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ADDITIONAL VALUE AND BUSINESS EFFICIENCY OF VARIOUS PROCESSING BANANAS PRODUCT IN THE BORDER AREA OF SEBATIK ISLAND

Nilai Tambah dan Efisiensi Usaha Aneka Olahan Pisang di Daerah Perbatasan Pulau Sebatik

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ABSTRACT

People who are living in banana production centers such as Sebatik Island have the opportunity to develop the products. Therefore, the purpose of this research are: (1) to know the added value from banana processing business in the border area of Sebatik Island and (2) to know the relative efficiency level of each banana processing business in the border area of Sebatik Island. The method used in this research was the added value of Hayami method which is to know the added value and the Data Envelopment Analysis (DEA) method of CCR with input orientation which is to know the relative efficiency level of banana processing business. The study of the added value of various proceed banana in the border area of Sebatik Island showed that the banana processing commodities provided an average added value of IDR 16,375.28 /kg. The relative efficiency analysis of 15 DMU of banana processing agroindustry showed that most of the banana processing agroindustry in the border area of Sebatik Island is not efficient yet. 40% of banana processing agroindustry is efficient and other 60% is inefficient. The average relative efficiency value of banana processing agroindustry is 0.737.

Keywords: *Added Value, Banana Processing, Efficiency*

INTISARI

Masyarakat yang tinggal di daerah sentra produksi pisang seperti Pulau Sebatik memiliki kesempatan untuk mengembangkan produk olahan pisang. Tujuan dari penelitian ini adalah: (1) mengetahui besarnya nilai tambah yang dihasilkan dari usaha pengolahan pisang di daerah perbatasan Pulau Sebatik dan (2) mengetahui tingkat efisiensi relatif pada masing-masing usaha pengolahan pisang di daerah perbatasan Pulau Sebatik. Metode yang digunakan dalam penelitian ini adalah nilai tambah metode Hayami untuk mengetahui besarnya nilai tambah dan metode Data Envelopment Analysis (DEA) CCR dengan orientasi input untuk mengetahui tingkat efisiensi relatif usaha pengolahan pisang. Kajian terhadap nilai tambah berbagai macam olahan pisang di daerah perbatasan Pulau Sebatik menunjukkan bahwa proses pengolahan pada komoditas pisang memberikan nilai tambah *rata-rata sebesar Rp16.375,28/Kg. Analisis efisiensi relatif terhadap 15 DMU agroindustri olahan pisang menunjukkan bahwa sebagian besar agroindustri olahan pisang di daerah perbatasan Pulau Sebatik belum efisien. Sebanyak 40% agroindustri olahan pisang efisien dan 60% inefisien. Rata-rata nilai efisiensi relatif agroindustri olahan pisang adalah 0,737.*

Kata kunci*: efisiensi, nilai tambah, olahan pisang*

INTRODUCTION

Sebatik Island is one of the gates of Indonesia in Kalimantan. Precisely, it is located in Nunukan District, North Kalimantan Province. Uniquely, the ownership status of the island is divided into two, the northern region of the island of 187.23 km^2, belongs to Malaysia, while the southern region of 246.61 km^2 is owned by Indonesia. The people of this island are native tribe of Tidung Bulungan, while the inhabitants are Bugis, Java, NTT, and Toraja. Until now the development in Sebatik Island has been done in all sectors. However, it is relatively lacking compared to the development in other regions (Siregar, 2008). The main livelihood of the inhabitant are from the plantation and agricultural sector by the number of 44%, fishery 21% and also 16% of the other Sebatik people depend on the food plant treading sector (Sariama, 2014).

The development of various leading agricultural commodities in this area is very possible, because it is supported by the biophysical conditions of adequate land resources (Hidayanto et al, 2009). Horticultural commodities in Sebatik Island are the abundance of bananas (sanggar/kapok banana). Total bananas production in 2015 in Sebatik Island was 1,800 tons. The large production in this area is due to the fertile and hilly land conditions, which is good for the growth of banana crops. The largest development of banana plants in Sebatik Island is in Nunukan District. Meanwhile, the production had been overproduced compared to its needs. Unfortunately, the high bananas production in Sebatik Island had not shown success in improving the quality of farmers' life. Increased productivity had not guaranteed an increase in the farmer's welfare. So far, they are only able to sell the harvest in the form of fresh or raw material. This marketing of the raw material had some disadvantages such as no added value, easily damaged or rotten, and relatively short shelf life. Meanwhile, the raw bunch of banana that is sold IDR 5.000 and if it is sold to the neighbor country, it becomes IDR 7.000/bunch (Harman, 2016).

Unfortunately, there is a problem with this Banana marketing. The local market in Sebatik Island starts to surfeit to use the local production. Meanwhile, the banana demand from the neighbor country is getting lower. In the beginning, the tons of bananas can be sent every day by the supplier to Tawau. However, now the supplier can also send the banana once in a week as it is the allocation that is given by their companion in Tawau. In an order, the supplier can bring 6 tons of bananas. The total amount of bananas that are sent in a week is reaching 30 tons. However, now the suppliers only have the allocation for sending the bananas once in a week and the maximum quantity that they can sell are only 3 tons of bananas (Harman, 2016).

One of the strategies to increase the wealth of the farming sector and the whole to reach the economic growth is by developing the agro-industry. The target that is reached makes the economic additional value is bigger so that it can be enjoyed by the local people through the local public economic organization empowerment. The Agro-Business Development Program in the home industry scale is a strategic approach to trigger the economic activity based on the business and industry for increasing the income and the public's wealthy (Usada, Darwanto, & Mulyo, 2011).

The Bananas Processing Industry in Sebatik Island has been started to be developed in every village to absorb the abundant production. With that processing, the consumers are having the options to consume the bananas in different shapes. The district that is active to develop the banana processing product is the Sebatik Tengah District through the UP2K program or an effort to increase the family income. UP2K in the Sebatik Tengah has the product specialization which is different between one village and the other village. In Sebatik Tengah District there are 5 UP2K in 5 villages in which each of the members will process the banana becomes various products. Totally, there are 9 kinds of banana processing products; those are the banana chips, banana mole chips, banana chips, banana flour, banana rice, banana cake, banana bangke, banana heart crackers, and banana noodle chips. Some craftsmen could have made the same product.

The added value describes the ability of an industry to create revenue, among business actors, regions, and countries. The efforts to create added value of agricultural products can encourage increased farmers' income through the increased price, as well as encouraging the development of the domestic economy as a whole (Hadi, 2015).

The management of banana processing agroindustry in Sebatik Island border area needs to consider the business efficiency aspect so that there will be a better business scale. Efficiency is an important indicator in measuring the overall performance of an enterprise's activities. Efficiency is often defined as how a company can produce at the lowest possible cost, not only the efficiency but also involves input and output of relationship management, that is how to allocate the available production factors optimally to produce maximum output. A company has a higher level of efficiency if in a certain number of inputs, it can produce more quantities of output or at a certain amount of output, it can use less input (Abidin et al., 2009).

The purpose of this study was to know the added value from banana processing business in Sebatik Island border area and to know relative efficiency level of every banana processing business in Sebatik Island border area.

METHODS

The study was conducted in Sebatik Tengah and Nunukan Sub-districts, Nunukan District, and Tarakan City, North Kalimantan Province. Determination of location in Sebatik Tengah sub district based on the consideration that the district had a working group that actively develop banana processing as one of government program, One Village One Product (OVOP). OVOP embodied in the Implementation of Family Income Improvement Efforts (UP2K) in Sebatik Subdistrict had different product specialization between the villages. It aims to maximize banana processing product. The superior products from UP2K Sebatik are as follows:

1. UP2K Srikandi Perbatasan, Aji Kuning Village: rock sugar chips.
2. UP2K Sakinah, Maspul Village: banana chips, banana cake, banana flour and dodol banana, banana pancake.
3. UP2K Sumber Hidup, Bukit Harapan Village: horn chips, mole chips, banana cake and noodle chips.
4. UP2K Al-Barokah, Sungai Limau Village: banana blossom crackers, banana rice and banana flour.

In a UP2K there is more than a person who processes the banana in which then they will send their products and it will be marketed through that UP2K. In the UP2K Al-Barokah for example, it has several members who process the banana for becoming chip flour or banana rice before it has to be deposited to the UP2K itself. Those various products will be packed up and labeled by the UP2K Al-Barokah, although they have different processor. However there is another UP2K which is only producing one variant product and it is all processed together as one, it is UP2K Srikandi Perbatasan. Data collection in Tarakan City on Doni banana chips business and Nunukan sub-districts in Mansapah Mandiri business were a comparison of processed products with the same raw materials.

The sampling technique was conducted by census to all of the processed banana makers. The number of samples for each location are: (1) Sebatik Tengah sub-district was 13 respondents, Nunukan sub district was 1 respondent, and Tarakan City was 1 respondent. Therefore, the total respondents for this study were 15 business units. The study was conducted in September 2016.

Added Value Analysis

To know the added value of various banana processing products in Sebatik Island border area, the analysis method used was Hayami method (Table 1).

Relative Efficiency Analysis

The efficiency shows the productivity of the resource. The efficiency in the ideal situation is called by the ideal efficiency (absolute) which is the percentage will be always 100% it means the number of the output which is produced equal with the number of the input are used. However, in fact that ideal condition hardly to be achieved because many influence factors appears so it has to be done with the relative efficiency approach. In this case, the efficient number of the object will not be compared with the ideal condition (100%) but it has to be compared with the

Table 1. Calculation of Added Value of Hayami Method

Variable	Score	Formula
Output, Input, and Price		
Output (Kg)	1	-1
Input (Kg)	2	-2
Labor (HOK)	3	-3
Conversion Factor	4	(4) = (1) / (2)
Employer Coefficient (HOK)	5	(5) = (3) / (2)
Output Price (IDR/Kg)	6	-6
Direct of Labor Cost (IDR/HOK)	7	-7
Input dan Profit		
Raw Material Price (IDR/Kg)	8	-8
Other Input Contribution(IDR/Kg)	9	-9
Output Value (IDR/Kg)	10	(10) = (4) x (6)
a. Added Value (IDR/Kg)	11a	(11a) = (10) – (9) – (8)
b. Added Value Ratio (%)	11b	(11b) = (11a)/(10) x 100%
a. Direct Labor Income (IDR/Kg)	12a	(12a) = (5) x (7)
b. Labor Share (%)	12b	(12b) = (12a)/(11a) x100%
a. Profit (IDR/Kg)	13a	(13a) = (11a) – (12a)
b. Profit Level (%)	13b	(13b) = (13a)/(11a) x100%
Reply Service of Production Factors Owners		
Margins (IDR/Kg)	14	(14) = (10) – (8)
a. Direct Labor Income (%)	14a	(14a) = (12a)/(14) x 100%
b. Other Input Contribution (%)	14b	(14b) = (9)/(14) x 100%
c. Profit of Company Owner (%)	14c	(14c) = (13a)/(14) x 100%

Source: (Hayami, Kawagoe, Morooka, & Siregar, 1987) other objects efficiency number (Marbunti, Bahauddin, & Ferdinant, 2013).

To know the relative efficiency level of banana processing business in Sebatik Island border area, it was analyzed by Data Envelopment Analysis (DEA) method. The model used DEA-CCR with input orientation. The number of banana processing makers or DMU was 15.

The basic data used was the efficiency level of each craftsman as analyzed DMU (Decision Making Unit) was the output and input variables. Measurement of efficiency is basically the ratio between multi-output and multi-input, or:

$$Efficiency = \frac{Multi\ Output}{Multi\ Input}$$

Measurement of efficiency for multiple inputs and outputs used the following weighted relative efficiency measures:

Efficiency of DMU

$$DMU\ Efficiency = \frac{\sum_{k=1}^{p} w_k Y_{kj}}{\sum_{i=1}^{m} v_i X_{ij}}$$

$$= \frac{w_1 Y_{1j} + w_2 Y_{2j} + \cdots + w_k Y_{kj}}{v_1 X_{1j} + v_2 X_{2j} + \cdots + v_i X_{ij}}$$

Information:

w_1 = Weight for output i

y_{1j} = Number of output 1 from unit j

v_1 = Weight for input 1

x_{1j} = Number of inputs 1 to unit j

m = Different inputs

p = Different outputs

The DEA analysis technic is particularly designed for measuring the relative efficiency of the DMU in the many conditions of the input and output. The relative efficiency of DMU is the efficiency of the DMU which is compared by the other DMU are using the same variant of input and output for the sample. The relative efficiency of DMU is the efficiency of the DMU which is compared by the other DMU are using the same variant of input and output for the sample (Sutawijaya & Lestari, 2009).

DEA is obtained if the model is transformed into a linear program with the weight of the DMU input and output as the decision variable, while the efficiency score is the objective function. The input model was oriented or CCR-I with the following formula:

$$TE = Min\ \theta$$

Obstacles:

$$\theta u_{jm} \leq \sum_{j=1}^{J} Z_j u_{jm}, m = 1,2, \ldots M$$

$$\sum_{j}^{J} Z_j x_{jn} \leq x_{jn}, n = 1,2, \ldots N$$

$$Z_j \leq 0, j = 1,2, \ldots J$$

TE is the technical efficiency for the second DMU; Θ is the measurement value for each observation (≤1); U_j is the jth output; X_jn is the input used; Z_ (j) is the intensity of variable use (Cooper, Seiford, & Zhu, 2004). The used input was the cost of raw materials, packaging costs and labels, labor costs, while the output was the obtained products value and added value is due to the processing. DEA analysis used the DEA_Solver Microsoft Excel LV8 program. In order to fulfil the basic concepts of DEA, some tests are conducted to the input and output variables used The tests are exclusivity, homogeneity, degrees of freedom, and positivity (Siregar, Jamhari, & Waluyati, 2016). The testing is necessary so that the resulting efficiency score is unbiased and can be believed to be true.

a. Exclusivity, this concept is to ensure that a variable is not part of another variable (inclusive). A variable is considered to be strongly correlated to other variables if the correlation score is ≥0.8.
b. Homogeneity, this concept demands all DMUs to have one kind and identical input and output variables. The differences can be tolerated, only on the intensity and magnitude of the number / size.
c. Degrees of freedom, the concept requires the use of input and output variables that meet the rule of thumb, ie the number of DMUs should be two or three times of the number of input and output variables.
d. Positivity, this concept requires all input and output variables to be positive even if they have different units.

In order to produce an unbiased and reliable score, the input and output variables were used to measure efficiency that have to get the basic DEA concepts above. Based on the numerical and positive concepts, the overall DMU 15 can be included in the relative efficiency measurements. The input and output variables are not negative. Based on the homogeneous concept, it can be concluded that the used input and output variables are one kind and identical. The next is the degrees of freedom, in this study the variables used 3 inputs and 2 outputs and 15 DMU.

The positive of the DEA Method is it can show the references of efficient DMU to the inefficient DMU for elevating its efficiency degree. The efficient DMU as the reference to the inefficient DMU, it means inefficient DMU will becoming the efficient one just if it control the using of the input should be as same as the percentage value which is recommended by the score of the lambda (Timisela et al., 2012).

RESULTS AND DISCUSSION

Added Value of Banana Processed Products in Sebatik Island Border Area

Production of bananas in Sebatik Island is the highest, when it was compared to other fruit production. Almost all of Sebatik Island people plant bananas on their land, in addition to cultivating oil palm and cocoa. Such large production should be a potential societies' income. An effort to maximize banana as a pre-eminent commodity in Sebatik Island that has easily damaged or rotten is the processing. Bananas are processed into a variety of products to extend the shelf life and increase the added value and profit. The banana processing business in Sebatik Island has a good prospect to be developed due to the abundant availability of banana raw materials in Sebatik Island.

Processed bananas are processed products of banana and banana blossom include banana chips, mole chips, sugar banana chips, banana flour, banana rice, banana cake, banana bangke cake, banana blossom cracker, and mie-mie chips. Some craftsmen could have made the same product. Sugar banana chips are banana chips covered with sugar with golden brown color, so it looks interesting and has a more unique taste than ordinary banana

Table 2. Additional Value of the Doni Banana Chips Business

Variable	Score	Banana Chips
Output, Input, and Price		
Output (Kg)	1	2,063.00
Input (Kg)	2	16,500.00
Labor (HOK)	3	220.00
Conversion Factor	4	0.13
Employer Coefficient (HOK)	5	0.01
Output Price (IDR/Kg)	6	48,000.00
Direct of Labor Cost (IDR/HOK)	7	60,000.00
Input dan Profit		
Raw Material Price (IDR/Kg)	8	761.90
Other Input Contribution(IDR/Kg)	9	1,723.08
Output Value (IDR/Kg)	10	6,001.45
a. Added Value (IDR/Kg)	11a	3,516.47
b. Added Value Ratio (%)	11b	58.59
a. Direct Labor Income (IDR/Kg)	12a	800.00
b. Labor Share (%)	12b	22.75
a. Profit (IDR/Kg)	13a	2,716.47
b. Profit Level (%)	13b	77.25
Reply Service of Production Factors Owners		
Margins (IDR/Kg)	14	5,239.55
a. Direct Labor Income (%)	14a	15.27
b. Other Input Contribution (%)	14b	32.89
c. Profit of Company Owner (%)	14c	51.85

Source: Processed Primary Data (2017)

chips. The production process on banana rice is raw banana dried in the sun for several days, then cut into small pieces and packed. This banana rice can be consumed by cooking it with rice. While the banana flour is made by way of banana dried in the sun for several days, then pounded to form a powder. Banana flour can be used like regular flour.

The total amount of raw materials absorption in the shape of raw banana in a year for 15 business unit is 38.980 kg. The biggest raw material absorption is the banana chip because it has the high frequency of production. Banana chip is the most popular processing products in some areas, included in the Sebatik Island. In its process, it can use any types of bananas and the taste that will be made is different. In the Sebatik Island, the Banana Chip is made from the kepok banana, Tanduk banana dan Mole Banana.

The processing of banana into various products can provide added value in rewards for the use of labor production factors, natural resource capital, and management. The added value received by banana processing makers were varied from product to product. Table 2 shows the calculation example of the additional value to the banana chip product for the Doni banana chip business. The total raw banana materials that are needed in a year are 16,500 kg. The Banana Chips that are made are 2,063 kg. Conversion factor shows from 1 kg of raw banana can be made 0.13 kg banana chips. After calculating the existence of the other materials that are used in making the banana chips such as salt, oil to fry the chip, gas, electricity, and package and also the development of people, it can be gotten the additional value for about IDR 3,516.47/kg. The additional value that is gotten is the value of 1 kg of raw material becomes 1 kg of the product that is ready to sell.

The amount of added value of various banana processed products in Sebatik Island border area is shown in table 3. The average added value of various banana products is IDR 16,375.28/Kg and average conversion factor is 0.46. Counting the additional value means counting the conversion factor deviation multiply by the price per kg output with the price of raw materials and other input contributions include labor. Although processing bananas into the same product, the added value produced by each agro-industry is varied. Factors that affect the difference in added value generated are raw material prices, use of raw materials and auxiliary materials; the use of labor, wage labor, and product selling price.

Each of the agro-industry gets the raw materials from the sources that are varied; that is why; the price of raw material for each kg can be different between one and the other. The raw materials usage and supporting ingredients will determine how much output that can be made. If a product uses too many supporting materials, it will have the higher output than a product that is originally using the banana with the same amount of materials that are used. The example is for making the banana cake and banana rice. Banana cake is made from the banana, flour, sugar, eggs, salt and the other ingredients. Meanwhile, the banana rice is made from the banana without any additional ingredients. That is why; from a kilogram of raw materials and after those are processed, the output will be bigger for the banana cake than the banana rice.

Table 3. The Added Value of Various Processed Banana

Product	Added Value (IDR/Kg)	Conversion Factor	Margin (IDR/Kg)	Direct Workman income (%)	Other Input Contribution (%)	Profit of Company Owner (%)
Banana Chips	3,516.47	0.13	5,239.55	15.27	32.89	51.85
Banana Chips	3,293.87	0.17	5,000.00	61.34	34.12	4.53
Banana Flour	2,066.96	0.13	2,666.67	70.31	22.49	7.20
Banana Rice	3,131.89	0.11	6,000.00	41.67	47.80	10.53
Banana Blossom Cracker	74,581.35	3.00	193,500.00	35.53	61.46	3.01
Sugar Banana Chips	7,343.26	0.10	13,000.00	7.21	43.51	49.28
Banana Flour	1,657.00	0.10	2,000.00	62.50	17.15	20.35
Banana Chips	3,682.30	0.10	7,000.00	33.48	47.40	19.12
Mie-mie Chips	49,167.00	0.50	57,000.00	68.72	13.74	17.54
Banana Cake	11,983.60	0.75	47,500.00	20.84	74.77	4.39
Banana Chips	23,293.40	0.42	39,000.00	19.29	40.27	40.43
Mole Chips	17,872.98	0.18	23,999.98	17.97	25.53	56.50
Banana Bangke Cake	11,820.09	0.30	25,000.00	25.00	52.72	22.28
Banana Flour	992.55	0.10	1,349.97	34.26	26.48	39.26
Banana Cake	31,226.50	0.80	65,000.00	9.62	51.96	38.43
Averages	16,375.28	0.46	32,883.74	34.87	39.49	25.65

Source: Processed Primary Data (2017)

The product with complicated processing process can add the fee or price for the additional ingredients and employees. The complicated process is used to have an effect on the process of production that needs a long time. When the employees' fee that is used is high, it will have the high charge as well. That huge production charge will determine the selling cost of a product. The higher selling cost will affect the amount of additional value.

The biggest added value is on the banana blossom cracker product. The amount of added value banana blossom crackers is due to the use of raw material supporting the large proportion. The supporting materials are production inputs other than raw materials needed in the production process such as cooking oil, flour, salt, sugar, and others. The most widely used supporting materials for banana blossom crackers are flour and cooking oil. The biggest conversion factor of banana chip cracker product is 3. The conversion factor showed the amount of output generated from one input unit.

So the value of 3 indicated that every 1 kg of input will produce 3 kg of output. The conversion factor could be less than 1 or more. If conversion factor is more than 1, then in the production process there are an increase of agro-industry output volume or agro-industry output volume is greater than the volume of raw material, and vice versa. Output of calculated banana blossom cracker is fried crackers, so that the output volume is very large because after frying, they will expand and the weight become lighter.

From table 3 it can be seen that the biggest margin is in cracker product, banana cake (banana processed craftsman number 15), and noodle chips, the smallest margin is in banana flour products (banana processor craftsmen number 3, 7, and 14). The margin share for other input donations on banana cake products (banana processed labor number 10) is the highest because these products require the most ingredients support. The highest direct labor income is in noodle chips products, which means that in its manufacture, this

Table 4. Correlation Score Among DEA

	Raw Material Cost	Packaging and Labelling Cost	Labor Cost	Product Value	Added Value
Raw Material Cost	1	0.0328	-0.2074	-0.1942	-0.6659
Packaging and Labelling Cost	0.0328	1	0.0485	0.4462	-0.0685
Labor Cost	-0.2074	0.0485	1	0.3551	0.4559
Product Value	-0.1942	0.4462	0.3551	1	0.2374
Added Value	-0.6659	-0.0685	0.4559	0.2374	1

Source: Processed Primary Data (2017)

product requires the most labor outpouring. Although the processed banana craftsmen mostly only involve labor in the family, but the time devoted per day is sufficient so that the allocation for direct labor income is also quite a lot. Of the fifteen products produced, the highest profits of company owners presents in mole chips products. It can be seen in the table that making small mole chips requires manpower, or it does not require many other input contributions.

Relative Efficiency of Banana Processing Agroindustry in Sebatik Island Border Area

Efficiency is an important concept in measuring the economic performance of a production process. Efficiency is one of the performance parameters that theoretically underlies the entire performance of an organization by referring to the philosophy of "the ability to produce the optimal output with the available input". With the identification of input and output allocations, it can be explicitly analyzed to see the efficiency and inefficiency of an agroindustry (Timisela et al., 2012).

Based on the comparison, it can be seen that DMU had reached the degrees of freedom concept because the amount is three times more than the number of tested variables.

Table 4 showed the number of correlation coefficients of each variable. A

Table 5. Relative Efficiency of Banana Processing Agro-industry

DMU	Score	Rank	Reference					
			DMU's reference	Lambda Score	DMU's reference	Lambda Score	DMU's reference	Lambda Score
1	1	1	1	1				
2	0.485	12	1	0.079	11	0.562		
3	0.357	14	1	0.321	11	0.168	15	0.014
4	0.386	13	6	0.177	12	0.281		
5	1	1	5	1				
6	1	1	6	1				
7	0.35	15	1	0.125	11	0.44		
8	0.599	9	1	0.929	11	0.368	15	0.113
9	0.567	11	5	0.665	12	0.537		
10	0.733	8	6	0.103	12	0.273	15	0.203
11	1	1	11	1				
12	1	1	12	1				
13	0.583	10	6	0.013	12	0.599	15	0.033
14	0.998	7	1	0.283	11	0.212		
15	1	1	15	1				

Source: Processed Primary Data (2017)

variable is said to have a strong correlation to other variables if it has a correlation score of ≥ 0.8. Correlation score was obtained by correlation test. Each variable has a correlation coefficient number smaller than 0.8. Thus the input and output variables reach the concept of exclusivity.

Analysis of the relative efficiency of banana processing agroindustry of 15 makers, DEA results showed that there are 6 efficient makers and 9 inefficient makers. Relative efficiency analysis results are presented in Table 5. Calculating the relative efficiency of each DMU was using the CCR input model, it can be seen that the efficiency of banana processing agroindustry DMU are DMU 1, 5, 6, 11, 12, and 15. While inefficient DMU are DMU 2, 3, 4, 7, 8 , 9, 10, 13, and 14.

DEA Method can give strategic direction to the owner of the agro industrial business to elevate the relative efficiency. The positive of the DEA Method is it can show the references of efficient DMU to the inefficient DMU for elevating its efficiency degree. Table 5 shows the reference pattern for inefficient DMU. The pattern follows DMU's reference which can be considered as the reference and the score of lambda. The resulted value of lambda measured by DEA describes the number of additional input in total which will be used to change inefficient DMU into efficient. Increasing input is based on the actual data of input use from efficient DMU. The number which is appeared in the lambda shows us how much the inefficient DMU use the input which is suitable for the using of the DMU reference input. For example, DMU 2 has the DMU reference 1 and 11 with the score of lambda 0.079 and 0.562. DMU 2 will becoming efficient just if it is using input by the number of 0.079 times from the actual data of DMU 1 plus 0.0562 times from the actual data of DMU 11.

DMU 2 produced a kind of processed product, banana chips. This DMU has not efficient yet especially in the using of high cost basic ingredients, packaging and labels also many labour requirements. If DMU 2 wants to reduce its inefficient level (Tab.5), DMU 2 will be efficient under the circumstance that the input use is 0.079 times more than actual data of DMU 1 plus 0.562 times from the actual data of DMU 11. DMU 2 had the score 0,485 as the efficient DMU and it ranked 12th after efficient DMU.

DMU 3 produces processed products in the form of banana flour. The DMU is not yet efficient mainly due to high packaging and label prices, as well as the use too much employees or the manpower. The packaging used is a thick transparent plastic with stickers to show the brand. This type of packaging is hard to find in the local market, thus making DMUs must be imported from neighboring countries. Production frequency to make banana flour is regular, but in one production the product is made only slightly so that the cost of labor per production is high. DMU 3 has a score of 0.357 as an inefficient DMU and is ranked 14th after DMU is efficient. To improve its efficiency, DMU 3 could exert input of 0.321 from actual input data of DMU 1, added to 0.168 times actual input data of DMU 11, and added to 0.014 times DMU 15's actual input data.

DMU 4 produces the processed products in the form of banana rice. The DMU is not yet efficient especially since the packaging and label prices are high. The packaging used is thick transparent plastic with aluminum foil with stickers to show the brand. This type of packaging is not locally produced, but imports from neighboring countries are priced high enough per unit. DMU 4 has a score of 0.386 as an inefficient DMU and is ranked 13th after the DMU is efficient. In order to be efficient, shown in table 5, the reference of DMU referred are DMU 6 and DMU 12. DMU 4 can use input of 0.177 times actual input data of DMU 6 plus 0.281 times actual input data of DMU 12.

DMU 7 produced the same product as DMU 3, banana rice. The cause of the DMU 7's inefficiency closed enough to the result of DMU 3 is the packaging. DMU 7 has a score of 0.350 as an inefficient DMU and it is ranked 15th after the efficient DMU. The reference pattern of DMU 7, according to table 5, is 0.125 times the actual input data of DMU 1 plus 0.44 times of DMU 11's actual input data.

The products that are produced by DMU 8 are the banana chip. DMU 3 has the score of 0.599 as an inefficient DMU. The efficiency constraint on DMU 8 is at the production frequency. DMU 8 processes banana into the banana chips when ordered. If there are no orders of DMU 8, it only remains in production but in small quantities. Table 5 shows a situation where DMU 8 wants to reduce its inefficiency, the reference pattern that can be used is the use of input of 0.929 times of DMU 11's actual input data, added to 0.113 times the actual input data of DMU 15.

The products that are produced by this DMU 9 are unique; namely noodle chips. This product is produced from the shredded raw banana so that its shape resembles the dry noodles that we always see. It is sweet slightly sour because they use the lime juice ingredients as well. The cause of why this DMU is inefficiency is the high use of labor in one production process and on the other side, the production is small. The efficiency score of DMU 9 is 0.567. To be more efficient, DMU 9 can use the input of 0.665 times DMU's actual input data plus 0.537 times of the actual input data of DMU 12.

DMU 10 has an efficiency score of 0.733 and it is ranked on the 8th position after the efficient DMU. The resulting product is a banana cake. Packaging price that is used for this banana cake per unit is quite high. The frequency of production is very irregular and it is only produced to fulfill orders or demands. That's what makes the DMU 10 inefficient. To be more efficient, DMU 10 can follow DMU 6, 12 and 15. The use of DMU 10 input would be more efficient when 0.103 of actual data input of 6, added to 0.273 times actual input data of DMU 12, plus 0.273 times actual in can use the input of 0.665 times DMU's actual input data plus 0.537 times of the actual input data of DMU 12m added to 0.203 times actual input data of DM 15.

The next incoming DMU is DMU 13 which produces banana bangke. The variants for bangke that is produced DMU 13 are bananas, tawaro or sago, durian, coconut, and nuts. The favorite flavor variant is bangke tawaro. Therefore DMU 13 is more often producing the bangke tawaro than the others. The production bangke for the banana variants is quite regular or routine and it is done every week but in small quantities. That thing is resulting inefficiency in this product. DMU 13 has an efficiency score of 0.583. In order to be efficient, the reference of DMU 13 uses input of 0.013 times the actual input data of DMU 6, added to 0.599 times DMU 12's actual input data and 0.033 times actual input data of DMU 15.

DMU 14 is ranked on the 7th position after the efficient DMU, its efficiency score is 0.998. The DMU efficiency score of 14 is most efficient. The resulting product is a banana cake. The main cause of efficiency is the high raw material price when it is compared to the price of other DMU raw materials. DMU 14 can decrease inefficiency (table 5) by using input of 0.283 times actual input data of DMU 1 plus 0.212 times actual input data of DMU 11.

The results showed that DMU 1 was used 5 times as a reference for inefficient DMUs. The makers in DMU 1 were able to combine the input well so that the optimized ouput is obtained. DMU 1 processed banana makers product is banana chips. These makers did production on a regular basis that is every three days. The average relative efficiency value for banana processing agroindustry is 0.737. This value is relatively high, but for agro-industry development in the future, every DMU should pay attention to several other aspects such as input prices, output prices, market information, processing technology, local food promotion, and processed products. However, it is possible that these aspects become weaknesses for DMU agroindustry which is still traditional (inefficient). They have not been able to develop themselves to diversify their processed products, so it needs a lot of improvement and it needs a change to a more modern direction.

In fact, lambda score interpretation is sometimes difficult to apply. This is due to the difference in characteristics between each input were used by the DMU. The

Table 6. Projection of using input to the efficient DMU (%)

DMU	Score	Raw Material Cost	Packaging and Labelling Cost	Labor Cost
1	1.000	0.00	0.00	0.00
2	0.485	-84.18	-51.49	-51.49
3	0.357	-64.34	-64.34	-64.34
4	0.386	-61.40	-76.09	-61.40
5	1.000	0.00	0.00	0.00
6	1.000	0.00	0.00	0.00
7	0.350	-78.47	-65.05	-65.05
8	0.599	-40.10	-40.10	-40.10
9	0.567	-43.29	-43.29	-63.64
10	0.733	-26.68	-50.97	-26.68
11	1.000	0.00	0.00	0.00
12	1.000	0.00	0.00	0.00
13	0.583	-41.66	-73.16	-41.66
14	0.998	-79.14	-0.22	-0.22
15	1.000	0.00	0.00	0.00

Source: Processed Primary Data (2017)

difference can be the intensity, quantity, or unit. Another reason is that every DMU has limited budget in its operational activities so it can not simply increase the used input.

The other way to accelerate efficiency level for inefficient DMU is by involving projection data as it is shown in table 6. The projection data which is produced by the DEA analysis, describes the compatibility or discrepancy between the actual data and the potential data. The increasing efficiency for model which is using input approach through proportional input alleviation. Table 6 shows the percentage of input usage which can bereduced if inefficient DMU needs to turn into more efficient. For example, if DMU 2 wants to reduce its efficiency level following the projection table, raw materials, bulk and label, and labor have to be reduced by 84.18%, 51.49% and 51.49% respectvely. For DMU 3, raw materials, bulk and label, and labor can be reduced by 64.34% each or by using 35.66% of each input to become more efficient. These steps can be applied for other DMUs, which means every DMU can decrease its input use in accordance to table 6.

Fixing the efficiency level by using projection data is easier to be applied. Projection data shows each used of actual and potential data from each DMU which is being the analysis object. According to Martic et al. (2009), the projection direction to the inefficient DMU is determinate by the approach used. The increasing efficiency for model which is using input approach through proportional input alleviation and for model which is using output approach needs additional proportional output. The management of DMU can choose one of those alternative inputs appropriate.

CONCLUSION

The study on the added value of various banana processing in Sebatik Island border area showed that processing of banana commodities provides different added value according to the type of the produced product. The average added value of banana processing products in Sebatik Island border area is IDR 16,375.28/Kg.

The relative efficiency analysis of 15 DMU of banana processing agroindustry showed that most of the banana agroindustry in Sebatik Island border area are not efficient yet. 40% of banana processing agroindustry are efficient and 60% are inefficient. The average relative efficiency value of banana processing agroindustry is 0.737.

SUGGESTION

Banana processing activities into various products proved to give the added value and benefits for processed banana makers in the Sebatik Island border area. Given the large agricultural potential of banana plants in Sebatik Island, processing activities should be developed in larger business scale so as to maximize the potential of the area. This processing activity has an aim to absorb the banana production as well and create an alternative option for the consumers in consuming the bananas. Local governments should help by opening up the market as much as possible for the production of banana processing products.

Efficiency is an important indicator on measuring the overall performance of an enterprise's activities. Before developing a business to a larger scale it is better to have some inefficient banana processing agroindustry trying to allocate optimum input usage in order to achieve perfect efficiency. This can be done by referring to an efficient banana processing agro-industry. Each inefficient agroindustry needs to minimize input or maximize output and rely on agroindustry that has been efficient.

The efficient agro-industry that do the regular production and create the products in the optimum amount based on its production capacity. Agro-industry with the high efficiency shows it ability in finishing every job based on the target that has made. For the inefficient agro-industry, the early step is to make the production schedule. With the well-planned regular production schedule, agro-industry can be able to increase its efficiency by saving the existing resources. In addition, it will be able to do the production in the shorter time from time by time. The usage too much raw materials and labors or resources can be minimized. The bigger job is used to need the longer time to finish it. By separating the big job to the smaller job, it will make it easier. After that, each agro-industry has to evaluate the causal factor of why it becomes inefficiency. It is because between one agro-industry and the other agro-industry has the different characteristics.

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