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Analysis of Business Development Strategy with Fuzzy SWOT Method (Case Study in the Potato Chips SMES Cluster)

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ABSTRACT
Potato chips small and medium enterprises (SMEs) in Batu City were formed into 2 clusters (micro and small scale) based on production capacity, sales turnover, number of labor, and length of production operation. SMEs "Agronas Gizi Food" and "Gajah" are representatives from these clusters which have good performance. The level of competition for the potato chips SMEs is increasing, thus encouraging the owners to develop strategies for expanding the market. The problems faced by the potato chips SMEs include the unstable supply of raw materials and the inconsistent quality of potato chips. The purpose of this study was to analyze alternative business development strategies in the potato chips SMEs cluster based on supply chain institutions and product quality using the Fuzzy SWOT method. The variables were measured based on supply chain institutions (i.e. farmers to distributors) and the quality of the production (i.e. color, size, crispness, and consistency of shape) with two potato chips SMEs as respondents. The results showed that the alternative strategy for supply chain institutional development in the potato chips SMEs cluster, in particularly is increasing the cooperative model partnership in the supply of raw materials. The alternative strategy to improve product process quality is standardization in the production process and product quality based on SNI.

***Keywords**: Cluster, Potato Chips, Quality, Strategy, Supply Chain*

1. INTRODUCTION

Potatoes are one of the horticultural commodities with the highest productivity in Batu City. According to the Central Bureau of Statistics, in 2019, potato production reached 9.138 tons. High potato production became an opportunity for the potato-based production industry, specifically for potato chips product. Until 2021, there are 30 SMEs in Batu City that produce potato chips, from micro-scale to intermediate. Potato chips SMEs are classified based on production capacity indicator, operational duration, average monthly revenue, Halal certificate, and the number of labor. From these categories, the SMEs are grouped into 2 clusters. First, cluster 1st is a small-sized business such as Ramadjaja, Gizifood, Rimbaku, and Istana. Second, cluster 2nd is a micro-sized business such as Gajah, Santoso, Asli, Super, and Sri Rejeki.

To enhance the performance of the potato chips SMEs cluster, various development strategies are urgently needed enabling these SMEs to be more competitive. Many factors are important in business continuity, including supplier chain and quality control. Supplier chain control is critical due to its relation with the ingredients and quality, as well as precise delivery time. Furthermore, those aspects also affect the efficacy of the production process and the ability to fulfil the customers' needs [1]. To know the quality product matches the customers' demand, SMEs need to apply the quality control [2].

In development, there are many issues encountered, especially the supplier chain factor and quality control. Issues in the supplier chain include no standards on the supply quality, the fluctuated potato prices, and the unpredictable weather (or climate), which may affect the potato supplies. Issues in the quality control include simple tools and

production processes, which hindering the SMEs to produce products that fit with the quality standards. Furthermore, agro-industrial competitiveness can be created and improved through quality control activity and production control. The evaluating and fixing the production activity, promotions, and information relay to the manufacturer are parts of the improvement activities [3]. Utilizing and fixing the quality product is more important in determining competitiveness [4].

Therefore, a comprehensive analysis is needed, starting from internal to external surroundings in SMEs. Internal and external surroundings analysis results can be used as an evaluation for SMEs and as the basis for designing their improvement. The analysis is widely carried out using Fuzzy SWOT. Fuzzy SWOT is applied in the same way as SWOT analysis however, there is some fuzzy logic applied to tackle fuzzy factors in an issue. The fuzzy SWOT method is used for analyzing problems in internal and external factor, as well as for determining alternative strategies to be applied in SMEs based on the issues identified. This study aimed to analyze alternative business development strategies in the potato chips SMEs cluster based on supply chain institutions and product quality using the Fuzzy SWOT method.

2. MATERIALS AND METHODS

The respondents of this study were Agronas Gizifood SME (cluster 1st) and Gajah SME (cluster 2nd). The variables used include internal and external variables (Table 1). The fuzzy SWOT method is superior to the SWOT method; however, it differs with 3 conditions in which Fuzzy SWOT's matrix includes optimistic, probable, and pessimistic values. The fuzzy SWOT method was only used to design alternatives improvement and not to apply those alternatives to the SMEs.

2.1. Fuzzy SWOT

There were several steps in the Fuzzy SWOT's analysis, as follows:

2.1.1. Internal and External Analysis

The objective of internal surroundings analysis was to identify internal factors (such as strengths/S and weaknesses/W). Utilizing the strength can be used as an advantage for competitiveness. The weakness had to be minimized and fixed to face the changes in the future. The objective of external surroundings analysis was to utilize the opportunities (O) or anticipate the threats (T) that affect SMEs' continuity. This step as carried out by analyzing the internal and external surroundings variables, as shown in Table 1.

Table 1. Internal and external variables

Variables	Description	Variables	Description
S1	Short supply chain flow	W1	No standard on the potato supply specifications
S2	Fair gain for the supplier chain	W2	Potato buying with the contract system
S3	Good relation with the supplier	W3	Farmers or suppliers are also doubles as the SMEs owner
S4	Punctual material availability	W4	Diverse product quality standards
S5	Varied potato for easier quality control	W5	Machines and production process hinders the quality control
S6	Standard SOPs	W6	Limited R&D functionality and facility
Variables	**Description**	**Variables**	**Description**
O1	SMEs is located near the supplier	T1	The uncertain climate influence o the potato supplies
O2	The tools improvement for easier production	T2	Fluctuated potato prices
O3	SMEs carry out product innovation	T3	Increasing demand for potatoes

2.1.2. Internal and external valuing

The internal and external variables valuing were done by some expert respondents. By a linguistic scale (VL to VH), the expert respondents gave the values to the SMEs internal and external variables. The variable valuing scale can be seen in Table 2 [5].

Table 2. Variable rating scale

Scale	Description
VL	Very low variable influence
L	Low variable influence
ML	Moderate-Low variable influence
M	Moderate variable influence
MH	Moderate-high variable influence
H	High variable influence
VH	Very high variable influence

2.1.3. Converting Variable Value to TFN

Valuation results of internal and external variables were then converted into the Triangular Fuzzy Number (TFN) scale. The TFN showed the variable values in three conditions such as optimistic, probable, and pessimistic. The fuzzy SWOT's TFN value in this research was using a value scale from -4 to +6. The weakest position for the weaknesses scale or threat was showed with a value of -4 and for the strongest position for the strengths scale or opportunity with a value of +6. The value range for the TFN condition is as follows where pessimistic value ≤ probable ≤ optimistic. This stage was aimed to identify the three conditions (pessimistic, probable, and optimistic) in each internal and external variable. The scale obtained from TFN is illustrated in Figure 1.

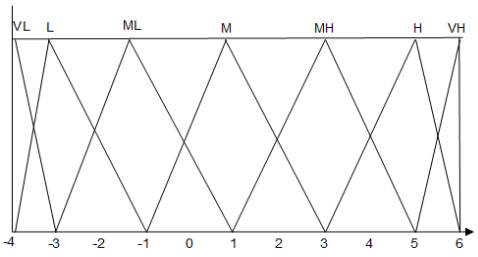

Figure 1 Fuzzy number linguistic scale [5]

2.1.4. Determining Variable's Average Value

The average variable value was obtained by adding values from every variable and dividing it by the number of respondents, as shown in Equation 1.

$$(A_{jk}B_{jk}C_{jk}) = \frac{1}{N}\left(\sum_{i=1}^{N} Ajk, \sum_{i=1}^{N} Bjk, \sum_{i=1}^{N} Cjk\right) \qquad (1)$$

Where:

A_{jk} = smallest value for pessimistic condition
B_{jk} = middle value for probable condition
C_{jk} = middle value for optimistic condition
N = number of respondents

2.1.5. Determining the Variable's Priority Scale

The priority scale valuation was based on consideration of how important the impact from variables to the SMEs. Each internal and external variable is valued in a 1 - 100 scale (Table 3). If the number of respondents is more than one then the average value is used.

Table 3. Priority Scale Fuzzy SWOT

Scale	Description
1-10	Absolute unimportant
11-20	Very unimportant
21-30	Unimportant
31-40	Little unimportant
41-50	Normal
51-60	Important
61-70	A little important
71-80	More important
81-90	Very important
91-100	Absolute important

2.1.6. Determining the Variable's Weight

Weighting the variable was aimed to obtain the weight value from every respondent. The weight value was obtained by adding the total value of all internal and external variables. The weight total from all variables (internal and external) was 1.

2.1.7. FIF and FEF Values Calculation

The average fuzzy value from every factor is based on the multiplication of every variable and the weight, as shown in Equation 2.

$$Aj = \sum_{k=1}^{nj} W_{jk}A_{jk}, Bj = \sum_{k=1}^{nj} W_{jk}B_{jk}, Cj = \sum_{k=1}^{nj} W_{jk}C_{jk} \qquad (2)$$

Where:

Aj = pessimistic condition variable value
Bj = probable condition variable value
Cj = optimistic condition variable value
Nj = number of variables
Wjk = each variable's weight value

2.1.8. FIF and FEF Total Calculation

The internal factors (FIF) and external factors (FEF) total value was obtained by adding the value from each variable.

2.1.9. Determining SMEs' Position in the Fuzzy SWOT Matrix

Determining the product's position or SMEs was carry out based on the FIF and FEF total value. The fuzzy's triangle area is shown with coordinates' majority location, where each area was inputted into the fuzzy SWOT's matrix. X-axis coordinate is from FIF's total value, while Y-axis is from FEF's total value. Overall, three coordinates were obtained based on the three conditions i.e pessimistic (X_1, Y_1), probable (X_2, Y_2), and optimistic (X_3, Y_3). Those coordinates formed a fuzzy SWOT triangle that signify the SME's position and most suitable improvement strategy within the SME's existing conditions.

The fuzzy SWOT matrix contained 4 quadrants: SO, WO, ST, and WT. Those four quadrants resulted in four combinations of improvement strategy alternatives. The fuzzy SWOT matrix difference was supported by three conditions: pessimistic, probable, and optimistic.

2.1.10. Determining the Gap between the Variables

The gap between FIF and FEF variables was calculated using Equation 3, below:

$$d[FIF, FEF]\frac{(a1 + 2a2 + a3) - (b1 + 2b2 + b3)}{4} \quad (3)$$

Where:
d = gap between FIF and FEF values
a1 = FIF pessimistic variable value
a2 = FIF probable variable value
a3 = FIF optimistic variable value
b1 = FEF pessimistic variable value
b2 = FEF probable variable value
b3 = FEF optimistic variable value

The internal influence is much bigger compared to the external if the value of FIF-FEF<0. This indicates that the basic strategy to be done was by fixing the product/SMEs's weakness and increasing the product/SMEs's strength, or vice versa.

2.1.11. Strategy Adjustment

The alternative strategy was formed based on the SWOT factors and reviewed based on the fuzzy SWOT calculation and the position in the matrix. Therefore, severak alternative strategies may be obtained from SO, WO, ST, and WT strategy combinations.

3. RESULTS AND DISCUSSION

3.1. Valuing Internal and External Variable Analysis

The results of internal and external variable values by the respondent were converted into the TFN values. Based on the TFN scale, it was found that the values from each variable in pessimistic, probable, and optimistic conditions. Table 4 shows the linguistic value from VL to VH provided by the respondents.

After valuing the internal and external variables, weighting was done by giving the value using a scale from 1 - 100. Average weight obtained from weight total on each variable divided by the number of respondents. Table 5 shows weight given by the respondent.

Table 4. Valuing internal and external variable

Internal Variable	**R1 (Agronas Gizifood)**	**R2 (Gajah)**
S1	ML	VL
S2	MH	VH
S3	VH	H
S4	H	ML
S5	VH	H
S6	H	MH
W1	MH	L
W2	L	L
W3	L	VL
W4	M	VL
W5	VH	M
W6	ML	VL
External Variable	**R1 (Agronas Gizifood)**	**R2 (Gajah)**
O1	H	VH
O2	MH	VL
O3	M	L
T1	VH	MH
T2	M	MH
T3	M	M

Table 5. Weighting internal and external variables

Internal Variable	R1 (Agronas Gizifood)	R2 (Gajah)
S1	40	90
S2	90	90
S3	100	100
S4	50	100
S5	100	100
S6	90	90
W1	60	50
W2	50	10
W3	30	10
W4	50	10
W5	90	80
W6	40	60
External Variable	**R1 (Agronas Gizifood)**	**R2 (Gajah)**
O1	80	100
O2	70	100
O3	60	100
T1	90	80
T2	50	80
T3	60	90

Next was calculating the FIF and FEF values. FIF value as obtained from the average addition value between the average internal variable value multiplications (Ajk, Bjk, Cjk) for every condition with internal variable average weight (Wjk). The same procedure was applied to FEF calculation (external variable). Based on the calculation, obtained the FIF and FEF values are shown in Table 6 for three conditions.

Table 6. FIF and FEF values

Condition	FIF	FEF
Pessimistic	0.462	0.472
Probable	1.924	2.028
Optimistic	3.114	3.475

3.2. Fuzzy SWOT Matrix

The fuzzy SWOT matrix was adapted based on the FIF and FEF calculation results. FIF values determined the X-axis coordinates, while FEF values determined the Y-axis. Pessimistic condition was on the coordinate (0.462 ; 0.472), the probable condition was on the coordinate (1.924 ; 2.028) and the optimistic condition was on the coordinate (3.114 ; 3.475). These three conditions were on the SO quadrant. This demonstrated that improvement alternative strategy is determined based on the strength and opportunity (SO quadrant). The fuzzy SWOT matrix for the potato chips SMEs can be seen in Figure 2.

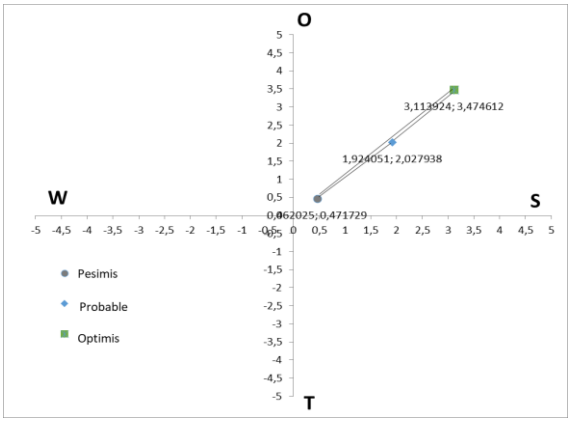

Figure 2 Fuzzy SWOT matrix

3.3. Internal and external variable gap

The calculation of the gap between FIF and FEF was needed to determine the most influential factor, either the internal or the external factors. FIF and FEF gap value calculation was calculated using Equation (3), obtaining the gap value between FIF and FEF of -0.144. If the FIF – FEF was < 1, then the internal factor was more influential than the external factor. Therefore, the results of this study indicated that the internal factor ws more influential towards the potato chips SMEs cluster development rather than the external factor. This result was in agreement with previous study reported by Nurcahyono et al. [6].

3.4. Strategy Adjustment

The fuzzy SWOT matrix showed the strategy alternative for improving SME potato chips was based on the first quadrant or SO strategy. SO strategy is to utilize all the opportunities and optimize the strengths of the company [7]. SO strategy is the best strategy as imposes the company to utilize the opportunities all around. The most appropriate strategy is the strategy that is development-oriented which the condition is profitable for the company [8]. Several alternative strategies potential to be implemented in the potato chip SMEs, include (1) technology implementation in the production process for increasing the product's quality, (2) product innovation by utilizing the

availability of raw materials, (3) improvement in the raw material purchasing system with a good cooperative relationship between suppliers and producers, and (4) adjustment in the raw material handling.

3.4.1. SO strategy adjustment: Technology implementation for improving product's quality

The utilization of technology in the production process is critical for the potato chips SMEs. For quality improvement, the SMEs can evaluate the external factor, such as determining the value needed by the customer and product value that can be enhanced by benchmarking with the competitor. In that condition, the SMEs need to integrate the technology, external knowledge, and internal skills for adapting to the market condition [9]. Some methods can be used on improving product quality, such as the introduction of the product or service, the improvement of the materials and components, the simplicity of use, the improvement of the technical specification, etc [9]. An example of the use of technology for potato chip producers is a chopper machine designed to cut the potato chips to make a uniform shape and size. Consistency in the shape and size of potato chips is one of the consumer's requirements [10].

Besides for made a consistent size and shape of potato chips, a semi-automatic slicer can be used to decrease the material's preparation time, thus reducing the processing time. By applying the slicer, the result of market sales increased up to 77-80%. This was possible due to an improvement in the appearance of potato chips include a consistent size, shape and quality [11].

3.4.2. SO Strategy adjustment: Product innovation by utilizing the availability of raw materials

The innovation of potato chips is needed to face an increasing market competitiveness and product diversification. The potato chips SMEs innovation is not only for the competitor of other potato chips, but also the other typical snack from Batu City (such as apple chips, snake fruit chips, and beverages). The SMEs cannot dominate the market only based on a variation consumer needs or rapid technological development at a long period just with one product variant. Therefore, the SMEs need to utilize external knowledge, internal skills, and integrated technology for facing and solving innovation problems [9].

In conducting product development, there are important aspects to be considered, specifically the availability of raw materials. The new product produced must be manufacturable, where the product has the convenience of being continuously produced [12]. The availability of raw material for potato chips is an opportunity for producers to carry out product development. Various approaches may be applied to achieve the innovative product of SME, such as improving an attribute of a new product, developing the consistency of product quality level, and improving the model and size of products [13].

3.4.3. SO strategy adjustment: Improvement of the raw material purchasing system with a good cooperative relationship between suppliers and producers

The material availability is related to the supply chain management of SME. The short supply chain supports the SMEs in controlling and improving material procurement. Developing the supply management of the SMEs is one of the strategies that can be used to increase competitiveness. It is because the supply chain is related to how big the SMEs have already achieved the effectiveness and efficiency [14]. Low quality of the raw materials, , can result in significant issues, especially in the food processing industry. The raw material purchasing strategy is classified into two main categories, include spot market and forward purchasing mechanism-contract. The spot market is flexible, practical, and does not require market analysis. However, the producers cannot choose raw materials at lower prices and there might be various uncertainties in the price sector and continuity of supply. While, in the forward purchasing mechanism contract, producers can communicate the need for raw materials and prices in the form of an agreement [6]. The SMEs apply the Just-in-time method on the material procurement where the SMEs bought the potatoes right before the production process. This procurement method allows the SMEs to reduce the idle activities, inventory, and work-in-process, as well as to eliminate unqualified suppliers [15].

3.4.4. SO strategy adjustment: Adjustment of the raw material handling

Various factors cause the inventory loss, such as respiration of the potatoes, germination, evaporation, potato disesase, physical properties change, chemistry

ingredients, and extreme temperature. These factors are occurred because of the inventory condition [16]. Therefore, the appropriate inventory control is important. The increase of capital and inventory cost is incurred when the material stock is increased. If the material stock is reduced it can cause stock out. The cost of procuring an emergency stock is more expensive. Besides, no inventory control can hamper the production process and may lead to unsatisfied customers [17]. The material handling system on the company is a compulsory activity in an industry [14]. The total material handling cost is up to 30-75% of the total production cost. The material handling system efficiency can reduce company operational systems by as much as 15-30% [18]. Some approaches can also be used to increase the production process, specifically using proper material handling tools. A proper material handling tools aimed to improve the efficiency material flows, to utilize the facilities and to enhance the productivity [18]. The duration of storage and drying time of potatoes affects the quality of potato chips. Potato chips produced from potatoes previously stored for 1 day and dried at 50° for 20 hours were the most preferred quality potato chips by the panelists [19].

4. CONCLUSION

An increase competition in the potato chips SMEs in Batu City encouraged the manufacturer to improve their performance. Various issues in improving the SMEs include: no standards quality is available for the potato supply, the fluctuated potato price, uncertain weather or climate, as well as the conventional machinery and technology. Such problems hinder the potato chips SMEs to produce the products with high quality standards. The findings in this study showed that, based on the internal and external analysis, the potato chips SMEs cluster are located in the SO quadrant. An alternative strategy that can be applied include (1) technology implementation in the production process for increasing the product's quality, (2) product innovation by utilizing the availability of raw materials, (3) improvement of the raw material purchasing system with a good cooperative relationship between suppliers and producers, and (4) adjustment of the raw material handling.

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