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2nd ICGAB 2018
International Conference on Green Agro-Industry and Bioeconomy

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ICGAB 2018

PROCEEDING

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"Sustainable Development and Strengthening Tropical Resources for National Welfare"

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FACULTY OF AGRICULTURAL TECHNOLOGY
UNIVERSITAS BRAWIJAYA

PROCEEDING

THE INTERNATIONAL CONFERENCE ON GREEN AGRO-INDUSTRY AND BIOECONOMY
Faculty of Agricultural Technology
Universitas Brawijaya, Malang, Indonesia

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WELCOMING SPEECH FROM CAIRMAN AND DEAN FACULTY OF AGRICULTURAL TECHNOLOGY, UNIVERSITAS BRAWIJAYA

Assalamu'alaikum wr.wb.

Dear distinguished guests and ICGAB participants,

It is a great honor for me to cordially welcome you all in Malang, and to our campus Universitas Brawijaya. And as an organizing committee of this conference, Faculty of Agricultural Technology gratefully thanks the Rector of Universitas Brawijaya for his continuous support.

Last year, International Conference on Green Agro-Industry and Bioeconomy (ICGAB) was successfully held and attended by a total of 310 participants from 8 countries. This year event has brought together nearly 400 delegates (from 7 countries) coming from national and international universities, research intitutions, and industries. This is our second ICGAB as we are aiming to organise the event on a regular basis. This is because ICGAB is very relevant with the vision, mission and strategic planning of our faculty. The Faculty aims are becoming a centre of excellence in the field of Agricultural Technology both nationally and internationally and giving a significant contribution towards sustainable development for strengthening the national welfare in Indonesia.

As we know that the water-food-energy nexus is critical and central to sustainable development. A rising of global population, urban expansion, changing diets and consumption behaviours causes an increase for all three nexus. The complex linkages between these critical nexus need integrated aprocahes to sustain water and food security, and to ensure a sustainable agriculture and energy production. Bioeconomy may bring us new hope for fulfil those needs through various range of approaches that can be implemented in agriculture and forestry, food, renewable energy, chemical, and pharmaceutical, as well as in creating innovative materials.

Furthermore, as part of the local, national and global communities, our faculty have continuously been making significant contribution in finding solutions towards national problems through research, developing technology, machinery, and conducting community service to educate people outside university. We take very seriously national problems such food security and food safety, developing renewable energy resources, waste management, and environmental degradation. Our faculty has also contributed in participating and winning the international research and scientific competition aiming to tackling the global problems. In addition, all aspects of agricultural technology integrated within our six (6) undergraduate study program offered in our faculty are also represented in the ICGAB conference.

Therefore, it is an honour for our faculty to host ICGAB conference to disseminate knowledge, research results and technology advances, as well as to exchange ideas and share success stories among all of you. It is our hope that this conference will be inspiring and deliver fresh inspiration and motivation to all participants. Thus, we can contribute to foster our national welfare by developing and implementing green-agroindustry and bioeconomy based on local and tropical commodities, while sustaining the environmental sustainability.

Last but not least, we would like to sincerely thanks all of our speakers for contributing to the conference program. Furthermore, we would like to express our most sincere appreciation to all contributing organisations include PERMI, FKPT-TPI, KBI, SEARCA SEAMEO, PATPI, PERTETA and APTA. We would also like to express sincere gratitude to the conference organising committees who have been working hard and with full dedication to make this conference possible.

We wish you all to have a fruitful conference that can integrate holistic aproaches in tackling our national problems and can strengthen our collaboration nationally and internationally. Thus, we can contribute in creating a safe, healthy and eco-friendly world for our future generation.

Wassalamu'alaikum wr.wb.

Dr. Sudarminto Setyo Yuwono

Chair of ICGAB2018
Dean of Faculty of Agricultural Technology

WELCOMING SPEECH FROM RECTOR UNIVERSITAS BRAWIJAYA

Assalamu'alaikum wr.wb.

Excellency's, Distinguished Delegates, Ladies and Gentlemen,

On behalf of the University members, it is a great honour for me, to extend to you all, a very warm welcome to Universitas Brawijaya, to Malang – East Java, and to Indonesia.

I would also to take this opportunity to express my sincere gratitude to The Conference Committee and Faculty of Agricultural Technology for organizing The Second International Conference on Green Agro-Industry and Bio-economy.

This conference an important conference to address Sustainable Development and Strengthening Tropical Resources for National Welfare through implementation of circular bioeconomy and green agro-industry.

Both in global world and in Indonesia, sustainable development is critical to tackle problems of poverty, climate change, and environmental degradation. Therefore, as a major global key producer of various agricultural tropical products, Indonesian government commits to deal those global concerns and to increase development partnerships among relevant stakeholders to ensure sustainable development goals can be sucessfully achieved. Despite many intensive activities and collaboration have been implemented by the government with concerned bodies; however, a lots remains to be done.

Universitas Brawijaya, as one of the state universities in Indonesia is also committed to contribute in finding solutions for major problems faced by the nation and the world today.

Indonesia, as part of the global communities are in transitioning toward a more industrialized country. Thus, many natural resources exploitation, high demand for fossil fuel, green-house gas emission and deforestation are happening in the country, which damaging environment and impeding the sustainable development. Therefore, the creation of bioeconomy through adopting green agro-industries and industrial biotechnology may stimulating technological innovation, industrial competitiveness and sustainable development in Indonesia, and at the same time perserving the natural resources. Also, not to forget, for integrating the concept of green agro-industries 4.0. and society 5.0 to bring new values to industry and society.

Universitas Brawijaya plays an important role in supporting the sustainable development through various research findings and community service programs, which integrated within our roadmap of food security; energy security; good governance; afroforestry; and health, nutrition and medicine. We have also supporting the development of green agroindustries by providing assistance, training, and technical supports. However, we realized that our efforts for the better world will make a bigger impact with more collaboration involving various concerned stakeholders.

Therefore, it is an honour for Universitas Brawijaya to host the second ICGAB conference to disseminate knowledg, research results, and technology, exchange ideas and share success stories among us and stakeholders from around the globe.

Finally, I wish you all enjoying the conference, having a fruitful experience and networking from the conference, as well as having a pleasant stay in Malang.

Wassalamu'alaikum wr.wb.

Prof. Nuhfil Hanani

Rector of Universitas Brawijaya

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Potential banana-based agroindustry in Lampung Province-Indonesia

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Abstract. Banana is a potential agricultural commodity to be developed as economic value products for agroindustry. This study was aimed at determining the type of potential agroindustry of banana in Lampung Province and its added value. The research was conducted in Lampung province by using survey method. The type of potential agroindustry was determined by using the AHP method through expert choice software, and for the added value analysis was conducted by Hayami method. The results showed that the potential agroindustry of banana to be developed in Lampung province was banana chips with AHP value of 0.415. Processing of banana into chips products presented high added value (Rp3,281/kg) with an added ratio of 30.56%.

1. Introduction

Banana is a great fruit grown in Indonesia as this country is a top ten major world producers of banana and plantain [1]. Until 2015, total production of 7,299,275 tonnes of bananas were produced ranking it first place among the fruits, and Lampung Province was put first in the most considerable banana production following by East Java (1,629,437 tons) and West Java (1,306,288 tons) by contributing 1,937,349 tons or 26, 54% of total national banana production [2]. This data indicates the enormous potential of Lampung Province to become an ago-based area of banana processing in making highly demanded products. Most of the Indonesian exported agricultural commodities are raw materials with processing retention index of 71-75 %. Only 25-29 % of farm products are transported in the processed form [3]. Likewise, in Lampung province, the processing of bananas are generally still limited to traditional foods such as fried bananas and kolak [4]. The downstream of banana-based agroindustry is generally performed at home industry level. These indicate the need for a strategy to increase the value of bananas either in upstream or downstream processing. Some researchers [5], [6] and [7] argued that the development of agro-industry, a rural-based industry with business characteristics, and primarily engaged in the processing of agricultural products are the strategy to improve the welfare of the farming sector and attain overall economic growth.

The development of agro-industry is expected to be a right way for increasing banana 's value-added products as the processing would make bananas to be a more durable and high economic product, as well as providing more alternative processed products for marketing. Development of banana-based agroindustry should be done through a potential raw banana sources approach and the possible processed products approach. Source of bananas as a raw material is spread in 5 districts in Lampung province namely Lampung Selatan, Pesawaran, Lampung Tengah, Tanggamus and Lampung Timur. Meanwhile, the numerous potential processed products that have high demand in the Market are chips, "sale", puree, and banana flour [9]. The opportunity of banana processed in the form of puree was quite potential because this product is needed as a raw material in making baby food and juice. The increase in the world population especially a newborns baby (4 - 5 months) consuming banana area big potential for the banana processed products [10]. Processing banana to chip also a potential added value processed

products with a good market in the community [11]. Likewise, the processed products in the form of flour are possible as its utilization could substitute the wheat flour.

The assessment of the potential banana-based processing agroindustry needs a study on their sustainability to determine the viability of ideas that legally and technically feasible as well as economically justifiable. This research, therefore, was conducted with the aim to find the type of banana-based agroindustry that potential to be developed in Lampung Province by using Hierarchy Process Analysis (AHP). The ratio of added value was determined as well to support the data of selected potential banana-based agroindustry; According to Gittinger [8], the added value is the difference between gross output and temporary consumption value. In another word, this is the market price of goods or services produced which is reduced by price material goods or services and services purchased from other parties.

2. Methodology

The study was conducted in three stages. The first stage was a qualitative component of the study through interviews and a closed questionnaire survey with people related to banana agro-industry as well as with the experts from the local government. The experts consisted of 10 people in which five persons were coming from the Department of Industry, Department of Trade, the Office of Agriculture Food Crops and Horticulture, Food Security Agency, and Bappeda Lampung Selatan. While, others 5 were from the Department of agriculture food crops and horticulture, Department of Commerce, Department of industry, and Lampung province of Central Bureau of statistics. The objective of the interviews and questionnaire survey was to inquire into the perspectives of the banana production, business competitors, capital, and labor, process technology (machinery and equipment), products added-value, and market potential of banana-based agroindustry. The result of the questionnaire was then processed by using expert choice decision program (Hierarchy Process Analysis). The mindset of this analysis can be illustrated in Figure 1.

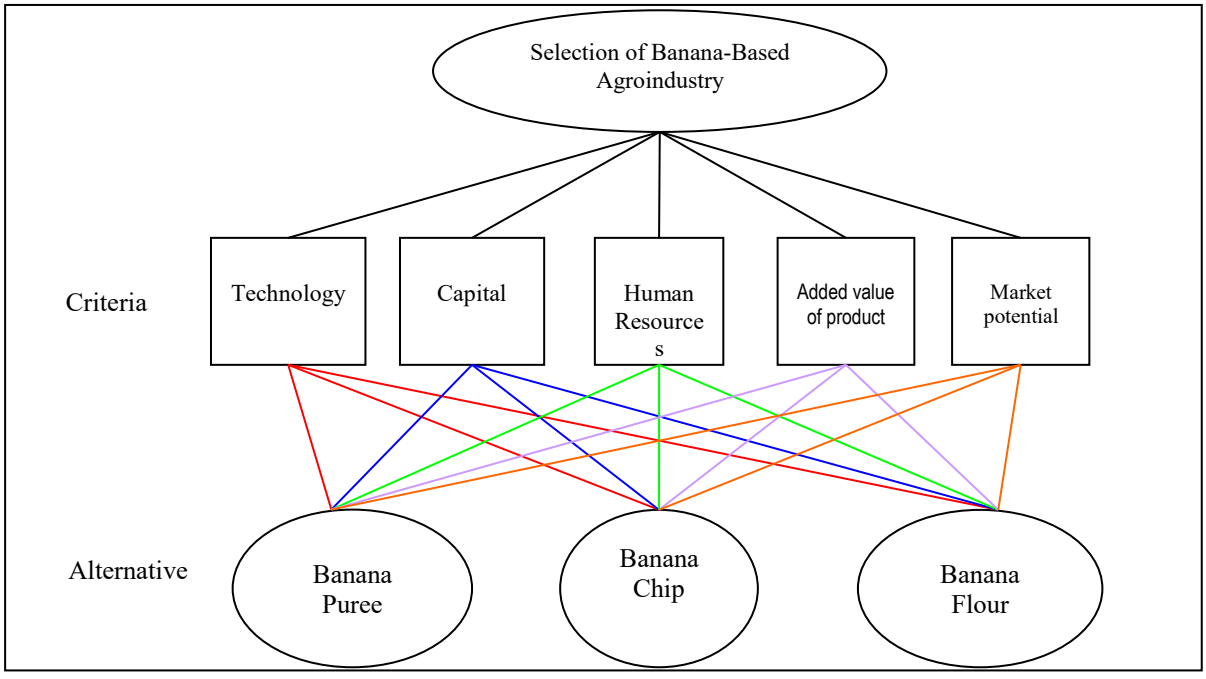

Figure 1. Product Alternative of Banana-Based Agroindustry.

The second stage was to determine the ratio of products added value, which was associated with the input-output, pricing, revenue and profit, and the retribution of the owners' production factors. The value-added analysis was conducted to find out the magnitude of the value added obtained from the processing of raw materials into a product. Procedure for the calculation of the value-added was a

method of Hayami. The final stage was to draw conclusions based on tools that were used for identifying potential banana-based agroindustry in Lampung province.

3. Resuts and Discussion

3.1. The Order of Priority Criteria

The results of the Hierarchy Process Analysis (AHP) test for the level criteria used as a determinant of the selection can be seen in Table 1. The most crucial rule was the market opportunity with an aggregate weight of 0.396 or 1.7 times more determinant than the Human Resources (HR), 2.5 times more decisive than the capital value, 3.6 times more critical than either technology or product value added. Market potential as the most critical factor is not surprising as this factor could indicate whether a production sector has good prospects or vice versa. In another hand, the market and marketing aspects are an essential determinant of the company.

Table 1. The order of priority criteria for determining an agro-industry selection results of the Hierarchy Process Analysis (AHP) test for the level criteria used as a determinant of the selection can be seen in Table 1. The most crucial rule was the market opportunity with an aggregate weight of 0.396 or 1.7 times more determinant than the Human Resources (HR), 2.5 times more decisive than the capital value, 3.6 times more critical than either technology or product value added. Market potential as the most critical factor is not surprising as this factor could indicate whether a production sector has good prospects or vice versa. In another hand, the market and marketing aspects are an essential determinant of the company.

Table 1. The order of priority criteria for determining agro-industry selection

Criteria	Description	Point	Order
Market Opportunities	Prospects of products to be developed both in domestic and international markets	0.396	1
Human Resources	Level of knowledge and technical ability and number of human resources in product development	0.237	2
Capital	Ability cost or all costs issued in the industrial implementation	0.155	3
Technology	The type of process technology used for producing and developing product.	0.110	4
Product Value-Added	The amount of profit to be gained if product developed	0.102	5

Human resources were the second rank (by 0.22) as a decisive criterion in the selection of agro-industries. The Human Resources play roles and responsibilities in leading the organization within the agricultural field [12]. As a determinant of the success of the project, human resources or labor must have suitable qualifications, skills, and expertise with the needs of the project [13]. Meanwhile, the capital factor was the third rank criteria that determine the establishment of agro-industry. The capital factor is essential as this is the primary factor of project production [14], capital is needed to start and develop the business either from internal or external sources [15]. Lack of capitals is one of the main people reasons to do not start a business yet. However, the capital will be no longer become an obstacle when the investors are interested in the attractiveness of people business model.

Technological factors and products value-added have similar level criteria in determining the priority sector of agro-industry types. Technical considerations are essential to make project keep in existing the trends and following the innovation opportunities. According to Kasmir and Jakfar [16], somethings to note in the selection of technology are the accuracy of technology with raw materials, technological success elsewhere, advanced technical considerations, the number of investment costs and maintenance costs, and possible development, as well as government considerations regarding labor.

The value-added products is another important factor for determining the priority criteria. This factor contributes a significant increase of the economic value of the banana'sperishable nature. Value-added is defined as an increase in the value of a product due to processing, transport or storage in a production process. The importance of value-added is apparently in the Hayami method, where the calculation of value-added products per kilogram of raw materials for one-time processing that produces a particular product will show a value-added processing of agricultural products.

3.2. Selected Product of Banana-Based Agroindustry

Among the priority banana-based agroindustry, the banana chip was the selected products with the highest cumulative aggregate value (41.5%) (Table 2 and Figure 2). Banana chips are fried banana slices that have characteristics with turned brown color and crunchy texture.

Table 2. Priority of Processed Banana Product.

Processed Banana Product	Criteria for selection					Aggregate	Percentage
	Technology	Capital	Human Resources	Product Added-Value	Market Potency		
Puree	0.091	0.650	0.559	0.393	0.111	0.346	34.6
Chips	0.677	0.103	0.151	0.351	0.698	0.415	41.5
Flour	0.232	0.246	0.290	0.256	0.192	0.239	23.9

CR = (*Consistency Ratio*) < 0.1 (10%)

Based on market potency, banana chips have the highest value, which was 0.698 compared to banana flour (0.192) and banana puree (0.111). Banana chips are popular as a snack food in many countries, consumed around the year by people of all age groups. The consumer acceptance of banana chips is based on quality attributes of the products influenced by processing [17]. Apriyani at al., [18] reported that banana chips are a potential product to be developed as these products are natural resources utilizing and are familiar with local human resources. Also, the processing of banana chips does not require much quantity and quality of high labor.

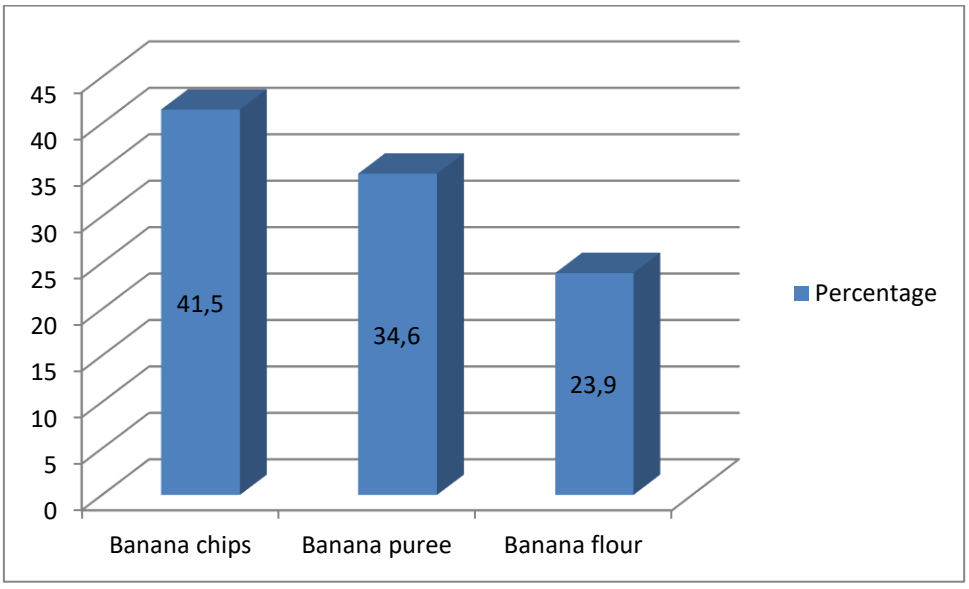

Figure 2. Priority of Processed Banana Product.

Based on technological factors, banana chips have the highest value compared to those of banana flour and puree. According to Siregar [19], the manufacture of banana chips is very simple and does not require significant venture capital. The technology of banana chips processing can utilize either the traditional or modern technology. However, production process using advanced technology will be faster and bigger capacity than those of conventional method. The use of the simple technique in the banana chips industry will be less capital required for operational implementation. According to [20], a capital factor is the most influential factor to the monthly net income generated by banana chips industry entrepreneurs. The higher the capital owned by the entrepreneur, the more significant quantities of banana chips can be produced, therefore it increased the net income of banana chips industry entrepreneurs.

Table 3. Calculation of value-added of banana chips agroindustry.

No	Variable	Calculation	
Output, Input and Price			
1	Output (Kg)	(1)	4,363
2	Raw Material (Kg)	(2)	14,223
3	DirectLabor (HOK)	(3)	45
4	Conversion Factor	(4) = (1) / (2)	0.31
5	Coefficientof DirectLabor (HOK/Kg)	(5) = (3) / (2)	0.0032
6	Price of Output (Rp/Kg)	(6)	35,000
7	DirectLaborCost (Rp/HOK)	(7)	50,000
Income and Value-Added			
8	Price of RawMaterials (Rp/Kg)	(8)	5,000
9	Price of Others Input (Rp/Kg)	(9)	2,456
10	Value of Output (Rp/Kg)	(10) = (4) x (6)	10,736
11	a. Value-Added (Rp/Kg)	(11a) = (10) – (8) – (9)	3,281
	b. Ratio of Value-Added (%)	(11b) = (11a) / (10) x 100	30.56
12	a. IncomefromD irect Labor	(12a) = (5) x (7)	158.19
	b. Pangsa of Direct Labor (%)	(12b) = (12a) / (11a) x 100	4.82
13	a. Margin (Rp/Kg)	(13a) = (11a) – (12a)	3,123
	b. Level of Margin (%)	(13b) = (13a) / (10) x 100	29.08
Reward for theOwner of Production			
14	Margin (Rp/Kg)	(14) = (10) – (8)	5,736
	a. Income of Direct Labor (%)	(14a) = (12a) / (14) x 100	2.76
	b. Contribution of AnotherInput (%)	(14b) = (9) / (14) x 100	42.81
	c. Profit of Company (%)	(14c) = (13a) / (14) x 100	54.44

3.3. Value-Added of Banana Chips

Value-added analysis and marketing margin of banana to processed banana", are needed to know the value-added given of banana chips on the banana raw material so it can be assessed whether the business efficiently runs and provide benefits or not [21]. According to Predita [21], value added is the increase in the value of a commodity because of the useful input imposed on the specialty concerned. The functional information is in the form of a form of utility, place utility, or time utility. Value-added

describes rewards for labor, capital, and management. The calculation of added value on banana chips agroindustry can be seen in Table 4 that is the value-added in 1 kg of bananas after being processed into banana chips.

4. Conclusion

The type of banana-based agroindustry potential developed in Lampung Province is banana chips with AHP value of 0.415, and a value-added ratio of 30.56.

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