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SWOT Analysis for the Development of Maize Farming

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***Abstract*: This study analyzes the development of maize farming in Central Pakue Subdistrict, North Kolaka District, Southeast Sulawesi Province, using a SWOT (Strengths, Weaknesses, Opportunities, Threats) framework. Maize farming is one of the key agricultural activities in the region that contribute to local livelihoods and food security. The analysis identifies several strengths, including motivated and resilient farmers, favorable agroclimatic conditions, secure land tenure, and economic viability. Main pportunities identified are high market demand, value-added processing potential, access to formal financing, and supportive government policies. However, weaknesses such as dependence on government assistance, weak farmer institutions, limited marketing knowledge, and low productivity present challenges. In addition, external threats, including climate variability, pest and disease outbreaks, price volatility, and inadequate infrastructure, hinder sustainable development. Based on the SWOT analysis, strategies are proposed to maximize strengths and opportunities, transform weaknesses into strengths, and mitigate external threats. These strategies include promoting climate-smart agriculture, strengthening farmer organizations, enhancing market access, and fostering partnerships with stakeholders. The study suggests recommendations to improve productivity, resilience, and sustainability in maize farming, which will contribute to the economic and agricultural development of the region.**

***Keywords*: agricultural development, maize farming, strategy, sustainability, SWOT analysis.**

1. Introduction

Maize (Zea mays) is the second most important food crop after rice in Indonesia [1]–[3]. It performs multifaceted roles as a staple food for a portion of the population, a critical ingredient in animal feed, and a raw material for various industries [4], [5]. As a carbohydrate source, maize contributes to national food security and supports diverse economic activities [6]. Its uses extend from direct consumption as boiled or grilled maize to processed forms such as flour, snacks, and syrups. Furthermore, maize underpins industrial applications [7], [8], including the production of starch, sweeteners, bioethanol, and other food and beverage products. Approximately half of maize production is allocated for animal feed [9], which directly affects the livestock sector's performance. As a result, maize plays a significant role not only in sustaining food and feed requirements but also in driving broader agricultural development and economic growth across the nation.

Maize development in Indonesia has been a priority for the agricultural sector due to its role in supporting food security, livestock feed [10], [11], and industrial needs. The government has implemented various policies and programs to increase maize production [12], such as providing high-quality hybrid seeds, expanding access to agricultural machinery and equipment (*alsintan*), and facilitating credit programs such as the People's Business Credit (KUR) [13]. In addition, strategies like extending cultivation areas into underutilized land, improving farming techniques, and promoting the use of organic and inorganic fertilizers have been employed [14]. Research and extension programs aim to equip farmers with knowledge and resources to adopt modern, high-yield maize cultivation practices [15]. Despite these efforts, farmers still face challenges in optimizing production efficiency and ensuring equitable distribution of benefits.

The prospects for maize development in Indonesia are promising, given its growing demand as a staple food, animal feed, and industrial raw material [16]. With a large domestic market and increasing export opportunities, maize has significant potential to contribute to the agricultural economy. However, the sector faces several challenges that need to be addressed. Productivity levels in many areas remain below their potential due to the limited adoption of advanced agricultural practices and technologies. Many farmers still apply traditional methods and local varieties [17]. Irregular rainfall and droughts due to climate variability [18], [19] exacerbate production risks. In addition, fragmented supply chains, limited market access, and volatile prices create uncertainties for maize farmers. Infrastructure limitations, including inadequate irrigation systems and post-harvest facilities, hinder efficiency and quality. These challenges should be addressed to realize the full potential of maize development.

Maize is the second most important food crop in Southeast Sulawesi [20]. Within the province, North Kolaka District has significant potential for maize cultivation given its favorable agro-climatic conditions and the availability of arable land. Kalahunde Village in Central Pakue Subdistrict is suitable for maize development. The cultivation of maize in the village benefits from its suitable soils and agroclimate as well as the community's agricultural tradition. Farmers in the village predominantly grow maize and local varieties, which are well-suited to the region's conditions and market demand. Despite

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these advantages, maize farming faces constraints such as low productivity due to traditional farming practices and limited access to modern agricultural inputs.

The SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis is a strategic planning tool widely used to identify and evaluate the internal and external factors [21]–[23] that influence the development of a specific commodity or sector. This method provides a comprehensive framework for strategy formulation by analyzing strengths and weaknesses within internal environments, and opportunities and threats in external environments. In the context of maize development, SWOT analysis can help identify key factors affecting production, productivity, and market potential while addressing challenges such as resource limitations, climate risks, and market dynamics. This approach allows policymakers, researchers, and practitioners to design targeted strategies that maximize strengths and opportunities while mitigating weaknesses and threats. This study seeks to provide strategic insights into the development of maize farming in Central Pakue Subdistrict, particularly in Kalahunde Village.

2. Materials and Methods

This study was conducted from February to March 2020 in Kalahunde Village, Central Pakue Subdistrict, North Kolaka District, Southeast Sulawesi Province. The location was selected purposively because the village is a maize-producing area, with a majority of the population engaged in maize farming. The population for this research comprised all maize farmers in Kalahunde Village, totaling 194 individuals. The sample size was determined using the Slovin formula, resulting in 66 respondents selected through simple random sampling. In addition to the farmers, interviews were conducted with agricultural extension workers and local maize traders to enrich the information.

The data collection techniques included direct interviews with maize farmers to gather quantitative and qualitative information on farming practices, production challenges, and development opportunities. Other data collection techniques include observation and key informant interviews. The variables include respondent characteristics, internal factors, external factors, and development strategies.

The primary analytical method used was SWOT analysis to identify internal and external factors [21], [24] influencing maize development and to formulate appropriate strategies. The analysis aimed to maximize strengths and opportunities while mitigating weaknesses and threats. The SWOT analysis was conducted in five stages, adapted from Yuan [22]:

1. Preliminary Assessment: Reviewing initial conditions in the research area and gathering information from relevant literature and references.
2. Questionnaire Development: Designing key questions to assess strengths, weaknesses, opportunities, and threats associated with maize development.
3. Field Survey: Conducting structured interviews and field observations to collect primary data.
4. SWOT Analysis: Analyzing the survey results to identify internal and external factors using the SWOT framework.
5. Strategy Formulation: Developing strategic recommendations based on the principle of maximizing strengths and opportunities, converting weaknesses into strengths, and mitigating threats

3. Results and Discussion

A. Socioeconomic Characteristics of Farmers

Most farmers are in their productive age group, with 88.9% aged between 25 and 55, and only 11.1% above 55. This demographic indicates a productive-age workforce capable of using innovative practices and technologies.

However, education levels among the farmers remain relatively low. The majority (77.8%) have completed high school, 11.1% have attained junior high school education, and 11.1% have completed elementary school. None of the respondents have formal higher education. In this regard, non-formal education through extension services and farmer training programs has provided valuable knowledge and skills to enhance their farming practices.

Family size, measured by the number of dependents, is predominantly small, with 88.9% of households having between 1 and 4 dependents and only 11.1% having more than 4. A smaller number of dependents implies manageable household responsibilities, which may positively influence the farmers' ability to focus on and invest in their farming activities.

Farmers have advantages in terms of farming experience. All respondents have over 10 years of farming experience and are familiar with local agricultural conditions and practices. This extensive experience could enable them to optimize their farming operations, address challenges, and explore new opportunities. Experienced farmers are more likely to adapt to and implement recommended techniques, enhancing productivity and sustainability.

Overall, the socioeconomic characteristics of maize farmers in Kalahunde Village reflect a workforce with adequate physical capability, an adequate level of education, and extensive farming experience. These attributes provide a strong base for further development of maize farming, provided that enough support exists in technology adoption, education, and market access.

B. Internal Factors

1) Strengths.

The development of maize farming in Kalahunde Village is supported by several internal strengths that enhance its potential for growth and sustainability:

1. High Motivation and Resilience of Farmers: Farmers in the study village show strong motivation and resilience in cultivating maize. This reflects their adaptability and commitment to improving their livelihoods through agricultural activities. Such a positive attitude toward farming enables them to persevere in the face of challenges, contributing to stable and sustainable maize production.
2. Land and Agroclimatic Suitability: The village is characterized by fertile soil and favorable agroclimatic

conditions, including rainfall and temperatures, which are suitable for maize cultivation. These natural advantages support optimal growth and productivity of maize, indicating the potential for maize farming development in the village.

3. Land Availability and Secure Tenure: Farmers have access to arable land with secure tenure arrangements, allowing them to cultivate maize without the risk of land disputes or tenure insecurity. This factor encourages long-term investment in improving land quality and adopting modern farming techniques.
4. Availability of Labor: The availability of local labor ensures that the operational labor needs of maize farming, including planting, weeding, and harvesting, are met. A workforce with experience in agricultural practices enhances productivity and reduces operational delays.
5. Profitability of Maize Farming: Farmers revealed during the interviews that maize farming in the village is profitable and provides sufficient returns to motivate them to continue cultivating the crop. This profitability is supported by relatively stable market demand.

2) Weaknesses

The following are several weaknesses that hinder the optimal development of maize farming in Kalahunde Village:

1. Dependence on Government Assistance: Farmers in the village seem to depend heavily on government support, especially subsidized seeds and fertilizers. This dependency creates a vulnerability, as any reduction or delay in government aid can directly disturb farming operations and productivity. Strengthening self-reliance among farmers is necessary to mitigate this dependency.
2. Weak Farmer Institutions: Farmer organizations in the village lack robust structures and effective management, limiting their capacity to function as production unit, collaboration forum, and learning avenue. Strong institutions are essential for collective action, bargaining power, and sustainable development of the maize sector.
3. Limited Knowledge of Marketing Management: Farmers have inadequate understanding of marketing strategies, resulting in difficulty to access broader markets and negotiate better prices for their produce. This limitation leads to low bargaining power against middlemen and in turn reduces their overall profitability and efficiency.
4. Poor Farm Management and Technical Application: Farmers operate suboptimal farming activities, with many farmers employing traditional techniques rather than modern, evidence-based practices. This lack of technical application leads to inefficiencies in input use and missed opportunities to maximize yields.
5. Low Productivity: Maize productivity in the study village is still below its potential, possibly due to suboptimal farming practices, limited adoption of appropriate technologies, and inadequate post-harvest handling. This weakness reduces the local maize's competitiveness in the broader market.

C. External Factors

1) Opportunities

Several external opportunities for the development of maize farming in Kalahunde Village are identified as follows.

1. Potential for Corn Processing and Utilization: The versatility of maize as food, animal feed, and an industrial raw material opens opportunities for developing value-added products. Establishing local processing facilities can generate value-added and increase income for farmers.
2. High Market Demand: The increasing demand for maize, both in the domestic and global markets, presents a substantial market opportunity. This demand creates a favorable environment for expanding production and improving market access.
3. Access to Financing from Formal Financial Institutions: The availability of credit from financial institutions, especially from state banks, can enable farmers to invest in modern agricultural inputs, improve their farming practices, and adopt appropriate technologies. Access to this capital can play an important role in increasing production.
4. Partnership Opportunities with Other Stakeholders: Collaboration with private sector, cooperatives, and other stakeholders can improve maize value chain. Partnerships can provide technical support, ensure the availability of quality inputs, improve market access, and stabilize prices of farm produce.
5. Government Policy Support: Government programs and policies for increasing maize production, such as subsidies, agricultural extension programs, and infrastructure and facility development, can create a conducive environment for agricultural growth. These measures are in accordance with the potential of the village and support farmers in improving productivity.

2) Threats

Several external threats pose challenges to the sustainable development of maize farming in Kalahunde Village. These threats need to be addressed to reduce risks and enhance resilience:

1. Occasional Shortages of Agricultural Inputs: The limited and inconsistent availability of farm inputs, such as seeds, fertilizers, and pesticides, can disrupt farming operations. These shortages disturb planting and crop management, which in turn will affect yields and farm profitability.
2. Pest and Disease Attacks: Maize farming in the region faces frequent pest and disease outbreaks, which can significantly reduce productivity and crop quality. Farmers often lack the resources and technical knowledge to manage these threats effectively, thus exacerbating their vulnerability.
3. Climate Change Impacts: Irregular rainfall, prolonged

droughts, and extreme weather events present a substantial risk to maize production. This climate variability increases uncertainty for farmers and might lead to harvest failure and reduced yields.

4. Price Fluctuations and Dependence on Middlemen: Farmers have low bargaining power, so that the price of maize is volatile and often determined by intermediaries or collectors. This dependence exposes farmers to income instability and reduces farm profitability.
5. Inadequate Infrastructure and Supporting Facilities: Poor road conditions and limited post-harvest facilities hinder the efficient transportation and processing of maize. This challenge affects market access, increases production costs, and contributes to post-harvest losses.
6. Suboptimal Agricultural Extension Systems: The agricultural extension system to provide farmers with the technical knowledge and support needed to adopt modern farming practices and gain market access is not fully functioning yet. This gap limits farmers' ability to optimize production and address emerging challenges.

D. Strategies for Maize Development

Maize farming development can be done by applying strategies that maximize strengths, address weaknesses, and mitigate threats. Based on the SWOT analysis, the following strategies are proposed:

1) Maximizing Strengths and Opportunities

This strategy focuses on using the strengths of maize farming while capitalizing on existing opportunities to achieve sustainable growth:

- Promoting Farmer Motivation and Resilience [12], [25]: Utilize the strong motivation and adaptability of farmers to adopt appropriate farming techniques and technologies. Training programs and extension services can further enhance farmers' productivity and efficiency.
- Optimizing Land and Agroclimatic Suitability: Encourage the expansion of maize cultivation in areas with optimal soil and climate conditions. Introduce climate-resilient maize varieties to maximize yields while mitigating the impacts of changing weather patterns.
- Developing Value-Added Products [26], [27]: Establish small-scale maize processing facilities in the village to create high-value products. This approach will increase income while reducing post-harvest losses.
- Enhancing Access to Formal Financing [13]: Promote farmer access to financial institutions for capital investment. Credit schemes can be adjusted to support the adoption of modern inputs and technologies to boost productivity.
- Strengthening Partnerships [28], [29]: Foster collaboration between farmers, private sector, and government agencies to improve input availability, market access, and technical assistance. Partnership can stabilize prices and provide a secure market for maize farmers.

2) Transforming Weaknesses into Strengths

This strategy aims to turn the weaknesses into strengths by addressing the main limitations of the maize farming system:

- Reducing Dependency on Government Assistance [10], [11]: Empower farmers to adopt sustainable farming practices and manage resources independently. Farmer training programs can focus on financial literacy, entrepreneurship, and risk management.
- Strengthening Farmer Institutions [5], [30]: Develop farmer organizations to strengthen collective action, facilitate capacity building, and improve market access. Farmer groups should serve as a production unit, learning forum, and means for collaboration.
- Improving Marketing Knowledge and Skills [31]: Conduct training programs to enhance farmers' understanding of market dynamics, negotiation skills, and marketing strategies. Encouraging direct market access through cooperatives or other farmer organizations (such as farmer groups and Bumdes) can help reduce dependence on intermediaries.
- Enhancing Farm Management Practices: Provide training on farm management and cultivation techniques [32]. For instance, crop rotation and intercropping can improve resource use and yields.
- Increasing Productivity: Encourage the adoption of high-yielding varieties [33] and modern inputs.

3) Minimizing External Threats

This strategy involves minimizing risks posed by external threats to ensure the sustainability of maize farming.

- Ensuring Timely Supply of Agricultural Inputs: Strengthen the supply chain for seeds, fertilizers, and other inputs by engaging multiple suppliers and establishing an input distribution center within the village.
- Pest and Disease Management [10]: Apply integrated pest management (IPM) to control outbreaks effectively. Regular training and access to pest control products can help farmers mitigate losses.
- Climate Adaptation Measures [19]: Promote climate-smart agriculture (CSA) practices, such as water-efficient irrigation systems, drought-resistant varieties, and agroforestry techniques. These measures can reduce vulnerability to climate change impacts.
- Improving Market Access: Invest in road infrastructure and transportation facilities to reduce logistical challenges. Establishing a local market or a cooperative can also stabilize prices and improve farmer income.
- Strengthening Agricultural Extension Systems [34]–[36] : Enhance the capacity and reach of extension services, including optimizing the use of social media,

to provide timely technical support and knowledge dissemination. Regular field visits and demonstration plots can improve technology adoption.

4. Conclusion

The development of maize farming in Kalahunde Village, Central Pakue Subdistrict, presents a promising opportunity to enhance agricultural productivity and farmer welfare. The SWOT analysis reveals that the village has several strengths, including motivated and resilient farmers, favorable land and agroclimatic conditions, secure land tenure, an available labor force, and the economic viability of maize farming.

Key weaknesses include dependence on government assistance, weak farmer institutions, limited marketing and farm management skills, and low productivity. Main opportunities identified are high market demand, value-added processing potential, access to formal financing, and supportive government policies. External threats, such as input shortages, pest and disease outbreaks, climate variability, price volatility, poor infrastructure, and suboptimal extension services, present challenges to maize farming in the region.

To realize the potential of maize farming, strategies must focus on maximizing strengths and opportunities, transforming weaknesses into strengths, and minimizing threats. This approach will enable sustainable growth, increased productivity, and improved livelihoods for maize farmers in the region. Recommendations include capacity building and training, strengthening farmer institutions, promoting climate-smart agriculture (CSA), improving infrastructure and input supply chains, encouraging value-added processing, and stabilizing prices and market access.

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