

MODEL FOR THE GROWTH OF MANGOSTEEN (*Garcinia Mangostana*) CULTIVATION IN KERINCI DISTRICT

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Abstract

The potential of mangosteen fruit is quite good in terms of demand and availability. The development of mangosteen farming needs to be carried out due to the support of natural resources and the increase in production from this farming activity. This study aims to 1) describe the overview of mangosteen farming in Keliling Danau Subdistrict, Kerinci Regency. 2) Identify internal and external factors that influence the development of mangosteen farming in the area. 3) Formulate alternative strategies for the development of mangosteen farming in Keliling Danau Subdistrict. We conducted this study in the Keliling Danau Subdistrict using the simple random sampling method. The research sample consisted of 52 mangosteen farmers representing a diverse population of 200 farmers. The data used were primary and secondary data, analyzed using descriptive methods and the SWOT (Strengths, Weaknesses, Opportunities, Threats) approach. The analysis results indicate that mangosteen farming in Keliling Danau Subdistrict is generally carried out on hilly land with limited cultivation techniques. Internal factors include seven strengths and four weaknesses, while external factors include six opportunities and five threats. Based on the SWOT matrix, the development of mangosteen farming in Keliling Danau Subdistrict can utilize the SO (Strengths-Opportunities) strategy by leveraging superior seed varieties and increasing high-quality production to meet the growing demand from both local and international markets.

Keywords: Eksternal Factors, Internal Factors, Mangosteen Farming, Strategy Model, SWOT Analysis

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INTRODUCTION

Indonesia is a country with a strong advantage in the agricultural sector. The agricultural sector has subsectors with superior commodities that must be developed as the main drivers of national economic growth. Horticultural commodities are particularly well suited for development, as they possess comparative and competitive advantages in both domestic and international markets (Pitaloka, 2017). Horticultural commodities include various types such as fruits, vegetables, ornamental plants, and medicinal plants. These commodities have significant potential for development as agricultural businesses. Mangosteen (*Garcinia mangostana*) is one of the tropical fruits highly favored by the public and is often referred to as the "Queen of Tropical Fruits." Mangosteen is a multifunctional fruit commodity, serving as a food source (nutritional source), income source, industrial raw material, and contributor to environmental conservation. The skin and seeds of mangosteen can also be utilized as raw materials for the cosmetic and pharmaceutical industries (Qosim, 2015).

According to Suprihardjo (2014), Indonesian agriculture must be developed sustainably by utilizing the potential of regional resources. Therefore, agricultural development policies must be formulated with consideration of the regional economic perspective. Since Government Regulation No. 2 of 2000, agricultural development has become more important for the regional economy because the central government concentrates on macro planning, while local governments are responsible for implementing programs in accordance with regional conditions. This policy perspective states that local governments must have the ability to manage the unique resources of each region.

Mangosteen is a high-quality fruit with great potential for development in Jambi Province. Mangosteen production has continued to increase year on year, particularly in 2019-2020. In 2019, mangosteen production in Jambi Province reached 3,689,700 kg, and in 2020, it increased to 4,438,700 kg. The production growth amounted to 749,000 kg, or approximately 20% (Horticultural Agriculture Survey, 2020). Kerinci Regency is the highest producer of mangosteen in Jambi Province, accounting for 52% of the province's mangosteen production, with a production volume of 2,307,000 kg (Jambi Province Central Statistics Agency, 2020). Kerinci Regency has a climate, topography, and longer rainy season that support the development of mangosteen farming.

Keliling Danau Subdistrict is a subdistrict that relies on the agricultural sector. The main agricultural activities in Keliling Danau Subdistrict are rice farming in the plains and plantations on the slopes of hills. However, Keliling Danau Subdistrict is the center of mangosteen production in Kerinci Regency. The productivity of mangosteen in this subdistrict is higher than in other subdistricts, at 15,625 kg/ha, with a harvested area of 40.32 ha and a production of 630,000 kg (Kerinci District Food Crops and Horticulture Office, 2021). Mangosteen farming in Keliling Danau Subdistrict is not carried out in all villages within the subdistrict, but only in five mangosteen production centers: Koto Patah Village, Semerap Village, Koto Tengah Village, Koto Baru Semerap Village, and Pasar Semerap Village.

Mangosteen farming is carried out using agroforestry methods, and agroforestry plantations in Semerap have clear stratification. The main canopy species are large durian and petai trees, while the productive layer in the middle contains various fruit trees such as mangosteen, duku, and avocado. A large number of clove and cinnamon trees are planted in the lower layer (Foresta et al., 2010). Some mangosteen plants are cultivated using mixed farming. Mangosteen plants are mixed with other crops such as duku, avocado, cinnamon, eggplant, long beans, papaya, and banana. However,

when considering the composition, it is evident that mangosteen is the dominant plant species among the existing plant population (Umaniora et al., 2012). The mangosteen variety cultivated by farmers is the Semerap Mangosteen Variety. This variety is a local variety that has been officially registered as a national superior variety, with registration number 10/PVL/2012 on July 9, 2012.

Mangosteen farming activities are still carried out traditionally, with low cultivation techniques, rarely fertilized or even never fertilized, no weeding or pruning, and only waiting for the mangosteen trees to bear fruit naturally. To address the challenges in mangosteen farming in Keliling Danau Subdistrict, a proper management strategy for mangosteen orchards is needed, implemented through the application of Standard Operating Procedures (SOPs) as a guideline for farmers in producing high-quality mangosteen fruit.

Another factor driving the development of mangosteen farming is external demand, particularly the high demand for mangosteen in both domestic and international markets. In addition to being consumed as fresh fruit, mangosteen is also used as raw material for industries, leading to a continuous increase in consumer demand overseas. According to Erlangga et al. (2012), mangosteen has stable prices that tend to rise, thereby contributing to economic growth.

Before designing the model, the variables involved in the development of terubuk farming were first identified based on their strengths, weaknesses, opportunities, and threats. These variables are: human resources, products, land, technology, markets, and institutions (Sukmawani et al., 2019). Additionally, based on the research findings of Saraswati et al., 2024, it is clear that considering cultural factors in agricultural development in Dagen Village is of great importance. Local culture, traditional values, and local wisdom can serve as sources of inspiration and solutions to address challenges in increasing community participation in the agricultural sector. Increased awareness of cultural values and environmental sustainability can motivate communities to re-value and engage in sustainable agricultural practices. Successful development is always directly proportional to structural transformation in the development of various agricultural commodities.

RESEACRH METHODS

This study was conducted in the Keliling Danau District of Kerinci Regency, Jambi Province. The research location was selected purposively, considering that it is one of the centers of mangosteen production with the highest productivity in Kerinci Regency. The sample research areas for this study were Koto Patah Village, Koto Tengah Village, Koto Baru Semerap Village, Semerap Village, and Pasar Semerap Village. The research subjects were mangosteen farmers. The data collected during the study were from the last harvest season, namely the 2021 harvest period.

The data collected in this study included primary data obtained through observation and direct interviews with the aid of questionnaires. Secondary data were obtained from various sources, namely journals, literature, relevant agencies, and official government websites related to the study. The sampling method used in this study was simple random sampling. The total population of mangosteen farmers in the selected subdistrict was 200 farmers, with a margin of error of 12%. The sample size was representative, reflecting the diversity of the population, and consisted of 52 respondents. To address the first objective, descriptive analysis was used to describe mangosteen farming. The second objective used descriptive analysis to

identify internal and external factors, and the third objective used the SWOT matrix through the identification of IFAS and EFAS matrices as well as diagrams that will produce several alternative strategies for the development of mangosteen farming.

RESULTS AND DISCUSSION

Overview of Mangosteen Cultivate

Mangosteen farming is not a primary commodity cultivated by farmers, but rather a supplementary crop that can increase farmers' annual income and serve as an investment crop for farmers. The primary farming activity conducted by farmers in the study area is rice farming. Mangosteen farming is a traditional farming practice that continues to be maintained and developed. In terms of planting systems, mangosteen farming is carried out without considering planting distances. The planting distances for mangosteen in the study area are mostly not in line with the recommended planting distances for mangosteen, which are 6 x 6 m, 6 x 8 m, and 8 x 8 m. It is advisable to use planting distances of 8 x 8 m, 8 x 10 m, or 10 x 10 m (Syah, 2016).

Mangosteen plant maintenance includes weeding, pruning, fertilization, and pest and disease control. Weeding involves clearing the land of anything that may hinder plant growth, such as grass, weeds, and accumulated dry leaves. Weeding is done using tools like hoes and sickles on a regular basis when the land is overgrown with weeds. Lizawati (2009) says weeding is to prevent competition for nutrients between weeds and mangosteen plants. Pruning is done on dry branches or twigs that are diseased using a machete. Pruning is done when the branches of the plant come into contact with other plants. Farmers do not prune regularly, as they believe that pruning by cutting branches will reduce fruit yield, but in fact pruning can increase fruit production.

Fertilization is the addition of several macro and micro nutrients to the soil around plants. In the research area, fertilization of mangosteen plants is carried out in two phases, namely fertilization of plants that have not yet produced fruit and fertilization of plants that have already produced fruit. Not all mangosteen farmers carry out routine fertilization of mangosteen plants. The fertilizers commonly used by farmers include manure, urea, and NPK fertilizer. Pest and disease control involves preventive measures to address disturbances caused by pests and diseases, ensuring plants can grow and produce optimally. Farmers in the study area practice pest and disease control both naturally and through the use of pesticides. Natural control methods include smoking under the trees and setting traps such as mouse traps. Prevention and eradication with the help of pesticides use chemical substances such as insecticides and herbicides. Mangosteen trees begin to bear fruit at the age of 8–10 years. Mangosteen is an annual fruit that bears fruit once a year. Mangosteen fruit can be harvested when the fruit is ripe, approximately 3 months after flowering. Harvesting is done gradually every 3-4 days and lasts about 1-3 months, depending on the number of mangosteen fruits per tree. In the research area, farmers harvest mangosteen by climbing the tree and picking the fruit by hand or with scissors.

Mangosteen farming is carried out using agroforestry and mixed farming methods. Agroforestry plantations are located in hilly areas with distinct stratification. Canopy crops such as durian, sungkai, and petai are grown. In the productive layer in the middle, there are fruit crops such as mangosteen, duku, avocado, and kulitmanis. In the lower layer, there are a large number of coffee and clove trees.

Mangosteen trees that have not yet produced fruit up to 20 years of age are mixed with vegetable crops, corn, papaya, and banana trees. Mangosteen trees are heritage crops and are cultivated by farmers themselves, with tree ages varying from those that have not yet produced fruit to those that have already produced fruit. Currently, most mangosteen trees are between 15 and 45 years old. The average number of mangosteen trees owned by farmers is 53 trees per farmer. The land area cultivated by farmers for mangosteen farming ranges from 0.2 to 2.5 hectares. The average land area cultivated per farmer is 0.86 hectares, with the land ownership status being private. The use of land area has not been optimized. Farmers only cultivate 62 mangosteen trees per hectare on their land. According to the Directorate of Fruit Crop Cultivation (2015), the ideal number of mangosteen trees is 100–125 trees per hectare, so the available land area could be better utilized by increasing the number of mangosteen trees.

The average mangosteen production in the study area is 1,011 kg per farmer or 1,171 kg per hectare, with the productivity of mangosteen trees owned by respondents being 1,777.69 kg per hectare or 49.24 kg per tree. The production volume per farmer varies depending on the number of productive trees, the age of the trees, and other production factors such as fertilizer use, pesticides, and others. The mangosteen fruit produced will be categorized based on quality into super quality and sorted goods (BS). Of the production obtained by farmers, 56% is super quality and 44% is sorted goods quality.

Agricultural costs are all costs incurred by farmers during one season or one year. Agricultural costs consist of fixed costs, which are the depreciation costs of agricultural equipment, and variable costs, which are the costs of fertilizers, pesticides, and labor. The total farming costs for mangoes incurred by farmers amount to Rp. 6,453,019 per year per farmer or Rp. 7,473,429 per hectare per year. It is known that the average income of surveyed farmers is Rp. 19,719,990 per year or Rp. 22,838,296 per hectare per year. In line with the results of research by Tariga et al. (2024), the recommended development model includes: ongoing technical assistance, capacity building for farmers, product diversification, and strengthening partnerships between farmers, the government, and the private sector to increase productivity.

Identification of Internal and External Factors Affecting Mangosteen Farming Formulation of Mangosteen Farming Development Strategies

The IFAS and EFAS matrices were created based on the identification of internal and external factors of mangosteen farming, with internal factors including the strengths and weaknesses of the farming business. The weighting values and ratings were obtained from the results of questionnaires, with the weighting values derived from questionnaires distributed to 52 farmer respondents in the research area and the ratings obtained from questionnaires given to key experts.

Table 1. IFAS Matrix for Mangosteen Farming in Keliling Danau Subdistrict, Kerinci Regency, 2022

Internal Factors	Weight	Rating	Score
Strenght (S)			
1.Agroecology	0,12	3,5	0,42
2.Availability of land area	0,11	3,7	0,41
3.Seed Varieties	0,12	4,0	0,48
4.Fruit Quality	0,12	4,0	0,48
5.Mangosteen Production Centers	0,11	3,7	0,41
6.Farmer Institution	0,09	3,4	0,31

7. Profit	0,11	4,0	0,44
SubTotal	0,78		2,95
Weaknesses (W)			
1.Farming Techniques	0,05	1,3	0,07
2.Farmers Knowledge	0,05	2,0	0,10
3.Technology Adoption	0,07	2,3	0,16
4.Mangosteen Phytosanitary Certificate	0,05	1,5	0,08
SubTotal	0,22		0,41
Total(S+W)	1,00		3,36

Source: Primary Data Processed, 2022

Based on Table 1, the IFAS Matrix shows that the strength strategy factor is more dominant than the weakness strategy factor, with a strength score of 2.95 and a weakness score of 0.41. From this, it can be categorized that mangosteen farming in the study area is in a strong enough position to be developed.

The most dominant internal strength factor is high-quality seeds and good fruit quality, with a score of 0.48. The superior quality of these seeds produces mangosteen with good quality, making it the greatest strength in the development of mangosteen farming in Keliling Danau Subdistrict. Interview results from PT. Buah Angkasa in Payakumbuh City indicate that, currently, among the mangosteens they purchase, the Semerap variety has distinct advantages, namely large fruit size and smooth, thick skin. This demonstrates that these two indicators are the strongest reasons for farmers to continue developing mangosteen farming. However, this must be accompanied by an increase in annual mangosteen production to achieve the optimal production target.

Meanwhile, the most dominant internal weakness indicator is traditional farming techniques, with a score of 0.07. Farmers do not yet have full knowledge of mangosteen cultivation. Many farmers still do not pay attention to planting distances and mangosteen care and maintenance systems. Another weakness that hinders the development of mangosteen farming in the study area is the mangosteen phytosanitary certificate. This certificate is essential for the long-term sustainability of mangosteen farming development. With the phytosanitary certificate for mangosteen in Keliling Danau Subdistrict, the product is deemed safe and free from harmful chemicals, ensuring its quality and making it attractive to the export market. This will also impact the selling price and income received by mangosteen farmers in the study area.

Table 2. EFAS Matrix for Mangosteen Farming in Keliling Danau Subdistrict, Kerinci Regency, 2022

External Factors	Weight	Rating	Score
Opportunity (O)			
1.Industrial Raw Materials	0,11	4,0	0,44
2.Demans for Mangosteen	0,12	4,0	0,48
3.Price Staibility	0,10	3,3	0,33
4.Investment	0,10	3,3	0,33
5.Potential Commodities	0,09	3,3	0,30
6.Government Support	0,10	3,4	0,34
SubTotal	0,62		2,22
Threats(T)			
1.Disease	0,05	1,0	0,05

2.Seasonal Changes	0,08	1,8	0,14
3.Competitors	0,08	1,8	0,14
4.Erosion	0,08	2,3	0,18
5.Transportation Access	0,09	2,0	0,18
SubTotal	0,38		0,69
Total(O+T)	1,00		2,91

Source: Primary Data Processed, 2022

Based on the EFAS matrix in Table 2, it is known that the opportunity strategy factor is higher than the threat strategy factor, with an opportunity score of 2.22 and a threat score of 0.69. These figures show a drastic difference, with the threats faced still outweighing the opportunities available, so that these opportunities can be a motivation for farmers in developing mangosteen farming in the Keliling Danau sub-district.

From the EFAS matrix research results, the opportunity strategy factor with the highest score is the demand for mangosteen in domestic and international markets, with a score of 0.48. This factor is the primary opportunity that can attract farmers to develop mangosteen farming. The high demand and open market for mangosteen are the result of collaboration among farmers, village collectors, and companies, including those involved in exporting mangosteen and those targeting the local market. Currently, mangosteen in the study area has collaborated with a mangosteen export company in Payakumbuh, namely PT. Buah Angkasa, with export destinations for mangosteen including China, Hong Kong, Taiwan, and the Arab countries. To date, there are no restrictions on sales and export volumes of mangosteen, so the amount of mangosteen production has a high market and sales potential.

The main threat factor and problem faced by farmers is pests and diseases, with a score of 0.05. The large number of pests and diseases that continue to attack mangosteen plants makes it difficult for farmers to deal with them. To date, farmers have not yet identified an effective method for controlling pests and diseases in mangosteen plants, making them the strongest threat to the development of mangosteen farming in Keliling Danau Subdistrict. The strategic position of mangosteen farming can be determined from the results of the IFAS and EFAS matrices, which have been identified and subjected to weighting, rating, and scoring calculations.

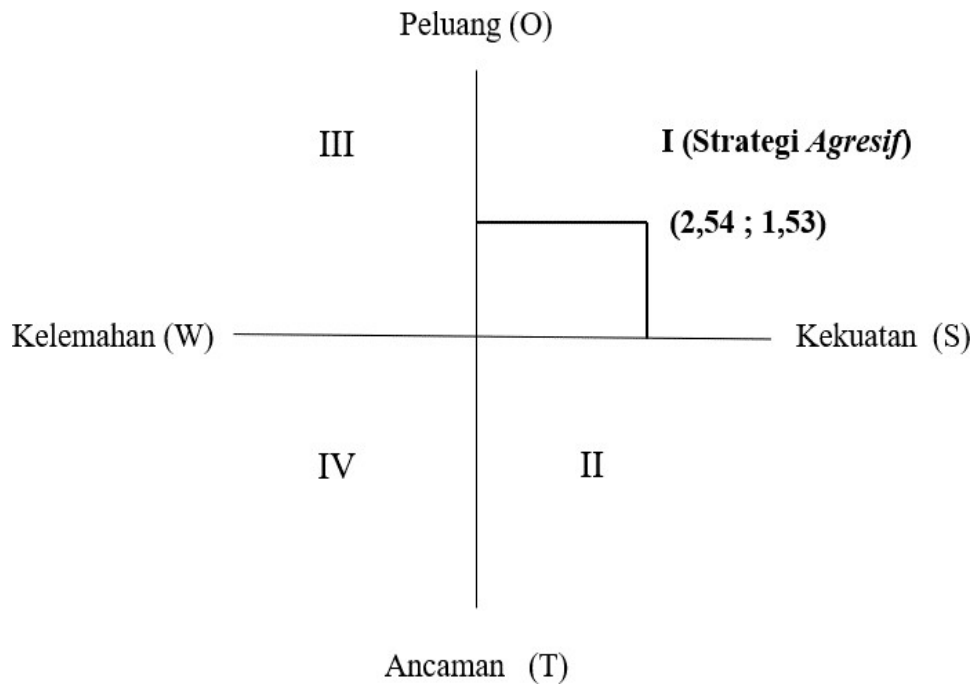


Figure 1. SWOT Analysis Diagram of Mangosteen Farming in Keliling Danau Subdistrict, Kerinci Regency.

Based on the SWOT analysis diagram, the x-axis point (2.54) is the weighted value of the difference between the strength and weakness scores. The y-axis point (1.53) is the weighted value of the difference between the opportunity and threat scores. The results obtained indicate that the coordinate point is in Quadrant I or the SO strategy. In Quadrant I or the aggressive strategy, this is a favorable situation because it has greater strengths and opportunities compared to weaknesses and threats. Although threats in this case are one of the factors that have a negative impact or can cause problems in business development (Lawani et al., 2020), the opportunities that are already available will provide opportunities for businesses to develop well (Rizki et al., 2024).

1. Alternative Strategies for Developing Mangosteen Farming in Keliling Danau Subdistrict, Kerinci Regency

Alternative strategies that can be applied in the development of mangosteen farming in Keliling Danau Subdistrict, Kerinci Regency, can be seen in the following table:

Table 3. SWOT Matrix for Mangosteen Farming Development Strategy in Keliling Danau Subdistrict, Kerinci Regency

<p>INTERNAL</p> <p>EKSTERNAL</p>	<p>Strengths (S)</p> <ol style="list-style-type: none"> 1. Agroecology Mangosteen production center 2. Availability of land farmer institutions 3. Seed varieties advantages 4. Fruit quality 	<p>Weaknesses (W)</p> <ol style="list-style-type: none"> 1. Agricultural techniques 2. Farmer Knowledge 3. Technology adoption 4. Mangosteen phytosanitary certification
<p>Opportunities (O)</p> <ol style="list-style-type: none"> 1. Industrial raw materials 2. Mangosteen demand 3. Price stability 4. Investment 5. Potential commodity 6. Government support 	<p>Strategy S-O</p> <ol style="list-style-type: none"> 1. Increase production by utilizing superior seed varieties, agroecology, and land availability 2. Optimizing fruit quality and quantity to meet market demand and maintain price stability. 3. Increasing the number of mangosteen trees cultivated to boost farmers' income and serve as an investment. 4. Enhancing agricultural development to make mangosteen a potential commodity and establish Keliling Danau Subdistrict as a mangosteen hub with government support and policies. 5. Government support for marketing institutions and mangosteen pricing to ensure price policies are controlled by collectors. 	<p>Strategy W-O</p> <ol style="list-style-type: none"> 1. Implementing good mangosteen cultivation techniques to produce good quality and quantity. 2. Assistance and empowerment of farmer groups by PPL and relevant agencies regarding good mangosteen cultivation practices. 3. Enhancing farmers' knowledge and training in agricultural management technology. 4. Application for mangosteen phytosanitary certificates as export permits for mangosteen fruits and broader sales security.
<p>Threats (T)</p> <ol style="list-style-type: none"> 1. Pests and diseases 2. Unpredictable seasonal changes 3. Competitors 4. Erosion 5. Transportation access 	<p>Strategy S-T</p> <ol style="list-style-type: none"> 1. Optimizing farmer group institutions to address agricultural issues. 2. Eradicating pests and diseases to improve mangosteen quality and increase farmer profits. 3. Maintaining the quality and quantity of mangosteen fruit to remain competitive against competitors. 4. Improving road infrastructure in areas leading to mangosteen plantations to facilitate transportation access. 5. Addressing land slope issues to minimize erosion risks. 	<p>Strategy W-T</p> <ol style="list-style-type: none"> 1. Improving farming techniques such as planting density to increase the number of trees and production per hectare. 2. Enhancing maintenance in mangosteen farming activities to prevent pest and disease attacks as well as unpredictable weather changes. 3. Enhancing training in the use of technology to assist mangosteen farming activities. 4. Obtaining phytosanitary certificates for mangosteen

		to compete with mangosteen from other regions.
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Source: Primary Data Processed, 2022

Based on Table 3, the SWOT analysis conducted, it can be concluded that mangosteen farming in Keliling Danau Subdistrict has great potential to be developed into a leading regional and even national commodity. This potential is supported by strong internal factors, such as favorable agroecological conditions, land availability, superior seed varieties, and good fruit quality. Additionally, high market demand, price stability, government support, and investment opportunities serve as external factors that strengthen development prospects. However, the success of development is still hindered by internal weaknesses, such as low cultivation techniques, limited farmer knowledge, minimal technology adoption, and the absence of phytosanitary certification, which is a requirement for export. Furthermore, external threats such as pest and disease outbreaks, climate change, erosion, and inadequate transportation access also require attention.

Mangosteen farming in Keliling Danau District has great potential to be developed into a national center and even an export hub, if it can overcome internal obstacles such as limited technology and knowledge, as well as anticipate external factors such as climate change and competition. Collaboration between farmers, the government, and investors is key to the success of this development strategy. This strategy aims to mitigate weaknesses and threats to sustain the farming industry. It leverages existing strengths and opportunities to reduce weaknesses and threats by optimizing land use with skilled labor, fostering good communication between farmers and the government for marketing information, and collaborating with capital providers. This makes it easier for farmers to generate income from their farming activities. (Mustaki et al., 2023). The success of farming is greatly influenced by internal and external factors, which must be understood in order to address opportunities and threats (Mutaqqien, 2018). To implement the best strategy, it is essential to leverage existing opportunities (Motik et al., 2021).

To take advantage of better business opportunities, farming businesses can reduce internal problems by creating a SWOT (Strengths, Weaknesses, Opportunities, and Threats) diagram based on internal and external elements (Pertiwi et al., 2024). However, according to Idris et al. (2023), even if some strategies cannot be implemented, the approach taken in agricultural business development is to seek alternative strategies that support the objectives.

CONCLUSION

Mangosteen farming in the research area is carried out on sloping and hilly topography with an average land area of 0.86 ha/farmer with a production yield of 1,011 kg/farmer. Mangosteen is cultivated in agroforestry and mixed farming, the planting system is carried out with polyculture (polikultur) with farming techniques still carried out traditionally. Mangosteen farming activities in Keliling Danau District are supported by farming strength factors, namely superior seed varieties and good fruit quality. Internal inhibiting factors of mangosteen farming weaknesses in the research area are farming techniques. supported by various factors of mangosteen farming opportunities which are very high, namely the demand for mangosteen in the domestic and foreign markets and the threat factors of mangosteen farming which are

the biggest obstacles in the research area, namely pests and diseases. Alternative strategies that can be applied in the development of mangosteen farming in Keliling Danau District are SO (Strength-Opportunities) strategies utilizing strength factors in the form of superior seed varieties and producing high production volumes and good fruit quality to meet the increasing demand for domestic and foreign markets. The production of sorted goods (BS) quality mangosteen is 44.46% and super quality is 55.54%. This is influenced by pest and disease disturbance farming techniques, harvesting and post-harvest processes. Improvement of farming techniques, maintenance, pest and disease control, harvesting and post-harvest can further increase the production of super quality mangosteen. The harvesting process and post-harvest handling are also important things that need to be considered to maintain the quality of the mangosteen fruit produced.

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