Determining Factors of Banana Chips Production in Lampung, Indonesia

M Apriyan and F M Saty

Food Agribussiness Study Program, State Polytechnic of Lampung, Jl. Soekarno Hatta No. 10 Rajabasa, Bandar Lampung, Lampung, Indonesia

Email: marlindazein@polinela.ac.id; fadila@polinela.ac.id

Abstract. This study aimed to reduce the dominant factors affecting the production of banana chips in Lampung, Indonesia. Banana chips currently become one of the superior products of Lampung Province, Indonesia. The development of the number of banana chips industry in Lampung is quite high. The banana chips industry is scattered in various regions. Respondents of this research were banana chips businesses in Lampung Province. The research areas were Bandar Lampung City, Central Lampung District, Pesawaran District, and East Lampung District. Data collection was conducted by distributing questionnaires. The analytical tool used was factor analysis method. Factor analysis was used to find the main factors that mostly influence the decision of the entrepreneur to produce banana chips through a series of tests and the fulfilment of assumptions. The most dominant factors affecting the production of banana chips in Lampung Province are: (1) raw material (33.657%), (2) capital (19.089%), and (3) market access (17.953%). The largest component of banana peels is water and carbohydrates. Banana peels can be fermented into bioethanol. Banana peel can be also used as active carbon or activated charcoal.

1. Introduction
1.1. The background of the problem

Lampung is one of the centres of banana production in Indonesia. Based on the data of the average banana production in Lampung, this area has contributed 12.38% of the total banana production in Indonesia, the third largest after West Java and East Java, respectively. The average of banana production in Lampung during 2011 - 2015 was 1,172,537 tons with a land area of 13,299 Ha (1). Banana products are sold both in fresh and processed. One of the processed products of banana is banana chips. Various flavors of banana chips have been produced. The development of the number of banana chips industry in Lampung is quite high. Areas that develop banana chips industry are Bandar Lampung City, Pesawaran District, Central Lampung District, and East Lampung District.

Banana chips become one of the superior products in Lampung Province. The government has given a major support for the development of banana chips industry by establishing a chips industrial centre in Bandar Lampung. This chips industry centre has become one of the typical culinary destinations in Lampung. Currently, there are more than 60 sellers of banana chips in the industrial centre with the average sales of approximately 50 Kg everyday. The success of banana chips business
development in Bandar Lampung was determined by the technical ability factor, the information access, the managerial ability, the production process and the raw material availability (2).

The development of banana chips industry in Bandar Lampung has encouraged the emerge of banana chips entrepreneurs in other areas. However, in line with this development, various problems are still needed to be encountered. One of the problems that keep coming to the entrepreneurs is the availability of fresh banana itself. There is a gap between the availability of the fresh banana with the production of the banana chips. This gap has resulted the ineffeciency of the production of banana chips. To overcome the problem, it is important to understand the factors that determine the decision made by the entrepreneur. Munizu (3) stated that the internal factors which consists of human resource, financial, technique production and operation, and market or marketing aspect have significant and positive effects to the small and micro business performance.

Banana is a plant that most parts of the body can be utilized. Bananas can be consumed in both fresh and processed forms. Banana leaves are used as food wrappers. Banana stem is used as cosmetic raw materials. Banana peels also contain many benefits. Research on the benefits of banana peels has been widely practiced. The results showed that banana peels can be used for animal feed, bioethanol and biogas. The analytical tool used in this research was factor analysis. Factor analysis is one of the data reduction procedures and one of the tools to test the measuring instrument in multivariate statistic method. Factor analysis simplifies the various and complex relationships in the observed variables. This analysis brings together the interconnected factors or dimensions of a new data structure that have smaller set of factors (4). The factors that determine the decision of the entrepreneur in producing banana chips are important things to be understood. The information obtained is expected to determine the policy of developing banana chips industry in Lampung Province, Indonesia.

1.2 The objectives of the research

This study aimed (1) to identify and analyze the factors that affect the production of banana chips in Lampung Province and (2) to investigate the benefits of banana skin waste as biomass.

2. Materials and Methods
2.1 The method of data collection

The method used in this research was the survey method. Respondents of this research were banana chips entrepreneurs in Lampung Province. Respondents spreaded in several districts, i.e. Bandar Lampung City, Pesawaran District, Central Lampung District, and East Lampung District. The respondents were selected intentionally. The number of respondents were 62 people.

2.2 The method of data analysis and data processing

The analytical methods used were descriptive analysis and quantitative analysis. Descriptive analysis was used to clearly describe the factors that affect the production of banana chips, while the qualitative analysis was used to see the factors that affect the production of banana chips in Lampung Province. The analytical tool used was factor analysis. Factor analysis in this study was used to reduce variables by stating the origin variable as a linear combination of a number of factors, so that a number of factors can explain as much as possible the diversity of data described by the origin variable. In this factor analysis there were several assumptions that must be fulfilled, i.e. the multivariate normal test, data adequacy test, and Bartlett test. Factor analysis can be performed if multivariate shows normal data distribution, adequacy requirement fulfilled by Kaiser Meyer Oikin (KMO) test, and correlation between multivariate variable is significant with Bartlett test. The factor analysis model can be written as follows (4).
\[ X_i = B_{i1}F_1 + B_{i2}F_2 + B_{i3}F_3 + \cdots + B_{ij}F_j + \cdots + B_{im}F_m + V_i\mu_i \]

Information:
- \( X_i \): The standardized i-variable
- \( B_{ij} \): The standardized regression coefficient for variable i on the factor component j
- \( F_j \): Component of factor j
- \( V_i \): The standardized regression coefficient for variable i in the factor component i
- \( \mu_i \): The unique factor of the i-variable
- m: The number of factor components

The factor component is expressed as a linear combination of observed variables:

\[ F_i = W_{i1}X_1 + W_{i2}X_2 + W_{i3}X_3 + W_{i4}X_4 + W_{i5}X_5 + W_{i6}X_6 \]

Information:
- \( F_i \): estimated factor i
- \( X_i \): Factor i
- \( X_1 \): the number of dependents
- \( X_2 \): capital
- \( X_3 \): labor
- \( X_4 \): market access
- \( X_5 \): raw material
- \( X_6 \): length of business
- \( W_i \): weights or coefficients of the i-factor value
- k: number of variable

3. Results and Discussions

3.1 The factors that affect the production of banana chips in Lampung province

The data used were the primary data with respondents of banana chips entrepreneurs in Lampung Province. Respondents spread in several districts in Lampung Province, i.e. Bandar Lampung City, Pesawaran District, Central Lampung District, and East Lampung District with 62 respondents. The research variables consist of six variables (\( X_1 \) = total dependent, \( X_2 \) = capital, \( X_3 \) = labor, \( X_4 \) = market access, \( X_5 \) = raw materials, \( X_6 \) = length of business). The questionnaire used was a structured questionnaire in the form of statements with the choice of answers in the form of Linkert scale. The scale used has been modified in the form of statements with the given range of scores between 1 and 5, i.e. 1 = Strongly disagree, 2 = Disagree, 3 = Do not know/Neutral, 4 = Agree, 5 = Strongly agree.

The variables used have been through several tests, i.e. Validity Test, Reliability Test, Bartletts test of shericity test, Measure of Sampling Adequacy Test (MSA) and Kaiser Meyer Olkin Test (KMO) in accordance with the theory of data requirements and factor analysis. Kaiser Meyer Olkin (KMO) is an index used to test the accuracy of factor analysis. High values (between 0.5 - 1.0) identify the exact factor analysis. If it is below 0.5, it indicates that factor analysis is not appropriate to be applied (5). The test results showed that 6 variables were valid and reliable with the value of r count more than 0.254. The result of the reliability test on the research variables showed that the data has a high level of reliability because the Cronbach Alpha value for the 6 variables> 0.254.

The test results of MSA, KMO and Bartlet’s test was 0.602 greater than 0.5 with a significance of 0.000 smaller than 0.05 then the variables and samples were eligible for further analysis by factor analysis. Determination of the number of factors based on the value of eigenvalue was the value of
An eigenvalue indicates the magnitude of the contribution of a factor to the variance of all the original variables. The result of eigenvalue from this research indicated that there were 3 factors or components that generated eigenvalue more than 1, which were factor 1, 2, and 3 each with eigenvalue equal to 2.019; 1.145; 1.077 (Table 1).

| Component | Total | % of Variance | Cumulative % |
|-----------|-------|---------------|--------------|
| 1         | 2.019 | 33.657        | 33.657       |
| 2         | 1.145 | 19.089        | 52.746       |
| 3         | 1.077 | 17.953        | 70.699       |
| 4         | 0.733 | 12.225        | 82.924       |
| 5         | 0.550 | 9.159         | 92.082       |
| 6         | 0.475 | 7.918         | 100.000      |

Tabel 2. Donate each variance of all the original variables (Extraction Sums of Squared Loadings).

| Component | Total | % of Variance | Cumulative % |
|-----------|-------|---------------|--------------|
| 1         | 2.019 | 33.657        | 33.657       |
| 2         | 1.145 | 19.089        | 52.746       |
| 3         | 1.077 | 17.953        | 70.699       |

Table 2 presented the amount of donation of variance given from each factor to the variance of all original variables. Factor 1 contributed variance of 33.657%. This factor was the largest contribution of variance that affected the production of banana chips in Lampung Province. Factor 2 contributed variance of 19.089%, and factor 3 contributed variance of 17.953%. The total contribution of variance from these three factors was 70.699%. Table 2 describes one of the determinants of the number of factors based on quantitative values.

Another way to determine the number of factors was with the image (Scree Plot). The Scree Plot results are shown in Figure 1. Scree plot is a decreasing function showing the variance explained by each factor in a factor analysis. The result of the curve showed that there were three determinants.

![Scree Plot](image-url)
Rotation factor (Table 3) aims to find factors that can optimize correlation between observed indicators. Factor rotation analysis used varimax rotation with loading factor value >0.3. By using SPSS 20 program, the matrix was obtained as shown in Table 3 below:

| Variable | Weighted Variable | Factor 1 | Factor 2 | Factor 3 |
|----------|-------------------|----------|----------|----------|
| X1       |                   | -0.011   | 0.702    | 0.343    |
| X2       |                   | 0.262    | 0.797    | -0.132   |
| X3       |                   | 0.573    | 0.366    | 0.091    |
| X4       |                   | -0.087   | 0.257    | 0.822    |
| X5       |                   | 0.799    | 0.021    | 0.001    |
| X6       |                   | 0.469    | -0.248   | 0.654    |

The variable that went into the factor was determined based on the factor loading value in the factor matrix. Factor loading is a number indicating the magnitude of the correlation between variable with factor one, two, or factor three. Based on factor loading, there were 3 determinants (Table 4) as follows:

| Variable | Name            | Weighted Variable |
|----------|-----------------|-------------------|
| Factor 1 |                 |                   |
| • X3     | Labor           | 0.573             |
| • X5     | Raw materials   | 0.799             |
| Factor 2 |                 |                   |
| • X1     | Total dependent | 0.702             |
| • X2     | Capital         | 0.797             |
| Factor 3 |                 |                   |
| • X4     | Market access   | 0.822             |
| • X6     | Length of bussiness | 0.654 |

Table 4 describes each factor represented by the dominant Weighted Variable score. Factor 1 was dominated by Raw Materials with variance contribution of 33.657%. The highest weight on the second factor was the variable Capital, factor loading of 0.797 with a variance contribution of 19.089%. The third factor of rotation result that obtained the highest weight was Ease of market with factor loading 0.822 and gave contribution of variance equal to 17.953%.

3.2 The benefits of banana skin as biomass

The types of bananas used for producing banana chips are kepok and ambon. It is unavoidable that the production activities produce banana peel waste. In general, banana peels have not been used properly and only disposed of as organic waste alone or used as animal feed such as goats, cattle, and buffalo. Entrepreneurs of banana chips have not utilized banana peel waste effectively.

Banana peel is a waste material (waste of banana) which is quite a lot. The number of banana peels is 1/3 of unpeeled bananas. Several studies have been conducted related to the utilization of banana peels. The largest component of banana peels are water and carbohydrates. Along with the advance of science and technology, banana peels can now be fermented into bioethanol with the help of Saccharomyces cereviceae. Carbohydrate content in banana peels reaches 18.50%. The large carbohydrate content makes the banana skin has great potential as a bioethanol feedstock. Banana peel can be utilized as raw material for making ethanol, biogas, floor wax and shoe polish (6).
The results of Mirsa (7) showed that banana peels can be used as active carbon or activated charcoal. Activated carbon has many applications in various industries as an absorbent for contaminants and heavy metals. From the selected conditions that have been carried out in the manufacture of activated carbon, it was obtained carbonate perfection value of banana skin of 96.56%, and the best adsorption ability against iodine was at the time of activation 2.5 hours using H₂SO₄ 2N activator of 45.685%.

4. Conclusions

In conclusion, the results of this study with 62 respondents and 6 variables gave the proportion of cumulative diversity of 70.699% with three extraction factors formed. These three factors were based on the assumption of banana chip business in Lampung Province that affected the production of banana chips by 70.699% and the rest can be influenced by other unidentified factors. The most dominant factors affecting the production of banana chips in Lampung Province are: 1st the raw material (33.657%), 2nd the capital (19.089%), 3rd the market access (17.953%). The number of banana peels is 1/3 of unpeeled bananas. The largest component of banana peels is water and carbohydrates that can be fermented into bioethanol. Banana peel can also be used as active carbon or activated charcoal.

References

1. Central Bureau of Statistics Lampung Province 2016 Lampung in Figures Lampung p 207.
2. Apriyani M, H Hardjomijoto, and D Kadarisman 2014 Business Development Prospect of Banana Chips in Bandarlampung SME MANAGEMENT: Journal of Management Development of Small and Medium Industry vol 9 no: 2 (Bogor Agricultural Institute) p 89.
3. Munizu M 2010 The Influence of External and Internal Factors on Performance of Micro and Small Enterprises (SMEs) in South Sulawesi. Management and Entrepreneurship Journal vol 12 no 1 Surabaya p33.
4. Anderson, TW 1984 Introduction to Multivariat Statistical Analysis John Wily Son Inc. New York.
5. Kaiser HF 1958 The Varimax Criterion for Analytic Rotation in Factor Analysis Psychometrika Vol 23 no 3 Springer p 187.
6. Dewati R 2008 Leather Waste of Skin Kepok Bananas as a Raw Material Ethanol National Development University "Veteran" East Java p 1.
7. Mirsa R A 2013 Utilization of Banana Leather Waste as Activated Carbon. Undergraduate thesis, National Development University "Veteran" East Java.