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Research Article

Strategies for Developing a New Shallot Center Area Through Innovation of Cultivation Practices and Post Harvest Technologies in Bengkulu

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Abstract

Background and Objective: An effective and efficient strategy for the development of shallot cultivation and agribusiness is required in Kaur District to improve shallot production in Bengkulu Province. This study aimed to identify internal and external factors determining both shallot cultivation expansion and agribusiness system, formulating development strategies based on the priorities of the analyzed attributes determined. **Materials and Methods:** The Kaur District related to the development of the Cawang Kidau irrigation area as a potential area for food estate development in Bengkulu Province. The Focus Group Discussion (FGD) was conducted to collect primer information and data from key informants related to the shallot farming development strategy. Data analysis using IFE analysis, EFE, IE (internal-external) matrix, SWOT matrix and QSPM analysis. **Results:** The strength attributes from internal factors affecting shallot farming development were land ownership by the farmers quite wide and water available continuously through irrigation supply and the weakness attribute for the shallot development were local farmer's institutions as well as farmer's associations limited activities. Furthermore, the external factor that threatened the expansion was agricultural inputs at high prices causing the farmers to cultivate shallot in low inputs. **Conclusion:** An appropriate strategy is an aggressive strategy (S-T) involving increasing shallot productivity and competitiveness through introducing good agricultural practices and technologies and government subsidies for agricultural inputs.

Key words: Agricultural practices and technologies, development strategy, innovation of cultivation, shallots farming, strategy of development

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Data Availability: All relevant data are within the paper and its supporting information files.

INTRODUCTION

Shallot is an important spice in the daily menu and processed food because of its unique taste and aroma¹. It is an economically important nutritive bulb vegetable and medicinal plant from the Alliaceae family². Shallot is a popular vegetable in Indonesia because it provides numerous health benefits. This vegetable is an important commodity having important value because it is used as a spice in dishes and as raw material for the food industry such as crispy fried shallots³. Shallot production in Indonesia in 2020 only reached 1,815,445 tons and this production is not enough to cover population demand⁴. With various environmental and agroclimatic conditions, the productivity of the shallot cultivation in Indonesia only reached in the range of 9-10 tons ha⁻¹⁵ which was much lower as compared to the world average of 18.8 tons ha⁻¹⁶. Also, the shallot production much depended on agroclimatic conditions causing the shallot supply out of cultivation season very limited⁷. Therefore, to fulfill the shallot consumption needs, Indonesian government should import every year when the shallot production is below the consumption demands. For example, in 2020 Indonesia imported shallots from Vietnam, Malaysia, Thailand was about 8.17 thousand tons⁸.

Shallot production in Indonesia mostly produced in some suitable areas, especially in Java which in 2020 this island contributed about 78.1% and the rest of 21.9% yields from the other islands⁹. The low production of shallots in the other islands especially in Sumatera caused the shallots in the market at high prices promoted economic inflation in these areas. Although Java still in high contribution to the shallot supply, unfortunately, some studies showed the shallot cultivation areas on this island facing leveling off and starting to nutrient exhausted¹⁰. So, that to fulfill the increased demands of shallot consumption in the future, expansion of the new land cultivation areas in the other islands likes in Sumatera, Kalimantan, Sulawesi should be implemented¹¹. The shallot extensification in the new potential areas out of Java hopefully could overcome the shallot production previously in deficit supply especially in the unsuitable periods in the rainy seasons¹².

Shallot cultivation in most areas of Indonesia is still in low productivity compared to their potential genetics yields which could reach 15 to 23.21 tons ha⁻¹¹³. The shallot productivity in low harvest because of some constraints such as using unselected local seed and cultivation practices not in accordance with the optimum requirement for shallot growth¹⁴. Agricultural productivity quite related to

determinant production factors such as agricultural inputs, crop varieties, cultivation infrastructures mainly irrigation facilities¹⁵. The shallot productivities have not achieved optimum following its potential genetic quite related to various cultivation practices by local farmers just simply following their previous cultivation practices¹⁶. Developing cultivation practices based on agricultural knowledge and technologies could promote improving crop productivity as well as the farmer's income and revenue¹⁷.

Development strategy was a crucial factor for shallot cultivation expansions to avoid some bias in reaching a productive goal. The strategy was important to push competitive advantages from local shallot production to raise the local market opportunities as well as the increasing farmer's income for their well being¹⁸. Shallot productivity and farmer income advantages from shallot cultivation were determined by some combination of the production factors implemented¹⁹. Shallot cultivation expansion faced with some problems such as technology adoption limited, high production costs, low available cultivation infrastructures, unavailable product price warranties and limited product processing industries therefore the development of shallot farming systems required a specific strategy to improve farmer's income and contribute to sustainable agricultural development²⁰.

The development of the shallot cultivation areas required strategic planning for a pursuing effective goal. Identification of various supporting factors and determinants coming from internal and external sources was the first important step in strategic planning for the expansion of agricultural areas²¹. Various internal and external factors affected significantly shallot agribusiness development²². Furthermore, these conditions should be considered in choice for finding an appropriate development strategy. Analysis of the internal and external factors for developing shallot cultivation areas could apply formulation matrices of strategy from internal factor evaluation (IFE) and external factor evaluation (EFE) as well as internal external matrix (IE)²³.

Research and development of the shallot cultivation in Bengkulu Province is very limited, especially in Kaur District therefore this study is very important for future development of the shallot cultivation development center. Cawang Kidau irrigation area in Kaur District Bengkulu Province is one of the potential areas because of available water in continuous supply for agricultural development. The Cawang Kidau irrigation area has potential not only for rice field but also for horticulture especially for the shallot cultivation center. This study focused on the identification internal and external

leverages and determinant factors to formulate the precious development strategy for the shallot farming system in the irrigated dry lowland in Kaur District Bengkulu Province.

MATERIALS AND METHODS

The Cawang Kidau irrigation area, Kaur District, Bengkulu Province covers about 1,325.25 ha lying on 103°13'-103°16' E and 4°24'-4°29' S with an altitude of 287 m above sea level. The previous study about shallot cultivation was conducted from August, 2022 to January, 2023 on the part of that area while the study focused on the identification of internal and external leverages and determinant factors to formulate the precious shallot development strategy was conducted from January to March, 2023.

Collecting data through Focus Group Discussion (FGD) and interviews with questionnaires at the Office of Regional Planning in Bintuhan City, Kaur District was obtained from 20 key informants interest in the development of the Cawang Kidau irrigation area for shallot extensification and intensification area. To identify some attributes for generating a questionnaire needed FGD invited some interested stakeholders²⁴. The key informants involved head office of -district development and planning, -agriculture, -food security, -public work, -central bureau statistics, the head division office of -horticulture, -water source, the head of Padang Guci Hulu Sub-District, Head of Manau IX 2 Village, head of village empowerment institution, head association of farmer institution, head of farmer institution, members of farmer institution and extension staff.

Analysis of the data was carried out through qualitative and quantitative descriptive analysis. Qualitative descriptive analysis was applied to get about the Strengths, Weaknesses, Opportunities and Threats (SWOT) of shallot farming cultivation at the Cawang Kidau Kaur District and the formulation of development strategies using the SWOT matrix. The matrix SWOT technique was the method for identifying some internal and external factors involving the strength and weakness attributes from internal factors and the opportunity and threat attributes from external factors. The internal and external factors related to the development of the Cawang Kidau irrigation area as the shallot cultivation center were identified based on the important values categorized into 5 levels such as (1) No important, (2) Rather important, (3) Important, (4) Important enough and (5) Very important. Some previous research used SWOT as an analysis tool to identify regional development strategy²⁵⁻²⁷. Meanwhile, the quantitative analysis uses the external factor analysis summary matrix (EFAS), internal

factor analysis summary (IFAS), internal-external (IE) and Quantitative Strategic Planning Matrix (QSPM)²⁸.

Statistical analysis: The technical formulation for design strategy could be developed in three frameworks for decision making involved: (1) Input stage, summarizing information input into the matrix of IFE and matrix of EFE. Weighting each factor with a scale from 1.0 (most important) to 0.0 (no important). The weighting method used was paired comparison with scores 1-4. (2) Matching stage, focuses on generating alternative strategies which suitable through aligned with the important internal and external factors. The second step involved the IE matrix and SWOT matrix. (3) Using QSPM, the QSPM revealed relative attractiveness from alternative strategies and provided objective basic reasoning in the choice of certain strategies. The QSPM formulates strategy rank for finding a list of decision priorities. The development steps of the QSPM matrix were as follows (a) Formulating strengths, weaknesses, opportunities and threats factors, which are likes IFE and EFE matrix, (b) Weighting with scores of each key internal and external factors, the weighting scores were the same as in IFE and EFE matrix, (c) Testing the scores of the matrices in b stage and identifying the alternative strategies which would be evaluated, (d) Determining attractiveness score (AS) range of 1 (no attractive), 2 (rather attractive), 3 (attractive enough) and 4 (very attractive), (e) Calculating the total attractiveness score (TAS), through multiply weighting score and AS value and (f) Calculating sum of total attractiveness score (STAS), finally the higher score indicated the more interesting strategy.

RESULTS AND DISCUSSION

IFE and EFE analysis: After the internal factors were identified as the strength and weakness attributes and the external factors identified as opportunities and threats attributes for the expansion of the shallot farming area in the Cawang Kidau irrigation area, then weighting and ranking were applied in each key attribute to generate IFE and EFE matrices. The IFE analysis for the development of shallot farming in this area were showed in Table 1.

The strength factor having the highest score (0.205) was the farmers hold land in wide areas with fully irrigated supply. Shallot required water supply in a high amount for optimum growth and yields. On the other hand, the lowest value of the strength factor was the local farmer institution/cooperation activity with score of 0.123.

Table 1: IFE Analysis for the shallot expansion in the Cawang Kidau area

Internal factors	Weight	Rating	Score
Strengths			
Farm land hold with good irrigation	0.04	4.71	0.205
High available farm labor	0.04	4.07	0.154
Fertilizers applied in optimum dosage	0.04	4.39	0.178
Own financial cost availability	0.04	4.04	0.151
Capital support from financial institutions	0.04	4.00	0.147
Farmers hold good management capacity	0.04	4.29	0.167
Soil tillage machinery availability	0.04	4.39	0.176
Fertilizers applied appropriate in quantity and time	0.04	4.32	0.170
Integrated pest, disease and weed control	0.04	4.07	0.151
Shallot harvested at ripe age	0.04	4.46	0.184
Harvested shallot maintained in good quality	0.04	4.36	0.174
Shallot warehouse/storage is in good condition	0.03	3.79	0.130
Marketable shallot after sorting	0.04	4.36	0.172
Local trader plays important rules	0.03	3.82	0.133
Local farmer institution/cooperation activities	0.03	3.68	0.123
Weaknesses			
Narrow land held by the farmers	0.03	3.54	0.115
Lack of experience in shallot cultivation	0.04	3.89	0.138
Unskillful farmer in shallot cultivation technologies	0.03	3.86	0.134
Farm labor in high wage	0.03	3.57	0.115
Lack of finances for shallot farming	0.03	3.82	0.131
Fertilizers unavailable	0.03	3.54	0.113
Pesticides unavailable	0.03	3.32	0.098
Agricultural machinery in limited used	0.03	3.21	0.092
High dependence on chemical fertilizers	0.04	3.82	0.134
No seed produced by themselves	0.03	3.43	0.107
Post-harvest processing technologies in traditional	0.03	3.43	0.107
Uncertain harvesting time	0.03	3.07	0.086
No warehouse in the location	0.03	3.11	0.087
No seed breeder organization	0.03	3.07	0.084
Total	1.00	111.43	3.896
Average	0.03	3.84	0.134

Primer data analyzed, 2023

The weakness factor giving the highest rank was the lack experience of the farmers cultivating shallot with score of 0.138. The lowest score of the weakness attribute (0.084) was no seed shallot breeder institution within and closed in this area. The shallot farmers still used seed from their own previous harvest.

The internal factor analysis for the shallot farming expansion in the Cawang Kidau irrigation area resulted the strength and the weakness responses with score difference about 0.87. This indicated the farmers had their own capacities to manage the strength factors overcoming the weaknesses ones. The internal factors identified in the strength condition with total score of 3.894 or above 2.5 with subtotal score of the strength factor of 2.41 and the subtotal value of 1.54 for the weakness attributes which much lower than the strength score. When the IFAS factor coming from the strength and the weaknesses attributes with the total values of 3.1 or more than 2.5 indicated the internal factors having strong position for the shallot cultivation expansion²⁹.

The expansion of the shallot farming area in the Cawang Kidau aimed to provide other alternative agricultural activity for increasing farmer's prosperous income and welfare within and the close area. Some unproductive land could be converted to the shallot cultivation area. The EFE for the shallot cultivation development in the Cawang Kidau showed in Table 2.

The highest score of the opportunity attributes was the providing farm job opportunities with a value of 0.179 while the lowest rank was the temporary post-harvest storage with a score of 0.122. In this area, the farmers keep the bulbs harvested at simple storage in their homes and some of them are not suitable for bulb storage.

The threat with the highest rank for the shallot cultivation development in the area was the high price of the chemical fertilizers in the market with a score of 0.143. The high price of fertilizers caused the farmers to provide agricultural input in a limited amount. The smallest value from the threat attributes was land tax with a score of 0.075.

Table 2: EFE analysis for the shallot expansion in the Cawang Kidau area

External factors	Weight	Rating	Score
Opportunities			
Improving new agricultural employment	0.04	4.39	0.179
Certificated seed provision	0.04	4.00	0.148
Transportation access to farm area	0.04	3.89	0.139
Good shallot development systems and planning	0.04	4.21	0.164
Good cultivation extension and monitoring	0.04	4.07	0.152
Area could be shallot production center	0.04	4.00	0.148
Capable paying farm labor	0.04	3.79	0.133
Suitable warehouse for keeping harvested bulb	0.03	3.71	0.127
Available a temporary bulb storage	0.03	3.64	0.122
Harvested bulb in good quality	0.04	4.14	0.161
Suitable marketing infrastructure	0.04	4.11	0.154
Shallot market in high demand	0.04	4.29	0.169
Market system and institution grow well	0.04	4.14	0.157
Government facility support	0.04	4.04	0.150
Threats			
Land rent increase	0.03	3.32	0.103
Land tax increase	0.03	2.82	0.075
Land use changes	0.03	3.36	0.103
Agricultural human resource in low educated	0.03	3.00	0.083
Low regional minimum wage	0.03	3.21	0.095
Chemical fertilizers in high price	0.04	3.93	0.143
Pesticides in high price	0.04	3.86	0.138
Limited fertilizers availability in local market	0.03	3.68	0.123
Limited pesticides availability in local market	0.03	3.64	0.122
Uncertain agro-climate promote pest and diseases	0.04	3.86	0.138
Unavailable post-harvest technologies	0.03	3.71	0.127
Lack of packaging brand	0.03	3.43	0.106
Production supply much lower than market demand	0.04	3.82	0.135
Un-continuous production and supply	0.03	3.61	0.120
Over supply from outer Bengkulu	0.03	3.57	0.116
Total	1.00	109.25	3.804
Average	0.03	3.77	0.131

Primer data analyzed, 2023

The difference external value between the opportunities and the threats attributes for the development of the Cawang Kidau as the shallot cultivation center was 0.38. If this value is above 2.5 the farmers had good capacities to utilize the opportunities facing the threat that arose and put the external circumstances of the opportunities stronger than the threat coming. The total score of the external factors was 3.804 with the subtotal coming from the opportunities, 2.10 comparing the threats with a lower subtotal value, 1.73. With the EFAS score of 2.75 which is above 2.5 indicates the external factors in the strong condition for agricultural development³⁰.

The IFAS value of 3.896 higher than the EFAS value of 3.804 indicated the IFE is in strong condition from the internal factors in utilizing the strength attributes to anticipate the weaknesses for the expansion of shallot cultivation in the Cawang Kidau. For that reason, the expansion of shallot cultivation should consider the strengths factors such as the farmers hold suitable land with unlimited water supply, farm labor in high availability, application of fertilizers in optimum

dosage, financial capital provided by themselves, the financial also provided by the commercial banks, good cultivation management hold by the local farmers, soil tillage machineries availabilities, fertilizers applied appropriated in amount and time, the farmers applied integrated pest, diseases, weed control, bulb harvested in ripe age, maintaining the quality of the marketed bulb, bulb storage in good condition, the market bulb sorted and local trader playing insignificant rules.

SWOT analysis: The shallot farming activities in the Cawang Kidau could be prosperous and expanded in the future because of the strength factors based on SWOT analysis showing the best strength of 2.41. The SWOT analysis for the development of the shallot cultivation area in the Cawang Kidau was shown in Table 3.

The weakness for the shallot expansion was indicated as high value, 1.54 fortunately the difference value between the strength and this weakness also in high score, 0.87. This circumstance should be considered for the shallot

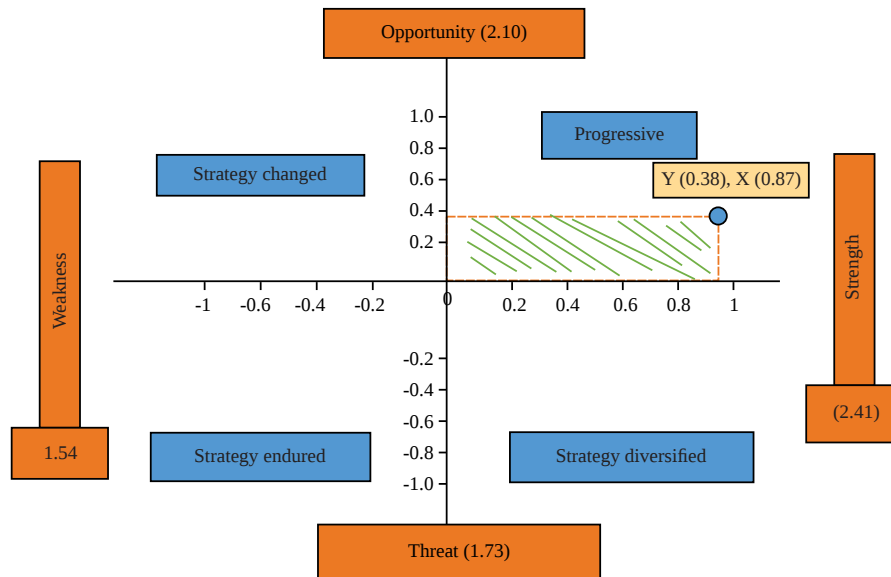


Fig. 1: Development strategies based on SWOT Analysis for shallot expansion in the Cawang Kidau

Data Primer Hasil Olahan, 2023

Table 3: SWOT analysis for the shallot expansion in the Cawang Kidau area

SWOT			
IFAS		EFAS	
S	2.41	O	2.10
W	1.54	T	1.73
X = S - W	0.87	Y = O - T	0.38

Primer data analyzed, 2023, IFAS: Internal factor analysis summary and EFAS: External factor analysis summary

cultivation expansion when some policies are decided based on promoting the strength attributes and the weakness attributes overcoming in a low risk. The EFAS analysis gave an opportunity score of 2.10, a high enough score however this was much lower than the ideal value for the shallot expansion in the accelerated time. The threat attributes from the external factors gave 1.73 points and this value suggested when the farmers expand the cultivation areas, they should consider how to smart choices in using and looking for opportunities and at the same time to minimize the threats that arise for the shallot cultivation expansion³⁰ in this area. The SWOT analysis diagram showed in Fig. 1.

Based on Fig. 1, quadrant I, a progressive strategy gave the best advantage for the shallot cultivation expansion in this area. The Cawang Kidau had high opportunity supported by the strength factors for the shallot development. The strategy applied in this condition was in line with the policies supporting aggressive growth. In quadrant II, strategy diversified, the expansion the shallot farming faced some threats however the expansion effort had some internal

strength factors. The strategy implemented should consider the strengths and opportunities in the long run with a diversified strategy of the products or markets. In quadrant III, strategy endured, the shallot farming expansion on one hand had a high opportunity, on the other hand, this effort could face with some internal constraint factors. Therefore, the development strategy should focus on minimizing the internal inhabitants to pursue the market opportunities³¹. In quadrant IV, the strategy changed, in this condition the shallot cultivation planning faced disadvantage factors from the internal threat and weakness attributes therefore the strategy should be changed. This model could be applied with the purpose of finding a more detail strategy considering the internal strength parameter as well as the external affect faced³².

The strategy for the shallot farming expansion based on the SWOT analysis in the Cawang Kidau, the external value was smaller than the internal score therefore the internal value could improve to overcome the external determinant. All external determinants appeared from the threat values

would be directly responded by the internal factors through alleviating the possibilities of failure. With the IFE value higher than the EFE one, the expansion of the shallot cultivation area could be implemented based on using the strength values to find the opportunity that appears. Furthermore, SWOT analysis revealed the X value lying on a positive score of 0.87 and the Y one also with positive value, 0.38. In short, from the SWOT quantitative evaluation for the shallot expansion area in the Cawang Kidau, the strategy lying in quadrant I with high advantage through the progressive strategy. On quadrant I the aggressive strategy applied to find the good opportunities as well as to maximize the strength factors affected positive purposes in the shallot cultivation expansion³³.

Alternative strategies: The matrix SWOT analysis put the strategy position for the shallot cultivation development in the Cawang Kidau lying in quadrant I as the progressive strategy (Table 4). From the matrix SWOT considering IFAS and EFAS would find alternative steps to improve the effective strategy for the shallot development. The alternative strategy applied as follow.

SO strategy (strength-opportunity): The SO Strategy was a combination of the strength attributes from internal factor and the opportunity ones from the external factors that appear from the logical thinking of how to use all strength attributes to find good opportunities for the shallot cultivation expansion:

- Expansion shallot cultivation area (S1, S2, S4, S5, S6, S7, S8, S10, S12, S13, O1, O2, O3, O4, O5, O6, O7, O9, O11, O12 and O13)
- Improving product quality (S1, S2, S6, S7, S8, S9, S10, S11, S13, O2, O3, O4, O5, O6, O8, O9 and O13)
- Improving product competitiveness (S1, S4, S11, S13, S14, O2, O5, O6, O9, O10, O11, O12 and O13)

ST strategy (strength-threat): The ST Strategy combines the strength attributes from the internal factors and the threat one from the external parameters with the purpose of finding the strategy how to overcome each determinant that caused the failure of the shallot cultivation development from outside:

- Improving cultivation technological skill (S1, S2, S3, S4, S6, S7, S8, S9, S10, S11, T1, T2, T3, T4 and T5)
- Increasing the shallot productivity (S1, S2, S4, S6, S7, S12 and S14)
- Government policies for agricultural input subsidize (S3, S8, S9, S11, S13, T1 and T2)

WO strategy (weakness-opportunity): This strategy could be implemented using all opportunities appeared with alleviating the weak factors on the shallot cultivation:

- Capacity building for human resources (W1, W2, W3, W4, O1, O4, O5, O6, O9 and O13)
- Partnership development with the financial institution (W3, O6, O7, O9 and O13)
- Government policies for agricultural input subsidize (W3, W4, O5, O9 and O13)

WT strategy (weakness-threat): The WT strategy was to find the optimal strategy with an in-dept evaluation of all the weak factors avoiding development failure:

- Partnership agreement with agricultural market institution (W1, W2, W3, W4, T1, T2, T3, T4 and T5)
- Development good agricultural practices (W1, W2, W3, W4, T1, T2, T3, T4 and T5)

QSPM analysis: The SWOT analysis found 11 strategies, then the strategies were given attractive values for QSPM analysis. The QSPM analysis was a technique to decide on the development strategy based on the strength and weakness attributes from the internal factors and the opportunity and threat attributes from the external factors identified by SWOT analysis³⁴. The alternative strategies for the shallot cultivation expansion in the Cawang Kidau based on SWOT analysis were shown in Table 5.

From the whole strategies then choose 5 strategies that had higher scores determining the prime strategies recommended for the shallot cultivation expansion in the Cawang Kidau. The main strategies were selected based on the highest TAS score from SQPM analysis (Table 6).

The first main strategy for the shallot cultivation expansion in the Cawang Kidau is how to improve the product competitiveness for the shallot market penetration. Improving the competitive advantage could be achieved through innovations therefore small and medium scale businesses should strengthen their performance and innovation capability³⁵. This strategy should be applied together with improving the shallot crop productivity. One of the ways to increase competitiveness is to act in the increase of productivity³⁶. Furthermore, it should be noted that competitiveness and productivity were complementary concepts and for competitiveness, it was necessary solid bases of productivity. Increasing the competitiveness and shallot productivity are quite relevant in this area because of well supporting conditions from the continuous water supplies

Table 4: Matrix SWOT analysis

IFAS/ EFAS	Strength (S)	Weakness (W)
	Farmers hold land with good irrigation High available farm labors Fertilizers applied in optimum dosage Their own capital for shallot cultivation Capital support from financial institution Good agricultural management Available soil tillage machineries Fertilizers applied in appropriate dosage and time Integrated pest, diseases and weed control Bulb harvest in ripe age Harvest bulb in high quality Bulb storage in good condition Marketing bulb after sorting Local trader playing the important rule	No experience farmers Lack of skillful labors in the shallot cultivation Lack of financial for the cultivation High dependence on agrochemical inputs
Opportunity (O)	SO strategy	WO strategy
Agricultural employment improved Seed quality availability Improving accessibility of transportation and agricultural machineries Good preparation and planning for shallot cultivation Empowering and monitoring for good cultivation practices Area could be the main area for shallot production Ability to pay labors Good post-harvest temporary storage High quality of the harvest bulb Market infrastructures availability High market demands Market institution in good development Government support	Expansion cultivation area (S1, S2, S4, S5, S6, S7, S8, S10, S12, S13, O1, O2, O3, O4, O5, O6, O7, O9, O11, O12 and O13) Product quality increase (S1, S2, S6, S7, S8, S9, S10, S11, S13, O2, O3, O4, O5, O6, O8, O9 and O13) Product competitiveness increase (S1, S4, S11, S13, S14, O2, O5, O6, O9, O10, O11, O12 and O13)	Human resources increase (W1, W2, W3, W4, O1, O4, O5, O6, O9 and O13) Partnership development with financial institution (W3, O6, O7, O9 and O13) Government support for agricultural subsidizes (W3, W4, O5, O9 and O13)
Threat (T)	Strategy ST	Strategy WT
Chemical fertilizers in high price Pesticides in high price Uncertain climate promoted pest and diseases attack Post-harvest technology in limited Product supply lower than market demand	Improving shallot cultivation skillful (S1, S2, S3, S4, S6, S7, S8, S9, S10, S11, T1, T2, T3, T4 and T5) Increasing shallot productivity (S1, S2, S4, S6, S7, S12 and S14) Government support for subsidize of agricultural inputs (S3, S8, S9, S11, S13, T1 and T2)	Partnership development with agricultural market institution (W1, W2, W3, W4, T1, T2, T3, T4 and T5) Develop program for cultivation technologies (W1, W2, W3, W4, T1, T2, T3, T4 and T5)

Primer data analyzed, 2023

Table 5: Alternative strategies for the shallot cultivation expansion in the Cawang Kidau

Strategy	TAS score
SO strategy	
Shallot cultivation expansion	5.330
Product quality improvement	5.238
Product competitiveness improvement	5.711
WO strategy	
Human resources development	4.545
Partnership development with financial institution	4.934
Government policies for fertilizers price subsidized	5.613
ST strategy	
Skillful improvement for shallot cultivation technologies	5.472
Increasing shallot cultivation productivity	5.685
Government support and policies for agro-inputs prices	4.706
WT strategy	
Partnership development with agricultural market institution	5.337
Program development for good agricultural practices	5.474

Primer data analyzed, 2023

Table 6: Main strategies for the shallot cultivation expansion in the Cawang Kidau

Alternative strategies	TAS score
Product competitiveness improvement	5.711
Shallot productivity improvement	5.685
Government policies for the fertilizers price	5.613
Program development for good agricultural practices	5.474
Skillful improvement for shallot cultivation technologies	5.472

Primer data analyzed, 2023

and using the certificated shallot seeds, the farmers having their financials, the harvested bulb in ripe age followed by the suitable post-harvest bulb storage, the market institutions and infrastructures in good availabilities, as well as the government policy, support for the shallot cultivation development. Increasing the shallot productivities and the market competitiveness in the new developing area should be initially facilitated with the government supports and subsidizes for agricultural inputs. This significant strategy should be implemented when the agricultural inputs in high prices while the farmers are unable to provide the inputs in high amounts. Without government policies for the inputs, subsidies could cause the shallot cultivation facing the harvest failed and the future shallot expansion in this area may be uncertain.

Improving crop productivity is the second effective strategy for shallot cultivation development in this area. Providing agricultural inputs and technological machinery through partnership development with financial institutions and government facilities and subsidies should follow this effort. However, before the mechanical equipment is applied, the farmer's knowledge and technical skills should be developed through useful extensions and training to overcome the unskillful human resources. An agricultural subsidy was a very strategic policy component to support the achievement goal of improving farming performance³⁷. Costs, product values, income and profits of all crops are positively affected by high levels of mechanization. For this reason, increase subsidies for the purchase of agricultural machinery, research and promote machinery suitable for farming in the market, improve mechanization and socialize agricultural services and use new farming tools and equipment to meet your needs. Enhancing farmers' ability to generate more operating profit is a wise decision³⁸. In short, an increase in shallot productivity in this area could provide market supplies for the local consumption and give a great opportunity for raising the farmer's income and welfare.

Most farmers in the Cawang Kidau have a lack of experience in the shallot cultivation technologies and post-harvest systems causing each farmer to cultivate their

lands for the shallot cultivation in a narrow area and few farmers have experience in post-harvest processing. Understanding the problems of the lack of experience in shallot cultivation held by the farmers, the government should create many training programs for improving human capacities in this area developed as a priority for the shallot cultivation expansion center. Inadequate skills and abilities in agricultural operations can result in reduced production³⁹. Moreover, the inability of farmers to develop their capacity, knowledge and skills is one reason why farming systems are so inefficient and disempowered.

Human resources having high knowledge and technical skills in shallot cultivation could work effectively and efficiently to produce in high bulb harvest. Also, with the well-known appropriate technologies could propose post-harvest processing and marketing systems with efficient costs and effective market penetration. Today the farmer's knowledge and technical shallot management both in the cultivation and post-harvest systems hold low capacities. With traditional knowledge and skill, shallot cultivation is produced in low bulb harvests and no warranty bulb qualities causing the farmer's income to face erratic conditions. Therefore, to overcome the lack of knowledge and the technological unskillful form of the traditional farmers, the government should empower the shallot farmers. Improving broad knowledge and appropriate technologies are important requirements for managing the business from an economic perspective⁴⁰. Expanded production with the basis of modern sciences and technologies maintained the business competitiveness in the long term⁴¹. Furthermore, upgrading the agricultural mechanization of the agricultural facility was a multilateral process, about increasing productivity, logistical and labor resources cost savings and optimization of business processes.

CONCLUSION

The Cawang Kidau irrigation area is the potential area for shallot cultivation expansion in Bengkulu because the farmers here hold land in wide areas with fully irrigated

supply however before the expansion, the local farmer institution/cooperation activities today should be empowered through sets of training and extension for the farmer's innovation capacities because of the lack experience of the farmers cultivating shallot. The shallot cultivation development in this area would create a wide range of farm job opportunities for the local societies. In some farms experiences in shallot cultivation, the farmers harvested low bulb yields because of the agricultural inputs applied in a limited amount. The farmers could not provide the inputs in a suitable amount due to the high price of the chemical fertilizers. The main strategy for the shallot cultivation expansion in the Cawang Kidau is to improve the product competitiveness for the shallot market penetration through increasing innovations capacity and capability for their shallot cultivation and business performances. Product competitiveness should work in line with increasing crop productivity because both competitiveness and productivity are complementary practices in the development processes. Next, the newly developing agricultural area should be initially facilitated with government support and subsidies for agricultural inputs because, without those, the expansion would face harvest failure and future shallot expansion toward uncertainties. Most farmers in the Cawang Kidau lack experience in shallot cultivation technologies and post-harvest systems therefore the government should create many training programs to improve human capacities. Without enough skills and competence in new agricultural activities could result in poor harvest and yields. Therefore, to overcome the lack of knowledge and the technological unskillfulness of the traditional farmers, the government should empower the shallot farmers. Giving the basis of the applied sciences and the appropriate technologies for the farmers would drive the shallot cultivation sustainability in certain goals.

SIGNIFICANCE STATEMENT

In Bengkulu Province, of 10 districts, only 1 district which suitable for the shallot cultivation area because of the area lying at a high altitude with medium temperature and the soil formed from volcanic ash. Kaur District, one of the districts in Bengkulu located far from the existing cultivation area would like to develop a new shallot cultivation however this district is located in the lowlands with high temperatures and the soil under marginal conditions. Therefore, the farmers knowledge and technical shallot management both in the cultivation and

post-harvest system hold at Kaur District in low capacities. Previous experiences from farmers cultivated the shallot in this area failed in bulbs harvested even the shallot growth short because of plant disease attacks. Therefore, developing the shallot cultivation area in the district requires new strategies involving improving broad knowledge and appropriate technologies both in the processes of the shallot cultivation and post-harvest innovation technologies.

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