The Mapping of Sustainability Index in Small and Medium Enterprises: A Case Study in Lampung Indonesia

Lintang Harwina Madyaratry *, Hartrisari Hardjomidjojo, Elisa Anggraeni
Teknik Industri Pertanian, Fakultas Teknologi Pertanian Institut Pertanian Bogor, Indonesia
Jl. Raya Dramaga, Babakan, Bogor, West Java 16680, Indonesia
*Corresponding author: lintangharwina@gmail.com

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ABSTRACT

Small-medium enterprises (SMEs) generally have constraints on their performance efficiency and productivity. It affects the ability of SMEs to compete in the global market. Therefore, the mapping of SME conditions needs to be analyzed. This study aims to map the SME conditions and find out SME's sustainability index. This study uses a multidimensional scaling method through ecological, social, economic, technological, and institutional dimensions. A case study was carried out at Banana Chips SMEs in Lampung Province. These SMEs are the mainstays of Lampung Province. The results show that the SME condition was divided into three categories: poor, good, and very good. The status of the sustainability of SMEs in each dimension was divided into two groups: the poor category for the technology dimension and the good category both for the ecological, social, economic, and institutional dimensions. The results of the mapping of SME's sustainability index produced several improvement strategies for SMEs.

1. Introduction

Small Medium Enterprises (SMEs) is a business that needs to get the most attention from the government. It is since SMEs have a significant role in the Indonesian economy. According to Tambunan [1], the central function of SMEs in the Indonesian economy is as a job provider. More than 90% of their employees are women and young people. Therefore, SMEs may become the source of both primary and secondary incomes for Indonesians. Following the objectives of Law No. 20 of 2008 [2], SMEs need to obtain the opportunity, support, protection, and development as a people's business. These are expected to help SMEs grow and improve their competitiveness.

One of the popular SMEs in Indonesia is banana chips SME. These SMEs, however, have several significant constraints and obstacles, such as efficiency and productivity performance [3]. It may affect the ability of SMEs to compete in the global market. Research on SMEs has been carried out to implement innovative strategies to improve SMEs' competitiveness [4]. Management capabilities such as technical abilities, access to information, and managerial abilities as determinants of the success of the banana chips

SMEs [5]. In the product life cycle of banana chips, the products have decreased due to the lack of influence of business infrastructure supports and environmental risks [6].

Performance improvement of the banana Chips SMEs can be realized using the sustainability index [7]. A sustainability index is a tool that can determine the sustainability status of a business. Some techniques have been carried out to assess the sustainability in the fisheries sectors [8] [9] [10]. In addition, sustainability index has been developed for measurements in sugar industry [11], rice availability [12], environmental management [13], livestock waste treatment [14], cocoa plantations [15], island sustainability index in Indonesia [16], and oil palm [17] [18].

Although many studies on the sustainability index have been carried out in various fields, very little attention has been given to the SME sector. This study aims to map the sustainability index at the banana chips SMEs in Indonesia. This study employs a Multidimensional Scaling (MDS) method with the RAPFISH (Rapid Appraisal for Fisheries) approach. The MDS method is chosen as it has been proven to produce a stable solution [19]. This study uses five dimensions: ecological, social, economic, technological, and institutional dimensions [12]. This study is expected to generate significant insights into mapping the sustainability index of the banana chips SMEs in Indonesia. Therefore, this study provides a significant contribution to research on the sustainability index in SMEs. This paper consists of four sections. Section 1 discusses the introduction, literature review, and research objectives. Section 2 explains the dimensions and attributes, data collection, and data analysis. Section 3 presents the results of the sustainability index assessment and the effects of the attributes on the sustainability index. The last section discusses the conclusion and suggestion for further research.

2. Methods

This section comprises dimensions of attributes, data collection, and data analysis procedure. The stages are explained as follows.

2.1 Dimensions and Attributes

The data collection began with a literature study to determine the study's dimensions, attributes, and indicators. The dimensions were ecological, social, economic, technological, and institutional dimensions. The determination of attributes and indicators was by each dimension. According to Hartono et al. [20], the ecological dimension is the dimension that reflects the good and bad quality of the environment and resources. The social dimension is the dimension that reflects the human social system. The economic dimension reflects an activity obtaining financial results. The technological dimension reflects the use of resources in using technology. The institutional dimension refers to the rules of an economic activity that can guarantee and support the activity. Twenty-five attributes were used to assess the sustainability index of the banana chips SMEs. The dimensions and attributes were reviewed by experts to ensure the suitability of aspects of the sustainable index. These are presented in Table 1 and Table 2.

2.2 Data Collection

This study was conducted at twelve banana chip SMEs in the province of Lampung, Indonesia. It made use of twenty-five attributes that corresponded to the condition of the banana chips SMEs. Furthermore, the dimensions and attributes were reviewed by some experts. The experts included academics, the head of the banana chips SME center, the officer of the Ministry of Cooperatives and SMEs of Lampung Province, the officer of the

Cooperatives and SMEs Office of Bandar Lampung, and the officer of the Ministry of Trade of Lampung Province.

Table 1. Attributes and indicators of banana chips SME

Dimension	Attribute	Reference	Scale Indicator
Ecology	Total workforce	Ardiana dan Brahmayanti [21]	0: None 1: 1-5 People 2: 6-10 People 3: > 10 People
	Workforce experience	Zahro dan Suyadi [22]	0: No experience 1: Less than one year of experience 2: More than one year of experience
	Special Training	Hidayati *et al.* [23]	0: None 1: 1-3 times per year 2: More than three times per year
	Availability of raw materials	Wuryandari dan Meilani [24]	0: Hard to obtain 1: Easy to obtain 2: Very easy to obtain
	Sustainability of raw material availability	Wuryandari dan Meilani [24]	0: Weak 1: Moderate 2: Strong
	Generated waste	Cahyana *et al.* [25]; Erviana *et al.* [26]	0: Available (More) 1: Available (Litle) 2: None
	Waste Management	Cahyana *et al.* [25]; Erviana *et al.* [26]	0: None 1: Available
Social	Source of suppliers	Rostamzadeh dan Sofian [27]	0: 1 Supplier 1: 3 Suppliers 2: > 3 Suppliers
	Number of resellers	Rostamzadeh dan Sofian, [27]	0: None 1: < 10 Resellers 2: > 10 Resellers
	Relationship with suppliers	Subroto *et al.* [28]; Anam dan Setyawan [29]	0: No relationship 1: Weak relationship 2: Good relationship
	Relationship with resellers	Subroto *et al.* [28]; Anam dan Setyawan [29]	0: No relationship 1: Weak relationship 2: Good relationship
	Relationship with other SMEs	Subroto *et al.* [28]; Anam dan Setyawan [29]	0: No relationship 1: Weak relationship 2: Good relationship
	Relationship with the community	Subroto *et al.* [28]; Anam dan Setyawan [29]	0: No relationship 1: Good relationship
Economy	Marketing area	Nuseto [30]	0: Local 1: Inter-island 2: Export
	Price	Rostamzadeh dan Sofian, [27]	0: > IDR 40,000 1: IDR 40,000 2: < IDR 40,000
	Demand	Rostamzadeh dan Sofian, [27]; Nuseto [30]	0: Low 1: Moderate 2: High
	Profit allocation for investment	Law No. 20/2008 [2]	0: Not available 1: Available

Table 2. Attributes and indicators of banana chips SME (continue)

Dimension	Attribute	Reference	Scale Indicator
Technology	The useful life of the machine	Parinduri et al. [31]	0: > 10 Years 1: 5-10 Years 2: < 5 Years
	Machine technology	Utari dan Dewi [32]	0: Not using new technology 1: Using modern technology only in the primary process 2: Using new technology in all processes
	Processing Technology	Utari dan Dewi [32]	0: Not using new technology 1: Using modern technology only in the primary process 2: Using new technology in all processes
	Process Standardization	Susanto et al. [33]	0: Not yet implemented 1: Will be implemented 2: Has been implemented
Institution	Relationship with regional offices	Foghani et al. [34]	0: No relationship 1: Weak relationship 2: Good relationship
	Relationship with research and education institutions	Foghani et al. [34]	0: No relationship 1: Weak relationship 2: Good relationship
	Relationship with other private sector institutions	Foghani et al. [34]	0: None 1: Available
	Roles of banana chips SME center in the community	Sumaryana [35]; Foghani et al. [34]	0: No contribution 1: Contributive 2: Very Contributive

The next stage constituted giving a score of each attribute. The scores were obtained through direct interviews and questionnaires to twelve banana chip SMEs. The scales used for each indicator can be seen in Table 1 and Table 2.

2.3. Data Analysis

Twelve SMEs were mapped with the multidimensional scaling analysis based on the Rapid Appraisal for Fisheries (RAPFISH) approach of bad (0%) and good (100%) [36]. The classification of the sustainability index of the SMEs is divided into four categories: the sustainability index value < 25% shows a very poor condition of SME; the sustainability index value ranging from 25,00 to 49,99% indicates a poor condition of SME; the sustainability index value from 50 to 74,99% shows a good condition of SME, and the sustainability index value ≥ 75% demonstrates a very good condition of SME [8].

The data were validated using stress and R^2 values. Monte Carlo analysis was also used for the attribute validation. It was to ensure that no error appeared in measuring the value of the sustainability index [13]. A low-stress value indicates a good fit. The best stress value category is a stress value that is smaller than 0.25 (S <0.25). It is the ideal value to describe the condition of banana chip SMEs. Furthermore, a high-stress value indicates that it cannot represent the actual condition. The tolerance limit of this value is 0.25 [36]. The value of R^2 also shows data accuracy. It also explains whether or not the addition of attributes is needed. R^2 is good if it is > 0.8. However, if the value of R^2 is < 0.8, the attribute addition is required [13].

After the data validation, leverage analysis was carried out. This analysis was used to determine the attributes that affect the sustainability index. The results of this analysis are displayed in the form of bar charts. The attributes with high values indicate a strong influence on the improvement of the sustainability index [8].

3. Results and Discussion

3.1 Sustainable Index

According to the stress and R2 values, the attributes used were appropriate as they constituted the stress value less than 0.25 (S <0.25) and R2> 0.8. The results of stress and R2 values are shown in Table 3. Furthermore, the Monte Carlo analysis results are presented in Table 4 (with a 95% confidence level). The Monte Carlo value on the sustainability index constituted only a small gap. It shows that the scoring error of each attribute was relatively low. It also confirms that the analysis process was carried out firmly, and errors could be avoided.

Table 3. Stress and R2 values on the sustainability index of banana chips SMEs

Dimension	Stress value	R2 value	Sustainability index value (%)	Category
Ecology	0.20	0.91	52.47	Good
Social	0.15	0.94	70	Good
Economy	0.19	0.93	56.88	Good
Technology	0.22	0.93	31.24	Poor
Institution	0.17	0.93	64.3	Good

Table 4. Monte Carlo values on the sustainability index of banana chips SMEs

Dimension	Sustainability index value (%)	Monte Carlo value	Gap
Ecology	52.47	52.33	0.14
Social	70	69.95	0.05
Economy	56.88	56.54	0.34
Technology	31.24	31.73	0.49
Institution	64.3	64.71	0.41

The sustainability index of the banana chips SMEs in Bandar Lampung is presented in Fig. 1. The figure shows the average index values of the twelve SMEs. Based on the figure, the sustainability status of the banana chips SME has divided into two categories: poor category went to the technological dimension (31.24%); meanwhile, and good category belonged to the ecological (52.47%), social (70%), economic (56.88 %), and institutional dimensions (64.3%).

Furthermore, the sustainability index values of each banana chip SME are presented in Table 5. The sustainability status of twelve banana chips SMEs is divided into poor, good, and very good categories. SMEs that belonged to poor category included SME 1, SME 2, SME 9, and SME 11. SMEs with good categories were SME 4, SME 5, SME 6, SME 7, SME 8, SME 10, and SME 12. Meanwhile, SMEs with a very good category were only SME 3.

To test the influential attributes, this study employed the root means square value of the leverage analysis. The higher the value of root means square, the higher the

influence of the attributes on the sustainability index's status. The root means square resulted from the leverage analysis are presented in the following sections.
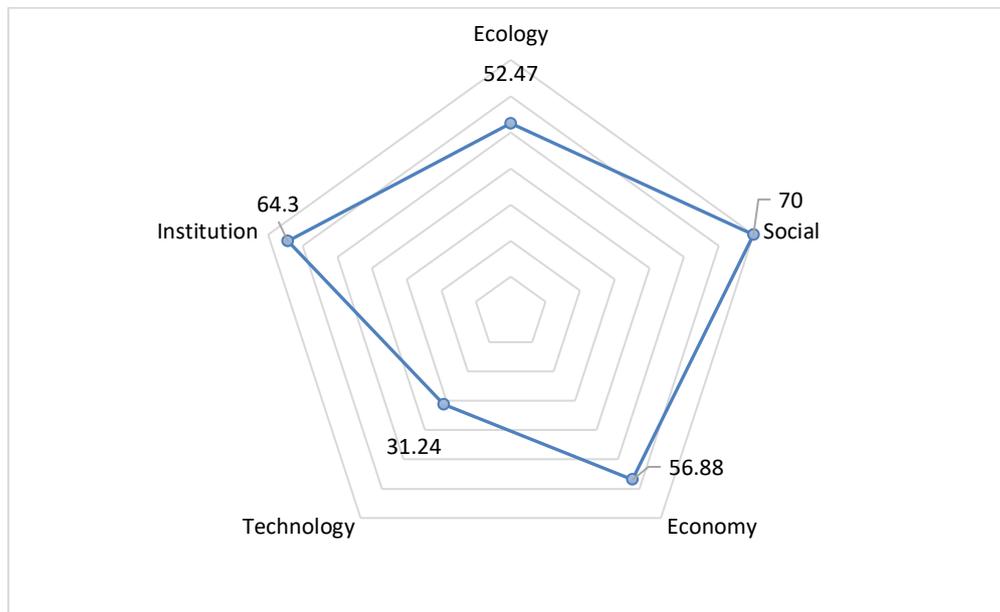

Fig. 1. Chart of the sustainability index (in percent) of banana chips SMEs

Table 5. The sustainability index values and status of banana chips SMEs

Name of SME	Sustainability index value (%)	Category
SME 1	42,59	Poor
SME 2	40,14	Poor
SME 3	75,73	Very good
SME 4	50,47	Good
SME 5	63,56	Good
SME 6	51,22	Good
SME 7	66,70	Good
SME 8	59,95	Good
SME 9	39,95	Poor
SME 10	58,16	Good
SME 11	45,80	Poor
SME 12	65,44	Good

3.2 Influence of the attributes on the sustainability index

3.2.1. Ecological Dimension

Based on the leverage analysis in Fig. 2, the attribute that influenced sustainability in the ecological dimension the most was the experience of the workforce. This finding is in line with Zahro and Suyadi [22]. They argue that work experience is an essential factor for increasing work productivity. Their study shows that the experience of the workforce has a significant influence on the performance of SMEs. Meanwhile, Alhempi and Harianto [37] explain that training had a significant impact on the

development of SMEs. It is different from the result of this study. The result of this study indicates that training had a relatively small effect on the development of SMEs.
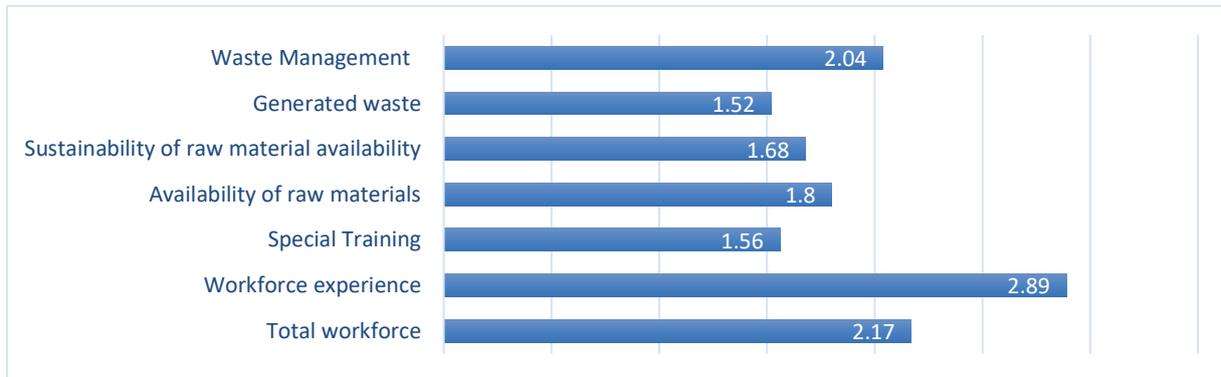

Fig. 2. Leverage graph analysis of the ecological dimension

3.2.2 Social Dimension

The result of the leverage analysis of the social dimension is shown in Fig. 3. The most significant attributes affecting the sustainability index were the relationship with other SMEs and the number of resellers. The relations among SMEs have already been good. However, in the present day, not all SMEs have coordinated activities to expand their market. The banana chip resellers are mostly permanent; but, the number of these resellers is relatively small. Meanwhile, the number of temporary resellers (from online) affects the sustainability index of SMEs. This result is by Hapsoro et al [38]. Consequently, SMEs are expected to innovate to keep up with the present-day technological development continuously. SMEs that have not utilized digital media have to change immediately, as Ahmad et al. [39] explain that social media can increase the brand awareness and experience of a product [39].
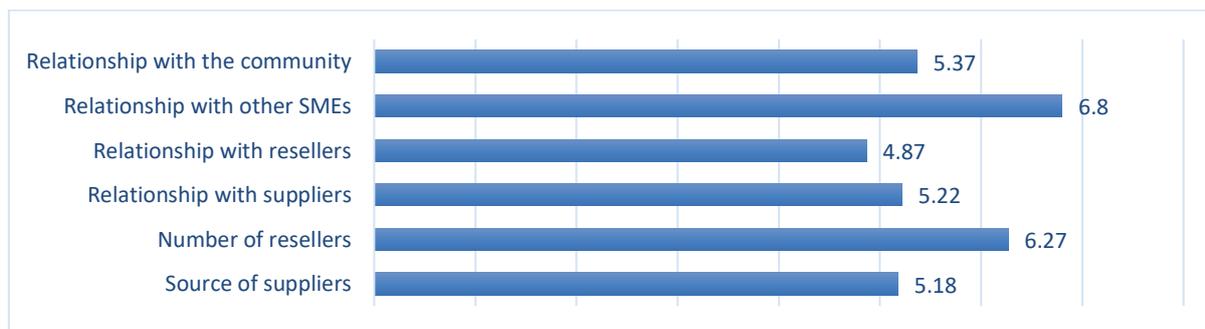

Fig. 3. Leverage graph analysis of the social dimension

3.2.3 Economic Dimension

Fig. 4 demonstrates that the most critical attribute for the sustainability index of the economic dimension was the marketing area. The marketing area was proportional to the number of resellers in the social dimension. It indicates that banana chips SMEs are still minimal in utilizing the technology in expanding their market share. Some SMEs nowadays have started to market their products using technology. However, some other

manufacturers still rely on store sales. Thus, The banana chips SMEs need to keep up with the changes in the market behavior to increase the values of their sustainability index.
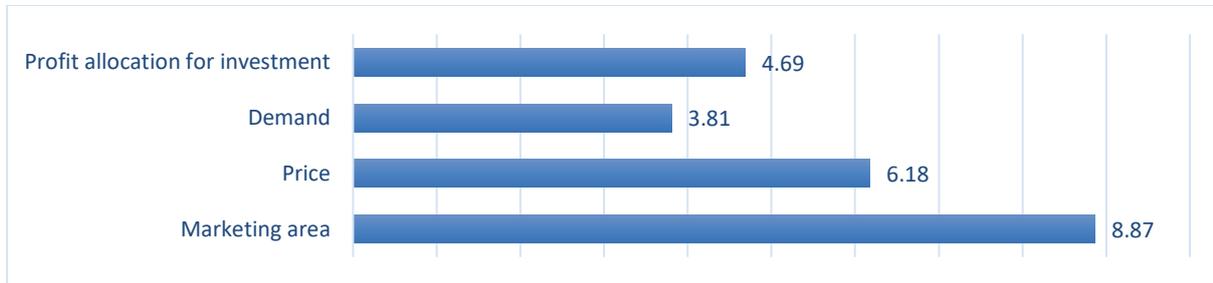

Fig. 4. Leverage graph analysis of the economic dimension

3.2.4 Technological Dimension

The result in Fig. 5 demonstrates that the most dominant attribute on the technological dimension is the machine's useful life. The machine has an economic age that is not profitable, although it can still be used well [31]. Therefore, banana chips SMEs need to change their machine regularly.
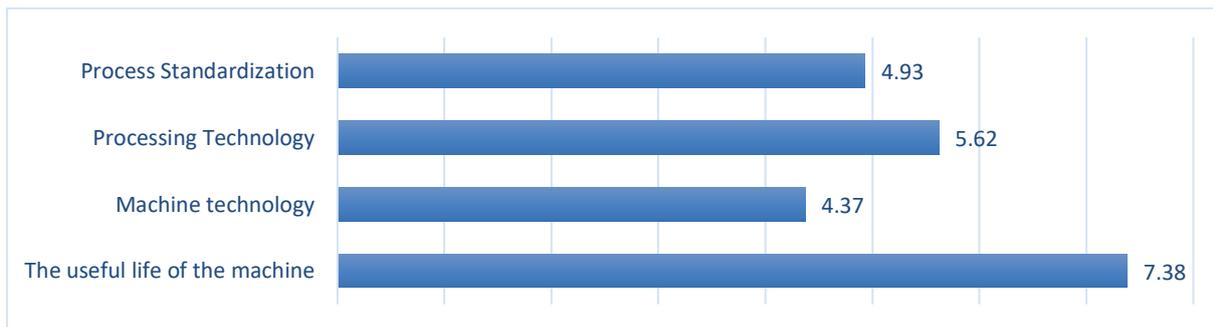

Fig. 5. Leverage graph analysis of the technological dimension

3.2.5 Institutional Dimension

Fig. 6 shows that the role of the banana chips SME center contributed significantly to the value of the sustainability index. The role of the SME center is mainly to help the SMEs in their marketing. Besides, the SME center and local government need to collaborate to introduce banana chip products. This research is by the study conducted by Lestari [40].
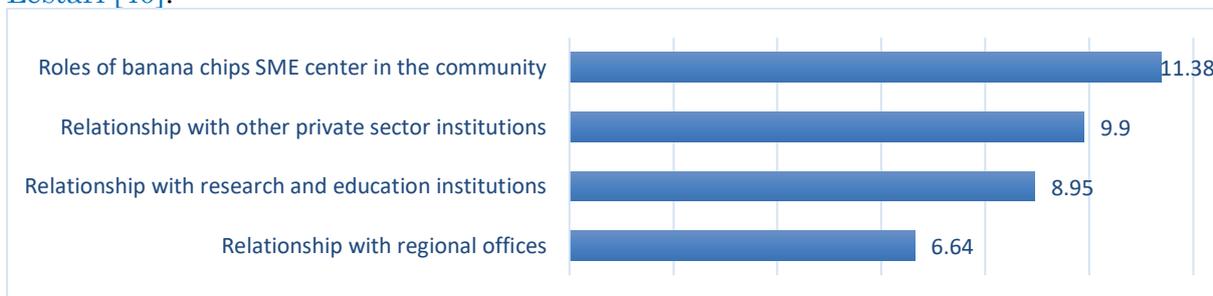

Fig. 6. Leverage graph analysis of the institutional dimension

4. Conclusion

The purpose of this study is to map the sustainability index at the Banana Chips SMEs in Indonesia. This study employed five dimensions, such as ecology, social, economy, technology, and institution. The results show that the sustainability index of banana chips SMEs in Lampung Province was divided into three categories (poor, good, and very good). The five dimensions were divided into two categories: the poor category belonged to the technological dimension, and the excellent category belonged to the ecological, social, economic, and institutional dimensions. Several attributes had a significant influence on the sustainability index, such as the machine's helpful age, workforce experience and training, marketing area, number of resellers, and the role of banana chips SME center. Further research needs to be done using broader dimensions and indicators. Furthermore, further research can be developed by analyzing some appropriate strategies to improve the sustainability index.

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