Contributing Organization In The Development Of Coconut Agro-Industry

Hermiza Mardesci, Santosa, Novizar Nazir, Rika Ampuh Hadiguna

Abstract: Agroindustry is one of alternatives to elevate the income, both community and country. Therefore, agrarian countries strives to develop the prospective agroindustry by utilizing their own natural resources. Indonesia is one of the world's top coconut producers and one of its national largest producers are located in Indragiri Hilir, Riau Province. Moreover, to support the development of coconut agro industry, the presence of supporting organization is also a critical point that should be taken into account. This study was aimed to determine the contributing institution related to the development of coconut agro industry. Type of organization contributing the highest expectation weight (47.8%) resulted from the village-owned enterprise (BumDes).

Index Terms: Analytical hierarchy process, coconut agro-industry, organization contributing, cooperation and small-medium enterprise, regional government-owned enterprise, private-owned enterprise, private-supported unit, village-owned enterprise

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1. INTRODUCTION

The agricultural industry is an effort to process natural resources with the support of industrial technology to produce various products conferring higher economic values. This kind of industry is known as agroindustry. Some agrarian countries compete in developing their own agroindustry as this sector could meet the community needs through the GDP improvement. Moreover, it also enable to increase the national income through tax, foreign exchange as well as excise from the export [1, 2]. Each country develops their agroindustry based on the specialties of their natural resources. For instance, Thailand develops food agroindustries and nowadays it has been regarded as world's most dynamic and diverse agroindustry. This progress had contributed a significant impact to the community welfare in Thailand [3]. Other agrarian countries, such as Brazil, the Philippines and India also implement the similar approaches as Thailand. According to Moreira [4], the economic development in Brazil was resulted mostly from the contribution of agribusiness or agroindustry activities. Larsen [5] also mentioned that the development of palm oil industry in the Philippines contributed a significant economic benefit to the local government. Similarly, agroindustry in India was also considered as the largest contributing sector in the increase of value-added as well as income of rural communities [6]. It is also in line with the statement of Supriyati [7] explaining that the role of agroindustry in boosting the value-added was more powerful than its role in expanding the employment.

Coconut is a strategic commodity for several countries in Asia-Pacific regions, such as Samoa, Tonga, Fiji, Vanuatu, Solomon Islands, Thailand, Indonesia, Philippines, Ceylon and Vietnam [8]. Philippines is the main exporting countries of coconut oil, dry grated coconut and coconut milk. However, Indonesia only exports 20-30% of its raw coconut oil as well as its by-

products and coconut milk. The largest exporting countries of dry grated coconut are the Philippines, Indonesia and Ceylon. For VCO products, the export is dominated by Philippines with the main export destination in the United States, France, Canada, Germany, England, New Zealand, Finland, Turkey, Hong Kong and Malaysia. The market for coconut water was also progressively developed where the exporting countries were steadily monopolized the global market, particularly Brazil, Philippines, Thailand, Indonesia, Ceylon, India, Vietnam and Malaysia [9]. Indonesia is one of the world's top coconut producers with harvested area reached 3.653.200 hectare (ha) in 2017 and total production reached 2,870,700 tonnes. Province of Riau is the number 1 largest coconut producer in Indonesia. Based on statistic data, coconut planted area in Riau has reached 510.800 ha with production over 416.000 tonnes. One of the districts in the Province of Riau having the largest area of coconut plantation up to 85% of the Riau region total area is Indragiri Hilir. Statistics Indonesia [10] recorded that coconut production of Indragiri Hilir in 2016 reached 341,295 tonnes produced from 429,943 ha. Based on previous research, prospective areas for the development of coconut agro-industry in Indragiri Hilir are Mandah, Reteh, and Enok districts [11], while prospective products to be developed are coconut oil, coconut sugar, and coconut shell charcoal [12]. However, the development of processing agro-industry in Indragiri Hilir had not comparable yet with the number of coconuts produced. To support the agro-industry development of coconut products, various stakeholders and relevant organizations are supposed to contribute. This processing agro-industry is regarded as a powerful business idea to elevate the value-added of coconut while supporting the community empowerment of coconut farmers in Indragiri Hilir. Fadhil et al. [13] stated that the study of organizational involvement was crucial to be performed to assess the prospect of developing certain agro-industry in Indonesia. Therefore, this present study was urgently required to investigate the most contributing organizations and evaluate the product's value-added to the development of coconut water-based products agro-industry in Indragiri Hilir. The result of this study served a supporting consideration for coconut farmers regarding their decision on developing coconut agro-industry to increase their income. Moreover, it also provided a promising suggestion for stakeholders and related institutions, thus it could support small-scale industry integratively resulting

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in higher income. This information was also useful as a reference for the making of various policy strategies by the government regarding the development of small-medium enterprises, particularly the agro-industry of coconut water-based products in Indragiri Hilir and other regions in Indonesia.

2 RESEARCH METHOD

This study was performed descriptively in District of Indragiri Hilir, Riau. This location was purposively selected as Indragiri Hilir is the largest production center of coconut in Riau. In addition, numerous coconut processed industries were found in Indragiri Hilir, such as coconut oil, coconut sugar, and shell charcoal available in various sub-districts. Both primary and secondary data were collected from seven respondents representing academician, professional assistant of the local coconut farmers group, extension officer and staff from the local plantation and food crops office. Primary data was collected and obtained directly from the coconut water processed entrepreneurs, contributing workers and experts through interview and questionnaires filling. Secondary data was collected from related governmental institutions (Statistics Indonesia, Plantation Office and Industry Office) and recently published scientific sources. Subsequently, the determination of contributing organization related to coconut agro-industry was carried out using Analytical Hierarchy Process (AHP). This method determined the decision making to solve certain complex issue or problem by using the hierarchical structure. Problem-solving analysis using this method involved several recommended criterions and alternatives [14-16] According to Saaty [15], AHP method was performed by describing some criterions and alternatives then it was arranged into a hierarchical structure. Those criterions and alternatives were evaluated using a pairwise comparison based on a questionnaire, discussion and interview with experts, resulting in certain score according to the scoring scale (Table 1). Afterwards, priority was determined by manipulating the matrix through a mathematical equation toward the result of a pairwise comparison. Additionally, rational consistency was evaluated according to the protocol adopted from Noer [17]. Matrix was multiplied with the correlating priority vectors, afterwards the result of multiplication per row was summed. Summation result was subsequently divided by priority vector before being re-summed. The result obtained was divided by the number of elements used (n), resulting in λ_{max} value. This λmax value was then used to determine the value of the consistency index (CI) through this following formula:

$$CI = \frac{(\lambda_{max}-n)}{n-1} \quad (1)$$

Consistency ratio (CR) was subsequently measured by comparing the value of the consistency index (CI) with the value of index random consistency (IR) (available in Table 2)

using this following formula:

$$CR = \frac{CI}{IR} \qquad (2)$$

If the ratio consistency was ≤ 5% for 3x3 matrix, ≤ 9% for 4x4 matrix and ≤ 10% for the bigger matrix, thus the calculation result was acceptable.

3 RESULTS AND DISCUSSION

TABLE 1
SCORING SCALE OF PAIRWISE COMPARISON [15]

Scale of interests	Description
1	Both elements have the same level of importance
3	One element is quite more important than another element
5	One element is more important than another element
7	One element is highly important compared to another element
9	One element is absolutely more important compared to other element
2, 4, 6, 8	Values among two adjacent considerations

TABLE 2
VALUE OF RANDOM CONSISTENCY INDEX [15]

Matrix	2	3	4	5	6	7	8	9	10
IR	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.51

According to Harris (2006) cited by Anifriza[18], the success of certain agro-industry activity could not be apart from the organizational factor. It showed that organizational supports played an influential role in the success of an agro-industry. However, the organization type showing an impactful contribution to the development of coconut agro-industry was supposed to be determined. It was useful to avoid the risk of an organizational mismatch, leading to the disturbance on the development of this agro-industry. The criterion used in this study was based on the criterion proposed by various relevant literature [18-20] and interview results obtained from several corresponding respondents. Those criterions consisted of several aspects, such as human resources, capital and financial resources, innovation and technology, as well as organizational management. These four parameters could be used to determine the contributing organization for the development of coconut water-based agro-industry in Indragiri Hilir, Riau. Several alternatives of organizations were selected to be evaluated in this study, including cooperation, small-medium enterprise, regional government-owned enterprise, private-owned enterprise, private-supported unit and village-owned enterprise (Figure 1).
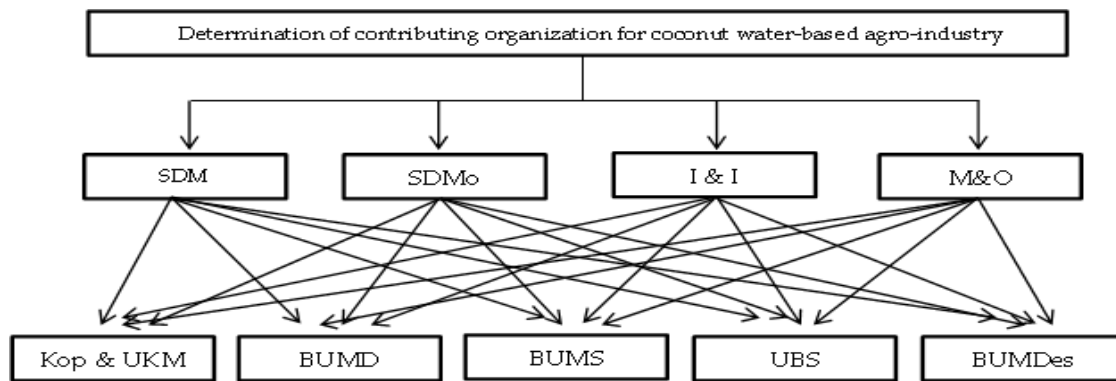
Fig. 1 *Hierarchical Structure on The Evaluation of Contributing Organization*

Descriptions:
SDM   = Sumber Daya Manusia (human resources)
SDMo   = Sumber Daya Modal (capital resources)
I & I   = Ilmu Pengetahuan Teknologi dan Inovasi (technological sciences and innovation)
M & O   = Manajemen dan Organisasi (management and organization)
Kop & UKM = Koperasi dan Usaha Kecil Menengah (cooperation and small-medium enterprise)
BUMD   = Badan Usaha Milik Daerah (regional government-owned enterprise)
BUMS   = Badan Usaha Milik Swasta (private-owned enterprise)
UBS   = Unit Binaan Swasta (private-supported unit)
BUMDes   = Badan Usaha Milik Desa (village-owned enterprise)

All respondents performed some scoring on all of those criterions and alternatives through the questionnaires filling (Table 3). These data were subsequently evaluated for its consistency. Data collected from these questionnaires were then presented a matrix of pairwise comparison as seen in Table 4. Data on Table 4 were also measured for its consistency by arranging the relative interest level on each criterion represented as normalized relative weight. This normalized relative weight was described as a relative score of each element on each column compared with the number of each element (Table 5). Afterwards, the summation of each element (Table 5) was used to determine the matrix normalization by counting the number of each column (Table 6) where every matrix element was divided by the number of the corresponding column as described in this following formula.

$$r_{11} = \frac{X_{11}}{\sum_{i=1} X_{i1}} = \frac{1}{1.593} = 0.628$$

TABLE 3
SAMPLE OF CRITERION EVALUATION FILLED IN QUESTIONNAIRE FROM A RESPONDENT.

SDM	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	SDMo
SDM	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	I & I
SDM	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	M&O
SDMo	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	I & I
SDMo	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	M&O
I & I	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	M&O

TABLE 4
MATRIX OF PAIRWISE COMPARISON OBTAINED FROM THE QUESTIONNAIRE DATA OF A RESPONDENT.

	SDM	SDMo	I & I	M & O
SDM	1	7	4	5
SDMo		1	1/5	1/3
I & I			1	2
M & O				1

TABLE 5
SUMMARIZATION OF EACH ELEMENT ASSOCIATED WITH THE DETERMINATION OF CONTRIBUTING ORGANIZATION.

	SDM	SDMo	I & I	M & O
SDM	1.000	7.000	4.000	5.000
SDMo	0.143	1.000	0.200	0.333
I & I	0.250	5.000	1.000	2.000
M & O	0.200	3.000	5.000	1.000
$\sum i$	1.593	16.000	5.700	8.333

TABLE 6

THE NORMALIZED RELATIVE WEIGHT OF A RESPONDENT'S PREFERENCE

	SDM	SDMo	I & I	M & O	Total	Priority vector
SDM	0.628	0.438	0.702	0.600	2.367	0.592
SDMo	0.090	0.063	0.035	0.040	0.227	0.057
I & I	0.157	0.313	0.175	0.240	0.885	0.221
M & O	0.126	0.188	0.088	0.120	0.521	0.130
Total	1.000	1.000	1.000	1.000	4.000	

Table 6 provided the information of the preference level of four criterions according to the first respondent. According to this data, human resources was the most critical criterion for the determination of contributing organization for the development of coconut water-based agro-industry. This criterion exhibited the highest value about 59.2%. these data were then analyzed to measure the consistency ratio toward the respected data using matrix multiplication as followed:

Matrix multiplication with the priority vector

$$\begin{vmatrix} 1 & 7 & 4 & 5 \\ 0.143 & 1 & 0.200 & 0.333 \\ 0.250 & 5 & 1 & 2 \\ 0.200 & 3 & 5 & 1 \end{vmatrix} \times \begin{vmatrix} 0.592 \\ 0.057 \\ 0.221 \\ 0.130 \end{vmatrix} = \begin{vmatrix} 2.525 \\ 0.229 \\ 0.913 \\ 0.530 \end{vmatrix}$$

Dividing the multiplication result by the priority vector

$$\begin{vmatrix} 2.525 \\ 0.229 \\ 0.913 \\ 0.530 \end{vmatrix} / \begin{vmatrix} 0.592 \\ 0.057 \\ 0.221 \\ 0.130 \end{vmatrix} = \begin{vmatrix} 4.268 \\ 4.030 \\ 4.130 \\ 4.068 \end{vmatrix}$$

Average of the multiplication :

$$\lambda_{max} = \frac{4.268 + 4.030 + 4.130 + 4.068}{4} = 4.124$$

Calculation of consistency index :

$$CI = \frac{(\lambda_{max} - n)}{n - 1}$$

$$CI = \frac{4.124 - 4}{4 - 1} x100\% = 4.13\%$$

Calculation of consistency ratio :

$$CR = \frac{CI}{IR}$$

Based on the table of random consistency index, the obtained IR value of 4x4 matrix was 0.9, thus resulted in 4.59% of CR value. As the CR value was below 9%, it indicated that the collected data was considered as consistent. A similar procedure was used to evaluate the information from the remaining selected respondents and the results were presented in Table 7. Of all respondents interviewed, one respondent showed an inconsistent answer as the resulted CR value was more than 9% (Table 7). This data was then eliminated for further data analysis.

TABLE 7

EVALUATION OF CONSISTENCY INDEX (CI) AND RATIO (CR) VALUES FROM ALL COLLECTED RESPONDENTS

Respondents	CI value (%)	CR value (%)
1	4.12	4.59
2	4.80	5.34
3	7.62	8.46
4	6.10	6.78
5	13.42	14.91
6	4.48	4.98
7	5.03	5.58

Data from 6 respondents showing consistent interpretation were then subjected into the arrangement of comparison by firstly combined all collected answers from the respondents (X1...X6) using the formula of geometric mean (GM) as followed.

$$GM = \sqrt[6]{(X_1)(X_2)(X_3)(X_4)(X_5)(X_6)}$$

The result of geometric mean calculation on each criterion's perspective was available in Table 8. Analysis of geometric mean was performed using the same procedure as criterion analysis based on first respondent's preferences (Table 5 and 6). Consistency index determination exhibited CR value of 0.31% indicating the high consistency of respondent answers as the CR value was below 10% for a 4x4 matrix. The weights of all criterion categories from all respondents were calculted and the result is shown in Table 9.

TABLE 8

THE GEOMETRIC MEAN OF CRITERION BASED ON THE INTEGRATION OF ALL RESPONDENTS' ANSWERS.

	SDM	SDMo	I & I	M & O
SDM	1.000	3.617	4.509	3.811
SDMo	0.276	1.000	1.468	1.372
I & I	0.222	0.681	1.000	1.011
M & O	0.262	0.729	0.989	1.000

As seen in Table 11, the highest priority vector (0.566) was achieved from human resources (SDM) criterion. It indicated that the determination of contributing organization in the development of coconut water should highly consider this human resources criterion. In line with several previous studies, the management of agro-industry required high competency human resources [18, 21]. Such a well-trained and professional human resource would be a powerful agro-industry player who enabled to follow the market development. Therefore, coconut water-based agro-industry was potential to be developed, not only as a small-medium enterprise but also was potential to reach the global market.

TABLE 9

INTEGRATION ANALYSIS BASED ON QUESTIONNAIRE ANSWERS FROM ALL RESPONDENTS

	SDM	SDMo	I & I	M & O	Total	Priority Vector
SDM	0.568	0.600	0.566	0.530	2.264	0.566
SDMo	0.157	0.166	0.184	0.191	0.698	0.174

I & I	0.126	0.113	0.126	0.141	0.505	0.126
M & O	0.149	0.121	0.124	0.139	0.533	0.133
Total	1.000	1.000	1.000	1.000	4.000	
Mean (λ)		4.008				
Consistency index (CI)		0.28%				
Consistency ratio (CR)		0.31%				

Human resources played a very important role for the industrial activity, therefore this factor should be well managed to support the company or industry's activities [22]. Along with the predominance of technology, innovation, and capital, human resources would determine the success of an industry. Maulidah [20] reported that an industry performing a well-managed human resources management would achieve its main target efficiently and effectively. Besides human resources, the criterion of capital resources was in the second priority with priority vector of 0.174. This criterion showed not much different value with third and fourth priority vectors obtained from management and organization (0.133) as well as technology and innovation (0.126). Capital resources as financial support are another criterion with the same importance as human resources. In line with human and capital resources, management and organization also play as an important supporting factor in the agribusiness. As mentioned by Maulidah [20], an organization of agribusiness can be categorized as a player as well as a supporter. Meanwhile, technology and innovation is a supporting criterion required by human resources to explore the potential agriculture commodities and enhance its value-added. Afterward, priority synthesis towards each criterion alternatives was performed using the same procedure as the integration analysis. The result of analysis on organizational alternatives is shown in Table 10. According to the result, the highest expectation weight was obtained from village-owned enterprise or government-owned enterprise about 0.478. It indicated that the most contributing organization in the development of coconut water-based agro-industry was village-owned enterprise. Although according to Fadhil et al. [23], the welfare of farmers is also never separated from the role of local government. Law of the Republic of Indonesia No. 32 in 2004 on Regional Government article 213 section 1 to 3 explained that village-owned enterprise is an enterprise built by village according to the village needs and potencies. This enterprise is based on the government regulation which enables to propose any loan according to the relevant government regulation [24]. A detailed explanation is set forth in Law of the Republic of Indonesia No. 6 in 2014 on Village. In chapter X, article 87 to 90 explained more detailed about the village-owned enterprise [25]. It can be concluded that village-owned enterprise is an enterprise managed based on the principle of mutual cooperation (gotong royong). Village-owned enterprise is aimed to build the welfare of the village community through various activities, including village and business development, local community empowerment and supports distribution through grants, social aids and etc.

TABLE 10
RECAPITULATION OF SYNTHESIS RESULT TOWARD THE ALTERNATIVE PRIORITIES ON SEVERAL CRITERIONS

	SDM (0.566)	SDMo (0.174)	I & I (0.126)	M & O (0.133)	Expectation weight $\sum(X_i \times P_i)$
Cooperation and small-medium enterprise	0.274	0.199	0.210	0.218	0.245
Regional government-owned enterprise	0.125	0.177	0.149	0.129	0.137
Private-owned enterprise	0.071	0.084	0.072	0.062	0.072
Private-supported unit	0.062	0.066	0.063	0.089	0.066
Village-owned enterprise	0.468	0.475	0.505	0.502	0.478
Mean (λ)	5.104	5.052	5.087	5.062	
Consistency index (CI)	2.60%	1.29%	2.18%	1.55%	
Consistency ratio (CR)	2.32%	1.15%	1.94%	1.39%	

In Indragiri Hilir, the village-owned enterprise is also regulated in Regional Government Regulation No. 9 in 2009 on Guidance of Village-owned Enterprise in Indragiri Hilir [26]. As the regulation was released, it is recorded that there are 80 village-owned enterprises in Indragiri Hilir. Through this village-owned enterprise, it could support the village economic development by exploring the existing local potencies, particularly coconut. The development of coconut water-based agro-industry is highly prospective agro-industry to develop as the resulted product could enhance the value-added of the raw ingredients.

4 CONCLUSION
Criterion analysis using AHP method resulted in human resources as the criterion exhibiting the highest priority vector. Alternative analysis conferred that village-owned enterprise was the organization showing the highest expectation weight compared to other organization types.

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