators	Assessment	Maximum Value	Results
Market demand	0 = no market demand 1 = there is market demand	1	1
Access to market information	0 = farmers have no access to market information 1 = farmers have access to market information	1	1
Distribution channels	0 = indirect 1 = direct	1	0
Maize marketing efficiency	0 = not yet efficient 1 = efficient	1	1
	Total	4	3

Based on the results of the agribusiness system index measurement in the maize marketing subsystem, it shows that the system is rated fairly well, but still has not reached its maximum potential. The weighted score of 3 out of a maximum score of 4 indicates that there are still indicators that need to be improved to reach maximum potential in maize marketing, namely distribution channels. The distribution channel for maize in Palolo Sub-district is an indirect channel, where farmers sell the dried maize to intermediary traders who then channel it to wholesalers and directly to consumers. Research by Asha et al (2024), found that the longer the distribution chain, the higher the marketing costs due to additional costs at each stage of distribution. This can reduce profit margins for farmers and lead to higher product prices at the final consumer level. Research by Raimbekov et al (2023), showed that an increase in intermediaries in the agribusiness distribution chain can lead to a decrease in product quality due to longer storage times and less optimal transport conditions, which in turn can affect product competitiveness in the market.

5. Supporting Services Subsystem Index

Measuring the performance of the supporting service subsystem in the maize agribusiness system is very important. This subsystem includes a wide range of services and infrastructure that support the entire maize production value chain, from inputs to marketing. The results of the measurement of the weighted agribusiness system index of the maize agribusiness support service subsystem in Palolo District, Sigi Regency can be seen in Table 5.

Table 5. Supporting Services Subsystem Index

Indicators	Valuation	Maximum Value	Result
Financial institutions	0 = none	2	1
	1 = there is no unused		
	2 = there is utilized		
Extension institutions	0 = none	2	2
	1 = there is no unused		
	2 = there is utilized		
Government policies	0 = none	2	
	1 = there is no unused		2
	2 = there is utilized		
Farmer groups	0 = none	2	2
	1 = there is no unused		
	2 = there is utilized		
Road	0 = none	2	2
	1 = there is no unused		
	2 = there is utilized		
Market	0 = none	2	2
	1 = there is no unused		
	2 = there is utilized		
Production facilities stores	0 = none	2	2
	1 = there is no unused		
	2 = there is utilized		
Gapoktan	0 = none	2	1
	1 = there is no unused		
	2 = there is utilized		
Cooperation	0 = none	2	1
	1 = there is no unused		
	2 = there is utilized		
Research institutes	0 = none	2	1
	1 = there is no unused		
	2 = there is utilized		
Transportation	0 = none	2	2
	1 = there is no unused		
	2 = there is utilized		
	Sum	22	18

The results of the measurement of the agribusiness system index in the maize agribusiness support service subsystem are considered quite good with a weighted score of 18 out of a maximum score of 22. Most of the infrastructure and supporting services that are important for agribusiness already exist and are used by farmers, such as extension agencies, government policies, farmer groups, markets, production stores, and transportation facilities. Financial institutions, gapoktan, cooperatives and research institutions need improvement to achieve optimal potential.

Financial institutions are available, but they have not been optimally utilized by farmers. This shows that despite access to financial services such as credit or loans, farmers undertake advantage of opportunities, due to the accessibility constraints of complicated administrative requirements or strict provisions from financial institutions that make farmers reluctant or unable to access the required financing.

Gapoktan, cooperatives, and research institutes are available, but they have not been well utilized by farmers. Gapoktan and Cooperatives need further encouragement to increase the utilization of gapoktan and cooperatives, so that they can provide collective and economic benefits for farmers. Research institutes are important in improving relationships with farmers to help adopt new technologies and best practices that can improve the productivity and efficiency of maize farming.

The results of the calculation of the five maize agribusiness system indices each have a value that can be included in the weighted average index. The following is the calculation of the maize agribusiness weighted index:

$$\boldsymbol{i} = \frac{\sum_{i=1}^{n} x_i w_i}{\sum_{i=1}^{n} w_i}$$

$$\boldsymbol{i} = \frac{(9.20 \text{ x} 12) + (9 \text{ x } 19) + (3 \text{ x } 4) + (3 \text{ x } 4) + (17.47 \text{ x } 22)}{12 + 19 + 4 + 4 + 22}$$

$$\boldsymbol{i} = \mathbf{11,3}$$

The results of the calculation of the agribusiness system index for the production facilities subsystem, farming subsystem, post-harvest processing subsystem, marketing subsystem, and supporting subsystem showed a value of 11.4 out of a maximum value of 16.7 or 67.7 percent. This value shows that the maize agribusiness system in Palolo District, Sigi Regency has been running well (the good value interval is 8.36-16.7). The results of this study are in line with the research conducted by (Jusniar et al., 2022), who stated that the index of the hybrid maize agribusiness system in Bengo District, Bone Regency has a value of 8.61 out of a maximum value of 11.86 or 72.59 percent, which shows that the maize agribusiness system has been running well.

Maize Agribusiness Development Strategy

SWOT Analysis

Formulation of Internal and External Factors

Based on the results of FGD, interviews, and literature reviews on the maize agribusiness development strategy in Palolo District, Sigi Regency, elements of internal and external factors were obtained based on the assessment of respondents and have been categorized into strength, weakness, opportunities, and threat as presented in the following Table 6.

Table 6. Results of Internal Factor Assessment

Internal Factors	Weight	Rating	Score
Strength (S)			
Profitable maize farming	0.19	4.64	0.87
Land area that supports maize farming	0.13	4.00	0.50
High farmer motivation	0.19	4.45	0.84
Active farmer groups	0.13	4.18	0.52
Total	0.63		2.73
Weakness (W)			
Limited capital	0.13	1.45	0.18
Maize productivity is still low	0.06	1.55	0.10
The availability of production facilities and infrastructure is still limited	0.19	1.45	0.27
Total	0.38		0.55
Overall Total	1.00		3.28
S-W			2.18

Table 7. External Factor Assessment Results

External Factors	Weight	Rating	Score
Opportunities **(O)**			
High Market Demand	0.17	4.36	0.73
Agricultural technology and innovation developments	0.11	4.09	0.45
Active agricultural extension activities	0.17	4.36	0.73
Government Support	0.11	4.73	0.53
Total	0.56		2.43
Threat (T)			
Climate change/weather	0.11	1.64	0.18
Maize prices fluctuate	0.17	1.36	0.23
Presence of OPT disorders	0.06	1.73	0.10
Limited access to financing for farmers	0.06	1.64	0.09
Increase in maize production in other regions	0.06	1.64	0.09
Total	0.44		0.69

Overall Total	1.00	3.12
O-T		1.75

Based on the results of the calculation of the IFAS and EFAS matrices above, an analysis is then carried out to determine the maize agribusiness development strategy to be used. This is done by calculating the difference between the elements of strength and weakness, and calculating the difference between the elements of opportunity and threat factors as follows.
Strengths - Weaknesses = 2.73-0.55 = 2.18 (X-axis)
Opportunities - Threats = 2.43-0.69 = 1.75 (Y-axis)

To determine the business position of the maize agribusiness development strategy using the main strategic matrix (*Grand Strategy*) obtained from the total IFAS and EFAS matrix scores. The results of the calculation are in quadrant I, namely an aggressive strategy where the maize agribusiness system is in a very advantageous position.

SWOT Strategy Formulation

To find out the priorities and relationships based on the weighting of the SWOT, a combination of internal-external strategies is interacted with. The formulation of these strategies is compiled based on strengths, weaknesses, opportunities and threats into the IFAS-EFAS SWOT interaction matrix. As in Table 7

Table 8. IFAS-EFAS SWOT Interaction Matrix

Internal Factors	Strength (S)	Weakness (W)
External Factors	1. Profitable maize farming 2. Land area that supports maize farming 3. High farmer motivation 4. Active farmer groups Weight: 2.73	1. Limited capital 2. Maize productivity is still low 3. The availability of production facilities and infrastructure is still limited Weight 0.55
Opportunities (O)	S-O Strategy	W-O Strategy
High Market Demand Agricultural technology and innovation developments Active agricultural extension activities Government Support Weight: 2.43	1. Optimize land use and maximize production (S1, S2, O1) 2. Improving farmers' skills through training and mentoring the latest agricultural technology (S3, O2, O3) 3. Developing cooperation with the government and agricultural organizations (S4, O4) Weight 5.16	1. Establish partnerships and contracts with large buyers (W1, O1) 2. Increasing maize productivity with active counseling and technological innovation (W2, O2, O3) 3. Increasing the availability of production facilities and infrastructure with government support (W3, O4) Weight 2.99
Threat (T)	S-T Strategy	W-T Strategy
Climate change/weather Maize prices fluctuate Presence of OPT disorders Limited access to financing for farmers Increase in maize production in other regions Weight: 0.69	1. Providing training and counseling on climate-resilient agriculture (S2, S4, T1) 2. Product diversification and harvest scheduling (S2, S3, T2, T3, T5) 3. Establishment of cooperatives or partnerships with financial institutions (S1, T4) Weight: 3.41	1. Establishment of cooperatives or joint business groups (W1, T1, T2, T4) 2. Increasing productivity and availability of facilities through the adoption of sustainable agricultural practices and environmentally friendly technologies (W2, W3, T1, T3) 3. Establish partnerships with the private and government sectors (W1, W2, W3, T5) Weight 1.24

From the results of the weighting, the strategy priorities are arranged based on the combination of strategies that have the highest to the lowest value as shown in Table 14

Table 9. Alternative Order of SWOT Strategies

Priority	Strategy	Value Weights
I	Strength- Opportunities (SO)	5.16
II	Strength-Threat (ST)	3.41
III	Weakness- Opportunities (WO)	2.99
IV	Weakness- Threat (WT))	1.24

The alternative strategy that gets the most weight is Strength-Opportunity (SO)This strategy focuses on leveraging internal strengths to take advantage of existing external opportunities. This condition is very favorable for maize farmers in Palolo District, Sigi Regency, in utilizing the existing potential optimally to strengthen the resilience and sustainability of the maize agricultural sector.

Although the strategy *Power-Chance (SO)* is the best alternative strategy, its implementation may not be possible simultaneously due to limited resources. Therefore, it is necessary to determine which strategic priorities should be prioritized. To determine policy priorities from various strategies generated through SWOT analysis, this study will use the *Analytical Hierarchy Process (AHP).*

Strategy Formulation with AHP

1. Hierarchical Arrangement

The hierarchy that is compiled is a strategy resulting from a SWOT analysis, which is fully presented in Figure

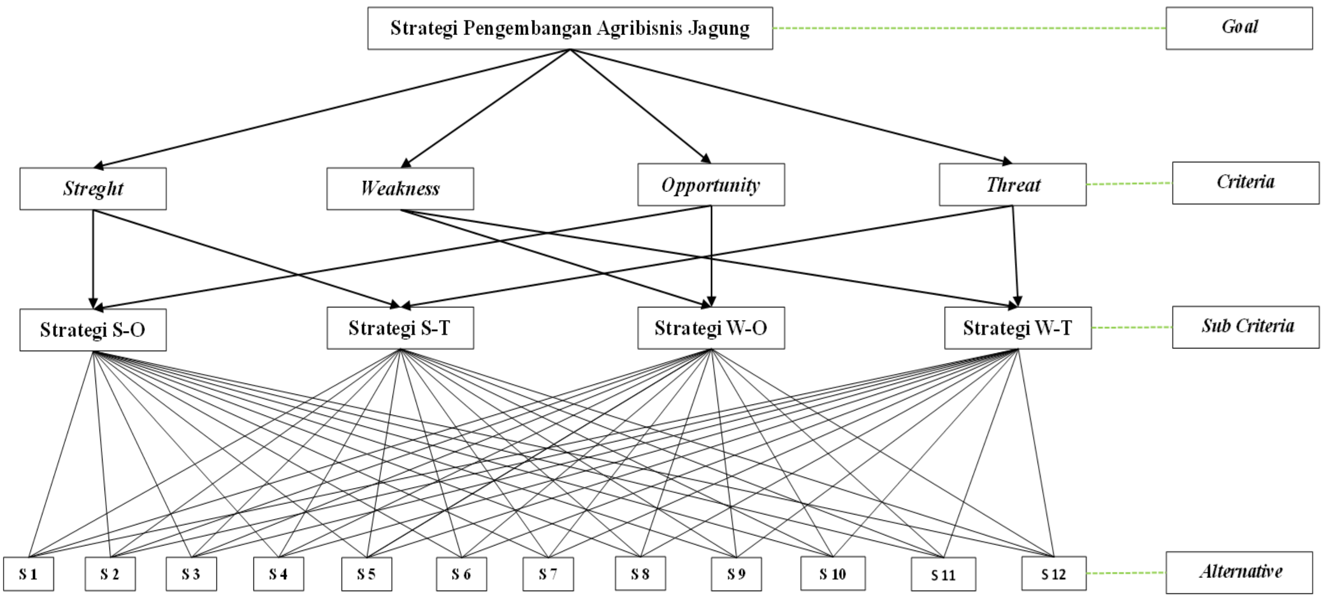

Figure 1. SWOT-AHP Hierarchy for Maize Agribusiness Development Strategy in Palolo District, Sigi Regency

2. Respondent Ratings

Based on the calculation of the results of the respondents' assessment of the AHP questionnaire, the results based on the highest priority ranking are presented in the following graph.

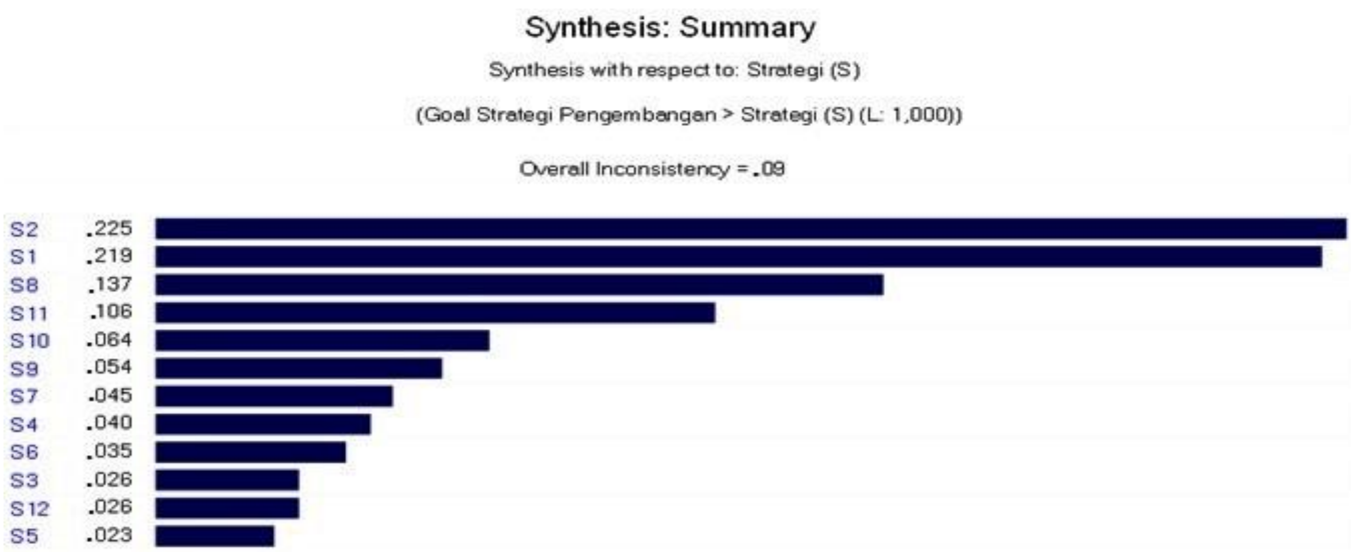

Figure 2. Priority Order Chart for Maize Agribusiness

In the graphic image above, there are four main strategies identified for the development of maize agribusiness in Palolo District, Sigi Regency. The order of strategies based on priority and weighting is presented in the following chart

Strategy 1 is to improve farmers' skills through training and mentoring on the latest agricultural technology (weight 0.225). This strategy ranks highest and is considered the most important. Research conducted by (Abbas et al., 2021) shows that technology training and mentoring can help farmers understand environmentally friendly agricultural practices, such as the proper use of fertilisers and pesticides, and water-saving irrigation techniques. Continuous training on modern agricultural practices can reduce production costs by 20 per cent and increase maize yields by 30 per cent in Pakistan (Abbas et al., 2021). Research by (Lambrecht & Ragasa, 2018) found that farmers who participated in training programmes had 25 per cent higher yields compared to farmers who did not receive training.

Strategy 2 is optimising land use and maximising production (weight 0.219). This strategy is ranked second. Land-use optimisation aims to ensure that each hectare of farmland should be used as efficiently as possible to maximise production. Possible approaches include applying appropriate cultivation techniques, using high-yielding varieties and managing inputs efficiently. Research conducted by (Getahun et al., 2024) the use of technology-based land management practices can increase land use efficiency and crop productivity by up to 25 per cent. Research by (Pretty et al., 2018) emphasised the importance of farming practices such as crop rotation that can result in increased production without the need to expand farmland.

Strategy 3 is to increase maize productivity with active counseling and technological innovation (weight 0.137). This strategy focuses on increasing maize productivity through active outreach that aims to provide farmers with ongoing information on best practices in maize cultivation. Technological innovations, such as the use of superior varieties and modern agricultural tools, are also expected to increase crop yields.

Strategy 4 is to increase productivity and availability of facilities through the adoption of sustainable agricultural practices and environmentally friendly technology (weight 0.106). This strategy occupies the fourth position. The main focus of this strategy is the adoption of sustainable agricultural practices and environmentally friendly technologies. Sustainable farming practices help maintain the balance of ecosystems, while eco-friendly technologies reduce negative impacts on the environment.

Conclusion

Based on the results of the calculation of the agribusiness system index, the value obtained was 11.4 from the maximum value of 17.4 or 65.5 percent. This value shows that the maize agribusiness system is running well, in a good value interval (8.71-17.40).
Based on the results of SWOT and AHP analysis, there are four main strategies for the development of maize agribusiness, namely: Strategy 1: Improving farmers' skills through training and mentoring the latest agricultural technology (weight 0.225). Strategy 2: Optimize land use and maximize production (weight 0.219). Strategy 3: Increase maize productivity with active counseling and technological innovation (weight 0.137). Strategy 4: Increasing productivity and availability of facilities through the adoption of sustainable agricultural practices and environmentally friendly technologies (weight 0.106).

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Author Contributions

This research was conducted by several authors with different contributions. Sofya A. Rasyid was responsible for the design of the research analyses, field data collection, and primary data. Made Antara and Alam Anshari contributed to the development of the theoretical framework and in-depth literature review, as well as drafting the discussion section. Effendy and Hadayani contributed to the methodology, assisted with data processing, and proofread the write-up. All authors have read and approved the final submitted manuscript.

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Conflicts of Interest

The authors declare no conflict of interest.

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