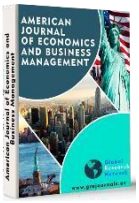

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Article

Development Strategy of Sugarcane (Saccharum officinarum L.) Farming in Bondowoso Regency

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Abstract: This research is aimed at identifying internal and external factors, as well as knowing and determining the right strategy for developing sugar cane farming in Bondowoso Regency. The data used is primary data and secondary data from related agencies, the Bondowoso Regency Agriculture and Food Security Service and the Ministry of Agriculture. The analysis method used is Internal and External Factor Evaluation (IFE and EFE) and SWOT (Strengts, Weakness, Opportunities, Treats). The results show (1) Utilizing the potential of natural resources - sugar factory to increase production and meet increasingly high market demand, (2) Development and implementation of technology - reducing dependence on production costs and increasing the efficiency of using natural resources, (3) Utilizing available capital resources to overcome higher production costs and increasing product competitiveness, (4) Increasing cooperation with sugar factories (5) Utilizing available capital resources and getting assistance from PG field officers, (6) Utilizing human resources experienced in maximizing production results and increasing farmers' income, (7) Using the potential power of natural resources to face the challenges of transparency in determining yields (8) Optimizing profits by utilizing bonuses/premiums as incentives for farmers, (9) Increasing collaboration with field officers PG (10) Increasing the use of technology by getting assistance from PG Field Officers, (11) Improving inadequate facilities and infrastructure (12) Increasing the use of technology by facing climate change, (13) Farmers are expected not to depend on intermediary traders, (14) Overcoming weaknesses in the use of technology (15) Sugar cane farmers have advantages if they join APTRI.

Keywords: Farming, Sugarcane, IFE, EFE, SWOT

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1. Introduction

The plantation subsector is one of the agricultural subsectors that has a major role in the development of agriculture in Indonesia. The potential yields of the plantation subsector are needed by the processing industry as raw material for products. One of the plantation subsector commodities that has a strategic role is sugarcane. It is said to have a strategic role because sugar cane is the raw material for making granulated sugar, while granulated sugar itself is one of the nine basic commodities for the community. Thus, the availability of granulated sugar in the market is highly dependent on the amount of raw material, namely sugar cane [1]

Sugarcane (Saccharum officinarum L.) is an annual grass that grows mostly in tropical and snow-free areas. This plant requires hot temperatures, high sun exposure, plenty of water, and fertile land with good irrigation [2]. In Indonesia, sugarcane stalks are utilized for the sugar processing industry.

Table 1. Sugarcane Production for the last five years 2018-2023

No	Wilayah	Produksi (Ton)				
		2018	2019	2020	2021	2022
1	Indonesia (National)	2,170,947	2,227,046	2,130,719	2,418,589	2,345,398
2	East Java	1,065,965	1,052,026	985,511	1,049,355	1,048,630

Source: Sugarcane Outlook, 2022

Notes: Year 2021 and Year 2022 BPS East Java, 2022

Based on Table 1, it can be seen that sugarcane production fluctuates every year. Both sugarcane production in Indonesia and sugarcane production in East Java province. It can be seen that in 2022 there was a decrease in sugarcane production by 3.026% or 73,191 tons for national production, while for East Java province there was also a decrease in production by 0.07% or 725 tons. Sugar producers in Indonesia are spread across various regions, namely Central Java, East Java, West Java, Sumatra and others. The largest sugar producers in Indonesia that contributed to total sugar production in 2018 were East Java by 51.15%, Lampung by 27.45%, Central Java by 7.82%, South Sumatra by 4.46%, and West Java by 2.75% (3)

Plantations in East Java have considerable potential and contribution to national production. The area of East Java Plantations in 2020 was 932,056 Ha with production reaching 1,663,346 tons. This condition is supported by the development of superior commodities in East Java plantations. Sugarcane production in East Java reached 985,511 tons which contributed approximately 48% to national production. Based on the data, the ADHB GRDP growth target of the East Java Provincial Plantation Office in the period 2020-2021 was not achieved because the crop that contributed greatly to the total plantation production of East Java, namely Sugarcane, experienced a decrease in production of 5.86%. The decline in production was due to several factors, especially the long wet climate that occurred in 2020 (4).

Bondowoso district is also a sugarcane producing area. The amount of sugarcane production increases every year. In 2020 Bondowoso Regency sugarcane production amounted to 327,222.25 tons, in 2021 sugarcane production reached 408,450.34 tons, and in 2022 sugarcane production increased again to 440,653.61 tons (4). So sugarcane has the potential to be developed by farmers. Sugarcane farmers in Bondowoso Regency are spread across several regions[3]–[5].

The area of sugarcane farming production centers in Bondowoso Regency needs to be increased, because consumer demand is increasing. This can be seen from the growth rate of Bondowoso's population and the increasing number of café or hangout businesses and their increasing purchasing power. In addition, the surrounding area of Bondowoso Regency has sugarcane processing industries such as PG Prajekan and the nearby PG in Situbondo Regency. So that for marketing sugarcane Bondowoso has opportunities for sugarcane farming[6]–[8].

The cost of sugarcane farming in Bondowoso District has increased, this is because it is influenced by labor wages which rose to Rp. 30,000 working from 06.00 to 10.00, land and rice field rent has also increased from Rp. 12,000,000/year to Rp. 16,000,000/year, as well as the increasingly expensive price of fertilizer. In addition, the use of inefficient technology such as farmers still using conventional methods can increase production costs[9]–[11].

Another constraint in sugarcane farming in Bondowoso Regency is uncertified sugarcane seeds. The price of certified sugarcane seeds tends to be more expensive so sugarcane farmers in Bondowoso use seeds from fellow sugarcane farmers or use their own sugarcane seeds (uncertified seeds). This results in less than optimal sugarcane

production. The sugarcane varieties used by Bondowoso farmers are mostly using the Bulu Lawang variety, so that during the harvest season if the varieties used are the same if the harvesting period does not match the schedule it can result in yields that are not up to standard, and vice versa if the harvest coincides the factory conditions will be overcapacity and if the harvest is not quickly milled it will also reduce the quality of sugarcane[12]–[14].

Climatic factors also affect sugarcane productivity in Bondowoso Regency. Erratic weather climate can also affect the growth of sugarcane. In addition, which is an obstacle to sugarcane productivity, pest and disease control can interfere with the growth and production of sugarcane. Therefore, pest and disease control is an important factor in sugarcane farming.

Some of these obstacles require a sugarcane farming strategy. This drives the background of this research that needs to be done by creating a sugarcane farming development strategy in Bondowoso Regency. So that it is hoped that this research can help the local government to provide advice or policies to be able to help sugarcane farmers in Bondowoso Regency.

Research objectives

Based on the problems described above, the objectives of this research are as follows;

1. Identify internal and external matrix factors of sugarcane farming development in Bondowoso District.
2. Knowing and determining the right strategy in the development of sugarcane farming in Bondowoso Regency.

2. Materials and Methods

The research location is Bondowoso Regency. The research was conducted using experts (expert respondents) from sugarcane farmers as well as the Head of the field and staff handling sugarcane at the Bondowoso District Agriculture and Food Security Office. The research time began for approximately 3 (three) months starting in March to June 2023.

The sampling technique used in this study used non-propability sampling, namely purposive sampling. Purposive sampling is taken based on certain predetermined criteria. The sample in this study is an expert respondent (expert) who is considered experienced in sugarcane farming activities and monitoring sugarcane crops, such as the respondent in question there are two people, namely the Head of Facilities and Infrastructure with an educational background of S1 and S2 graduates in agriculture and staff in the facilities and infrastructure section of plantation crops with a background in S1 agriculture. Both respondents also manage the Agriculture and Food Security Service garden with sugarcane commodities with an area of 2 ha. The other 28 respondents were sugarcane farmers in Bondowoso Regency with the criteria of using uncertified sugarcane seeds, sugarcane cultivation experience for 2 years and farmers who are members of the Indonesian Sugarcane Farmers Association (APTRI).

Data Acquisition Techniques and Tools

Data and data sources from this study came from interviews with several expert respondents who have the capacity and knowledge of aspects of sugarcane farming development in Bondowoso District. Other supporting data such as the Government Agency Performance Report of the Bondowoso District Agriculture and Food Security Office, journals, and other data used in the research. The data collection techniques were carried out as follows;

1. Data collection in this study was carried out using an interview and questionnaire system
2. Collecting questionnaires on expert respondents by giving written questions to respondents to be filled in and answered.

3. Literature study by studying secondary data obtained from various sources, including the Bondowoso District Agriculture and Food Security Office, the Bondowoso District Plantation Office, and the Bondowoso District Sugarcane Farming Office. Bondowoso District, East Java Plantation Office, Directorate General of Plantation, and other supporting documents.

Data type for This research uses:

1. primary data conducted by direct interviews in the field with expert respondents at the Office of Agriculture and Food Security and sugarcane farming actors in Bondowoso Regency which are carried out in a structured manner using questionnaire tools and conducting interviews to obtain information.
2. Secondary data collection was also carried out by obtaining some literature in the field of plantations, especially sugarcane commodities such as books, journals, previous research and reports of related agencies of the Bondowoso District Agriculture and Food Security Office.

Data Analysis Technique

Internal Factor Evaluation (IFE) and External Factor Evaluation (EFE)

IFE is what internal factors affect the development of sugarcane farming from internal influences in the form of strengths and weaknesses. The evaluation is carried out by calculating the average internal factors that exist in the development of sugarcane farming using a weighting matrix to see its internal conditions weighting matrix to see its internal conditions.

EFE is an external factor in the form of opportunities and threats that come from outside that can affect the development of sugarcane farming in Bondowoso Regency. A weighting matrix is carried out to see the external conditions. After formulating the Internal and External factors, the Internal External (I-E) matrix is obtained which is used to map the total value of the company.

The Internal - external matrix (IE Matric) positions the various divisions within a company that appear nine cells. The IE matrix is based on two key dimensions: the total IFE weight value on the x-axis and the total EFE weight value on the y-axis (5).

The IE matrix is divided into three major parts of the quadrant, first cell I, II, IV can be described as growing and building (Grow and Build), second cell III, V, VII can be handled well through strategies to maintain and maintain (hold and maintain), third cell VI, VIII, IX is harvest and divest (harvest & divest) (5).

SWOT Analysis

SWOT analysis according to (6) is a systematic assessment of the company's internal factors in the form of strengths (strengts) and weaknesses (weaknesses) in the face of the company's external environment in the form of opportunities and threats (treats). Meanwhile, according to (7) SWOT analysis is defined as the process of identifying various aspects of a company in a systematic manner to determine the appropriate design systematically to determine the appropriate design and implement the best company strategy.

Based on the research above, it can be concluded that SWOT analysis is an analysis that can be carried out by a company in examining internal and external factors by the company in determining the desired strategy. SWOT analysis in this study describes and determines the strategy of the internal and external factors of the sugarcane farming development strategy in Bondowoso Regency.

3. Results and **Discussion**

This research was conducted using SWOT analysis in order to determine alternative strategies for sugarcane farming development in Bondowoso Regency which was carried out in several stages.

Formulation of Internal and External Factors

Determination of internal factors that have strengths and weaknesses and external factors that have opportunities and threats is obtained based on the results of literature studies, reviews of previous research, books and conducting interviews with sugarcane farmers and extension workers in the research environment. The internal and external factors are presented in table 2 as follows.

Table 2. Internal Factors (Strengths and Weaknesses) and External Factors (Opportunities and Threats)

No	**Internal Factors (Strength/Strenght)**
1	Natural Resources Potential
2	Capital Resources available
3	Experienced human resources
4	Sugarcane farming is profitable
5	Joining APTRI
	Internal Factors (Weakness)
1	Use of Technology
2	Pest Disease
3	Inadequate facilities and infrastructure
4	Uncertified seedlings
5	High price of fertilizer
6	Monotonous sugarcane varieties
No	**External Factors (Opportunity)**
1	The existence of a sugar factory
2	Getting PG Field Officer Assistance
3	Giving bonus/premium
4	Government assistance
5	Increased market demand for sugar as a processed sugarcane product
	External Factors (Threats)
1	Transparency in setting yields
2	Higher production costs
3	Climate change
4	Emergence of intermediary traders
5	Untimely harvesting

The results of the questionnaire from sugarcane farmers and resource persons from the Department of Agriculture and Food Security of Bondowoso Regency were carried out IFE - EFE weighting of SWOT elements. The matrix results of the weighting can be seen in Table 3 and Table 4

Table 3. IFAS SWOT Weighting Assessment Results

	Internal Factors	**Total**	**Weight**	**Rating**	**Value**
No	***Strength***				
1	Natural Resource Potential	118	0.093	4	0.373
2	Capital Resources available	116	0.092	4	0.367
3	Human resources are experienced	126	0.100	4	0.398
4	Sugarcane farming is profitable	125	0.099	4	0.395
5	Joining APTRI	124	0.098	4	0.392
	Total *Strength*	**609**			**1.926**
No	***Weakness***				
1	Use of Technology	109	0.086	3	0.258

2	Pest Disease	89	0.070	3	0.211
3	Inadequate facilities and infrastructure	108	0.085	4	0.342
4	Uncertified seedlings	110	0.087	4	0.348
5	High price of fertilizer	126	0.100	4	0.398
6	Monotonous sugarcane varieties	114	0.090	4	0.360
	Total *Weakness*	**656**			**1.918**
	Internal Total	**1265**	**1.000**		**3.843**
	Difference				**0.008**

Notes:

1. Total: Is the result of the accumulation of linkert scale values from 30 respondents. The linkert scale in the study ranges in value from 1 to 5, where 1 = disagree, 2 = disagree less, 3 = undecided, 4 = agree, and 5 = strongly agree.
2. Weight: Is the result of the division of the number of indicators divided by the number of internal values. Example: the strength indicator is the sum of respondents' linkert scale scores on natural resource potential divided by the internal sum = 118/1265 = 0.093
3. Rating: Is a value that often appears (Mode) in the linkert scale value of the respondent.
4. Value: Is the result of multiplying the weight of each indicator multiplied by the rating of each indicator. Example: Indicator strength weight on natural resource potential multiplied by its rating = 0.093 x 4 = 0.373
5. Total Strength: Is the sum of the total of each strength indicator = 118+116+126+126+125+124 = 609
6. Total Weaknesses: Is the sum of the total of each weakness indicator = 109+89+108+110+126+114=656
7. Internal Total: Is the sum of the total number of strengths and the total number of weaknesses = 609+656 = 1265
8. Total Internal Weight: Is the sum of the weight of each strength and weakness indicator and the total amount must be 1. Example: the overall weight of each indicator is summed =0.093+0.092+0.100+0.099+0.098+0.086+0.070+0.085+0.087+ 0.100+0.090 = 1.00
9. Internal sum of values: Is the sum of the total strength value and the total weakness value = 1.926 +1.918 =3.843
10. Difference: Is the result of subtracting the total value of strengths and the total value of weaknesses = 1,926 -1,918 =0.008

Tabel 4. EFAS SWOT Weighting Assessment Results

	External Factors	**Total**	**Weight**	**Rating**	**Value**
No	***Strength***				
1	The existence of a sugar factory	141	0.123	5	0.615
2	Getting PG Field Officer Assistance	119	0.104	4	0.415
3	Giving bonus/premium	108	0.094	4	0.377
4	Government assistance	106	0.092	4	0.370
5	Increased market demand for sugar as a processed sugarcane product	105	0.092	3	0.275
No	**Total *Opportunity***	**579**			**2.052**
	Threats				
1	Transparency in setting yields	115	0.100	4	0.401
2	Higher production costs	131	0.114	4	0.457
3	Climate change	120	0.105	4	0.419
4	Emergence of intermediary traders	101	0.088	3	0.264
5	Untimely harvesting	100	0.087	3	0.262
	Total *Threats*	567			1.804

Eksternal Total	**1146**	**1.000**	**3.856**
Difference			**0,248**

Notes:

1. Total: Is the result of the accumulation of linkert scale values from 30 respondents. The linkert scale in the study ranges in value from 1 to 5, where 1 = disagree, 2 = disagree less, 3 = undecided, 4 = agree, and 5 = strongly agree.
2. Weight: Is the result of the division of the number of indicators divided by the number of internal values. Example: the opportunity indicator is the sum of respondents' linkert scale scores on The existence of a sugar factory divided by the internal sum = 141:1146= 0.122
3. Rating: Is a value that often appears (Mode) in the linkert scale value of the respondent.
4. Value: Is the result of multiplying the weight of each indicator multiplied by the rating of each indicator. Example: Indicator opportunity weight on The existence of a sugar factory multiplied by its rating = 0.123 x 5 = 0.615
5. Total opportunity : Is the sum of the total of each opportunity indicator = 141+119+106+106+105 = 577
6. Total ***Threats***: Is the sum of the total of each ***Threats*** indicator = 115+131+120+101+100 = 567
7. Internal Total: Is the sum of the total number of opportunity and the total number of ***Threats*** = 577+567=1146
8. Total Internal Weight: Is the sum of the weight of each opportunity and ***Threats*** indicator and the total amount must be 1. Example: the overall weight of each indicator is summed = 0.123+0.104+0.094+0.092+0.092+0.100+0.114+0.105+0.088 +0.087= 1.00
9. Internal sum of values: Is the sum of the total opportunity value and the total ***Threats*** value = 2.052 + 1.804 = 3.856
10. Difference: Is the result of subtracting the total value of opportunity and the total value of ***Threats*** = 2.052 - 1.804 =0.248

Analisis Matriks (IE)

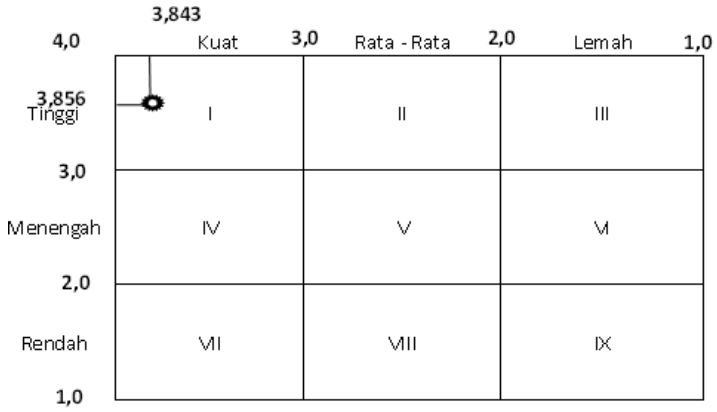

Figure 1. Position of sugarcane farming Development in bondowoso Regency according to the result of the IE matrix

Position analysis in the development of sugarcane farming in Bondowoso Regency is described in an Internal - External matrix. The Internal-External Matrix is obtained from the results of mapping the total value of the IFE and EFE matrix values obtained from the assessment of environmental and external factors that influence the development of sugarcane farming in Bondowoso Regency. This Internal-External Matrix assessment is based on two key dimensions, namely the X axis is the total value of the Internal Factor Evaluation (IFE) matrix and the Y axis is the total value of the External Factor Evaluation (EFE) matrix[15], [16]. The mapping of the IFE and EFE positions can be seen in Figure 4.1

with an internal factor value (IFE) of 3.843 and an external factor (EFE) of 3.856. So that the IFE and EFE are obtained in quadrant I.

The position in the Internal Evaluation (IE) matrix shows that the development of sugarcane farming in Bndowoso Regency in quadrant I position can be described as growing and building (Grow and Build). Being in quadrant I position, the development of sugarcane farming in Bondowoso Regency means that the strategies used can be integrative and intensive strategies.

Overall, the intensive strategy in developing sugarcane farming in Bondowoso district has a clear objective of achieving optimal yields by utilizing the latest technology, optimizing the use of resources, and increasing the competitiveness of cane sugar products. By adopting this approach, farmers can face challenges more readily and make a positive contribution to the growth and development of the agricultural sector in the Bondowoso district.

Alternative Strategies for Sugarcane Farming Development in Bondowoso District

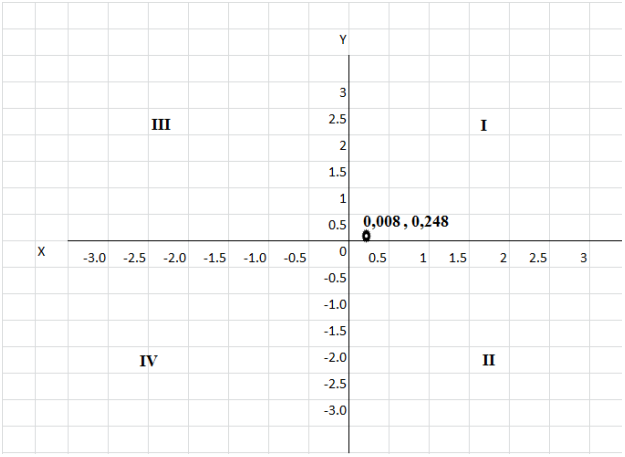

Figure 2. The Result of IE Matrix Analysis

Based on the results of the analysis of respondents' assessments of internal and external environmental factors, it shows that the development of sugarcane farming in Bondowoso Regency is in the most favorable condition, namely with a value of x = 0.008 and y = 0.248 which is located in Quadrant I, namely a progressive strategy. This means that the current condition of sugarcane farming in Bondowoso Regency is very good and it is very possible to continue to develop, enlarge growth, and achieve maximum progress. The results of the IE matrix analysis of sugarcane farming development in Bondowoso Regency can be seen in Figure 4.2. The strategy can be carried out by making efforts to expand and increase the scale of sugarcane farming activities. In this context, strategic expansion refers to the steps taken to increase sugarcane production, the area of agricultural land, and the number of farmers involved in sugarcane farming. The main objective of this strategic expansion is to optimize growth potential and increase maximum yield.

Being in Quadrant I illustrates that the development of sugarcane farming in Bondowoso Regency has great potential to continue to advance and develop. This also means that sugarcane farming can play an active role in increasing production, farmer income, and a positive contribution to the regional economy. The importance of maintaining internal advantages and adapting to changes in the external environment should not be overlooked, as this will be the key to success in maintaining sustainable growth in sugarcane farming in the Bondowoso region. As such, this progressive strategy provides a strong foundation for the development of sugarcane farming in Bondowoso district, with the potential to continue to grow and contribute to sustainable agricultural development in the region.

Strategy Formulation

The next stage is to formulate the IFE-EFE strategy into a SWOT matrix. The formulation of the IFAS - EFAS matrix, based on the SO, ST, WO, and WT strategies, is presented in matrix form in Table 5.

Table 5. SWOT Matrix Analysis Results for sugarcane farming development in Bondowoso Regency

IFAS / EFAS	*Strength* 1. Potential Natural Resources 2. Capital Resources available 3. Experienced Human Resources 4. Sugarcane farming is profitable 5. Joining APTRI **weight : 1,926**	*Weakness* 1. Use of technology 2. Pest Disease 3. Inadequate Facilities and Infrastructure 4. Uncertified seedlings 5. High price of fertilizer 6. Monotonous sugarcane varieties **weight : 1,918**
Opportunity 1. The existence of a sugar factory 2. Getting Assistance from PG Field Officers 3. Provision of bonus/premium 4. Government assistance 5. Increased market demand for sugar as a processed sugarcane product **weight : 1,846**	S-O Strategy 1. Utilize the potential of natural resources with the existence of sugar factories to increase sugarcane production and meet higher market demand. (S1, O1) 2. Utilize available capital resources and get assistance from PG field officers to improve operational efficiency and maximum cane yield quality. (S2, O2) 3. Utilizing experienced human resources and providing bonuses/premiums to maximize production results and increase farmers' income. (S3, O3) 4. Optimizing the benefits of profitable sugarcane farming by utilizing the provision of bonuses/premiums as an incentive for farmers. (S4, O3)	W-O strategy 1. Increase the use of technology by utilizing obtaining PG Field Officer Assistance as an opportunity to optimize production processes and reduce production costs. (W1, W5, O2) 2. Improve inadequate facilities and infrastructure by utilizing bonuses/premiums as incentives to improve the quality and productivity of farming. (W3, O3) 3. Increase cooperation with sugar mills to obtain technical support and certified seeds, use of appropriate technology to overcome pest and disease problems, increase production and increase investment in necessary infrastructure. (W1, W2, W3, O1) 4. Increased cooperation with PG field officers and government assistance (assistance to agricultural extension workers) in developing more diverse sugarcane varieties, improving seed quality through certification. (W4, W6, O2, O4)

Threats	S-T Strategy	W-T Strategy
1. Transparency in determining yields **2. Production costs are getting higher** **3. Climate Change** **4. The emergence of intermediary traders** **5. Untimely harvesting** **weight : 1,804**	1. Use the potential power of natural resources to face the challenges of transparency in yield determination and ensure fairness in price determination and farmer profits. (S1, T1) 2. Utilize available capital resources to overcome increasingly high production costs and increase product competitiveness. (S2, T2) 3. Having experienced human resources to deal with the emergence of intermediary traders, it is hoped that farmers will not depend on intermediary traders (middlemen) so that the profits generated will be maximized if sold individually to PG. (S3, T4) 4. Sugarcane farming is profitable, especially if you join APTRI. To increase supervision and control over sugarcane harvesting times, increase coordination with APTRI to overcome the problem of untimely harvesting. (S4, S5, T5)	1. Overcoming weaknesses in the use of technology to maximize production results and good yields as well as facing transparency in determining yields and ensuring that yield determinations are carried out fairly and accurately. (W1, T1) 2. Development and implementation of technology that can reduce dependence on high production costs, increase efficiency in the use of natural resources, as well as adjust and adapt to climate change to minimize negative impacts on sugar cane production. (W1, T2, T3) 3. Increase the use of technology to deal with climate change (0.413) to increase adaptation and resilience of farming. (W1, T2)

Based on table 4.5 the results of the SWOT analysis matrix of sugarcane farming development in Bondowoso Regency there are 15 alternative strategies divided into SO, ST, WO and WT strategies. Furthermore, the analysis will be carried out to determine the alternative strategy of sugarcane farming development in Bondowoso Regency and determine its ranking.

4. Conclusion

This results of the analysis and discussion on the Sugarcane Farming Development strategy in Bondowoso Regency are as follows;

1. Based on the identification of internal and external factors, the matrix of sugarcane farming development in Bondowoso Regency is obtained;
   a. Internal factors consist of strength factors, namely potential natural resources, available capital resources, experienced human resources, profitable sugarcane farming, joining APTRI and weakness factors, namely the use of technology, pests and diseases, inadequate facilities and infrastructure, uncertified seeds, high fertilizer prices, and monotonous sugarcane varieties.
   b. External factors consist of opportunity factors, namely the existence of sugar factories, getting assistance from pg field officers, providing bonuses / premiums, government assistance, increasing market demand for sugar as a processed sugarcane product and threat factors, namely transparency in setting yields, higher production costs, climate change, the emergence of intermediary traders and untimely harvesting.
2. The right strategy in developing sugarcane farming in Bondowoso Regency is :
   a. Utilizing the potential of natural resources with the existence of sugar factories to increase sugarcane production and meet higher market demand,

b. Utilizing available capital resources to overcome higher production costs and increase product competitiveness,
c. Increasing cooperation with sugar factories to obtain technical support and certified seeds, the use of appropriate technology to overcome pest and disease problems, increase production and increase investment in the necessary facilities / infrastructure,
d. Utilize available capital resources and obtain assistance from PG field officers to improve operational efficiency and maximize sugarcane yield quality,
e. Utilize experienced human resources and provide bonuses/premiums to maximize production yields and increase farmer income,
f. Use the potential strength of natural resources to face the challenge of transparency in setting yields and ensure fairness in pricing and farmer profits,
g. Optimizing profits from profitable sugarcane farming by utilizing bonus/premium payments as an incentive for farmers,
h. Increased cooperation with PG field officers and government assistance (agricultural extension assistance) in the development of more diverse sugarcane varieties,
i. Increasing the use of technology by utilizing obtaining PG Field Officer Assistance as an opportunity to optimize the production process and reduce production costs,
j. Improving inadequate facilities and infrastructure by utilizing the provision of bonuses / premiums as an incentive to improve the quality and productivity of farming,
k. Increasing the use of technology by dealing with climate change to increase adaptation and resilience of farming,
l. Development and implementation of technologies that can reduce dependence on high production costs, increase efficiency in the use of natural resources, and adjustment and adaptation to climate change to minimize negative impacts on sugarcane production,
m. Having experienced human resources to deal with the emergence of intermediary traders is expected that farmers do not depend on intermediary traders (middlemen) so that the maximum income is generated if sold individually to,
n. Overcoming weaknesses in the use of technology to maximize production yields and good yields and face transparency in setting yields and ensuring that the determination of yields is carried out fairly and accurately,
o. Sugarcane farming is profitable especially if you join APTRI. To improve supervision and control of sugarcane harvesting time, improve coordination with APTRI to overcome the problem of untimely harvesting.

REFERENCES

[1] S. N. Nurjayanti, Eka Dewi, "Analisis Kelayakan Usahatani Tebu," *J. Ilmu-ilmu Pertan.*, vol. 10 (1), pp. 60–68, 2014.
[2] Siregar dan Sulardi, *Agribisnis Budidaya Padi*. Medan Indonesia: Fakultas Pertanian Universitas Panca Budi, 2018.
[3] M. Deepanayaki, "Sugarcane Yield Classification and Prediction Using Light weight Deep Network," *Int. J. Intell. Syst. Appl. Eng.*, vol. 12, no. 2, pp. 207–213, 2024.
[4] M. Tayyab, "Sugar Beet Cultivation in the Tropics and Subtropics: Challenges and Opportunities," *Agronomy*, vol. 13, no. 5, 2023, doi: 10.3390/agronomy13051213.
[5] G. M. Sanches, "Towards greater sustainability of sugarcane production by precision agriculture to meet ethanol demands in south-central Brazil based on a life cycle assessment," *Biosyst. Eng.*, vol. 229, pp. 57–68, 2023, doi: 10.1016/j.biosystemseng.2023.03.013.
[6] M. Zhu, "The Impact of Agricultural Insurance on Farmers' Enthusiasm for Sugarcane Production: Evidence from Guangxi, China," *Sustain.*, vol. 15, no. 5, 2023, doi: 10.3390/su15054191.
[7] R. B. Dhumale, "Fuzzy Internet of Things-based water irrigation system," *Agric. Eng. Int. CIGR J.*, vol. 25, no. 2, pp. 1–10, 2023.

[8] H. G. Mawandha, "Mobile Application Implementation as Agriculture 4.0 Strategy for Sugarcane Yield Prediction," *Proc. 2023 9th Int. HCI UX Conf. Indones. CHIuXiD 2023*, pp. 23–27, 2023, doi: 10.1109/CHIuXiD59550.2023.10477167.

[9] M. M. Rulli, "Valorization of sugarcane vinasse for fungal biomass protein production: Potential application as fish feed ingredient," *Ind. Wastewater Reuse Appl. Prospect. Challenges*, pp. 49–61, 2023, doi: 10.1007/978-981-99-2489-9_3.

[10] H. M. de Souza Filho, "Adoption of farm management information systems (FMIS): The case of Brazilian sugarcane farmers," *Inf. Dev.*, 2023, doi: 10.1177/02666669231177864.

[11] A. S. Ghura, "Sarvaay Solutions – creating value innovation for farmers," *Emerald Emerg. Mark. Case Stud.*, vol. 12, no. 2, pp. 1–21, 2022, doi: 10.1108/EEMCS-01-2022-0018.

[12] N. Mhlanga-Ndlovu, "Socio-Economic Effects of Neoliberal Transformation on Irrigated Agriculture in Eswatini: A Case of Sugarcane Farmers' Groups in the Komati Downstream Development Project," *Adv. African Econ. Soc. Polit. Dev.*, pp. 203–218, 2022, doi: 10.1007/978-3-030-89824-3_10.

[13] H. D. Ziero, "Foresight for corn-to-ethanol mills in the Southern Brazilian Amazon: Energy, economic and environmental analysis," *J. Environ. Chem. Eng.*, vol. 9, no. 6, 2021, doi: 10.1016/j.jece.2021.106740.

[14] Rokhani, "Factors Affecting the Participation of Sugarcane and Tobacco Farmers in Farmer Groups, Associations and Cooperatives in Indonesia," *Caraka Tani J. Sustain. Agric.*, vol. 36, no. 2, pp. 340–354, 2021, doi: 10.20961/carakatani.v36i2.46817.

[15] F. Monteiro, "Current status and trends in Cabo Verde agriculture," *Agronomy*, vol. 10, no. 1, 2020, doi: 10.3390/agronomy10010074.

[16] M. Nunes, "Changes in invasive alien aquatic plants in a small closed estuary," *South African J. Bot.*, vol. 135, pp. 317–329, 2020, doi: 10.1016/j.sajb.2020.09.016.

[17] Nurjayanti, Eka Dewi SN. Analisis Kelayakan Usahatani Tebu. J Ilmu-ilmu Pertan. 2014;10 (1):60–8.

[18] Siregar dan Sulardi. Agribisnis Budidaya Padi. Medan Indonesia: Fakultas Pertanian Universitas Panca Budi; 2018.

[19] BPS JawaTimur. Provinsi Jawa Timur dalam Angka Tahun 2023. Surabaya: Badan Pusat Statistik Provinsi Jawa Timur; 2023.

[20] DPKP Bondowoso. Laporan Kinerja Pertanggungjawaban. Bondowoso; 2022.

[21] David FR. Manajemen Strategis. Jakarta: Salemba Empat; 2009.

[22] Yunus F. Manajemen Strategi Edisi Pertama. Yogyakarta Indonesia: Andi Offset; 2016.

[23] Ward P. Strategic Planning for Information Systems. New York: John Wiley & Sons, Ltd; 2002.