

**FARMERS' ATTITUDE TOWARD ORGANIC COCOA BEAN FERMENTATION
PRACTICE: Case on the Cocoa Farmers' Group of Buana Mekar, Tabanan District, Bali
Province**

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ABSTRACT

Cocoa farming has still played important role in the income of farmers in the district of Tabanan, Bali Province, Indonesia. However, the quality of beans produced by farmers is still low. One of the reasons contributing to low quality of cocoa beans in at the farmer level in Bali is the use of conventional processing method. Farmers did not conduct fermentation on their beans. The objectives of this study are to describe the attitude and knowledge of farmers about cocoa bean fermentation process, and to analyse the correlation of farmers' characteristics and their attitude toward cocoa bean fermentation. The research was conducted in farmer's group of Buana Mekar located in Tabanan district. 40 samples were selected by using simple random sampling out of 92 farmers as a population (members of farmer's group). Data used were primary and secondary data gathered by employing survey, observation and documentation techniques. Data analyzed by using descriptive method and statistical method, namely correlation test.

The results of study pointed out that the attitude of farmers toward cocoa bean fermentation was categorized into agreed with the average score was 78.50 % out of maximum score. This condition means that farmers have high positive attitude related to benefits of fermentation, techniques of fermentation, drying and quality of bean. The knowledge of farmers about cocoa bean fermentation was high with the average score was 72,40 % out of maximum score. Information about fermentation was gained from the government staff, project staff, facilitators, other farmers. Several characteristics of farmers (formal education, knowledge, land size of cocoa plantation and experiences on cocoa farming) have strong correlation to their attitude toward an application of cocoa bean fermentation. The other characteristics (age, and family members) have weak correlation to their attitude toward an application of cocoa bean fermentation. It is still needed to conduct more intensively extension and training on fermentation practices and ensure the proper price of fermented bean at the farmers level.

Key words: Cocoa bean, fermentation, attitude, correlation and farmer

1. INTRODUCTION

In Bali Province, cocoa is one of the main commodities that are relied upon in the plantation sub-sector, which until now has experienced quite rapid growth. As an illustration that in 2010 the area of cocoa is about 6,564 ha with production reaching 5,424,367 tons, then expanded in 2014 where the area reached 8,769 ha with the achievement of production reach 7,123,869 tons. In particular regency, Jembrana regency, Tabanan regency are also the cocoa production center in Bali with total area of 3,149 hectares with production reaching 2,273,860 tons. Cocoa farming in Tabanan regency to date has been able to absorb the workforce of about 425,214 people or 17,094 households.

Organic cocoa beans demand has been increased for the international market. Therefore, the exporters have initiated to introduce the production process of organic cocoa beans. They have been obliged to have organic certificate to ensure that their cocoa beans are really organic. In Bali Province, organic certification for cocoa beans has been known since 2010. There were five cocoa farmers groups called *subak abian* in Tabanan regency, Bali, obtained organic certificate from an institution in Bogor because all of its production process apply environmentally friendly pattern. Organic certificate is one of the requirements in free trade in the global market with the tight competition among the exporters within many countries.

The five *subak abian* has members as may as 271 farmers with a cultivation of cacao plant area of 180.9 hectares. *Subak-abian* Catur Guna in Akah Village, West Selemadeg District , 75 members of farmers, with a land area of 26.65 hectares with annual production of 19.9 tons. Similarly, *subak abian* Pangkung Sakti I consists of 70 farmers with 72 hectares of land with 52.3 tons of production per year. *Subak Abian* Pangkung Sakti II consists of 69 farmers working on 29 hectares of cocoa plant with production of 29 tons per year. In addition, *subak abian* Buana Mekar Akah Village, West Selemadeg District, has member 92 farmers with 23.3 hectares of land per year and 17.5 tons per year, and *subak-abian* Pemaksan Kaja consisting of 27 farmers owning 18.8 hectares with 13 production, 5 tons per year.

However, the development of cocoa production in Indonesia, including in Bali Province is often not followed by improved cocoa beans quality. Cocoa beans from smallholder plantations tend to be of low quality. The low quality of cocoa beans, mainly due to poor processing, such as unfermented cocoa beans or fermentation process is not good. Whereas fermentation is the core of cocoa processing process. This process not only aims to free cocoa beans from pulp and kill seeds, but mainly to improve and shape good and pleasant chocolate flavors and reduce the taste of bitter and bitter on the seeds (Putra, 2008). Fermentation can be done by several methods, such as fermentation of stacks, fermentation in baskets, and in-box fermentation. The choice of method depends on the ease of application and obtaining the fermentation container, as well as the availability of labor.

The perfect fermentation determines the flavor of cocoa beans and their processed products, as well as ripe and healthy fruits and good drying. If fermentation is less or less perfect, in addition to the distinctive flavors of chocolate are not formed, it is also often produced undesirable followup flavors, such as sour, bitter, sour, tasty, and ground flavor. This might bring about low quality of cocoa beans, thus make lower price.

Subak-abian Buana Mekar in Angkah Village, Selemadeg Barat District, Tabanan Regency has started to process organic cocoa beans, by fermentation. Fermentation technology has been introduced by the Provincial Plantation Office of Bali and the Office of Forestry and Plantation Tabanan District since the last ten years. In addition to fermentation technology, the government has also provided facilities such as fermented cocoa bean processing equipment, such as fermentation boxes, drying tools, para-para and solar dryers which are needed to obtain good quality fermented cocoa. Given the process of fermentation is a relatively new innovation, then research in this direction needs to be done to find out more about the social aspects of farmers who do fermentation. The objectives of this study are to describe the attitude and knowledge of farmers about cocoa bean fermentation process, and to analyse the correlation of farmers' characteristics and their attitude toward cocoa bean fermentation.

2. Methods

The study was conducted in farmer's group of Buana Mekar located in Tabanan district situated about 44 km from Denpasar city, westward. This was selected by using purposive sampling with some reasons. Firstly, this farmers' group has implemented fermentation process on organic cocoa beans. Secondly, this farmers' group has a partnership with an exporter of cocoa beans. In this study, it was selected 40 samples by using simple random sampling out of 92 farmers as a population (members of farmer's group). Measurement of categories of attitude and knowledge of farmers is based on the Likert scale by giving value 1, 2, 3, 4, and 5. Each category has an interval 16 gained from the below formulation.

$$i = \frac{\text{Score maximum} - \text{score minimum}}{5} = \frac{100\% - 20\%}{5} = 16$$

Referring to the interval cited above, the categories of attitude and knowledge of farmers could be seen in the Table 1.

Table 1
Categories of attitude and knowledge of farmers about fermentation of cocoa beans

No	Category of attitude	Score (%)	Category of knowledge
1	Strongly agree	> 84 - 100	Very high
2	Agree	> 68 - 84	High
3	Hesitate	> 52 - 68	Moderate
4	Disagree	> 36 - 52	Low
5	Strongly disagree	20 - 36	Very low

Data collected in the study were primary and secondary data. Data collection techniques used were survey, observation and documentation techniques. Data analyzed by using descriptive method

and statistical method, namely correlation test by using Karl Parson Correlation. Its formulation is below.

$$r = \frac{N \sum xy - (\sum x) (\sum y)}{\sqrt{N \sum x^2 - (\sum x)^2} \quad N \sum y^2 - (\sum y)^2}$$

Remarks:

N = Samples

x = Independent variables (age, formal education, family size, land holding and experiences on cocoa farming; knowledge).

y = Attitude

Value of r indicates the strength of correlation between the independent variables and dependent variables, with the intervals as shown below:

1. Very very strong correlation: 0,91 – 0,99
2. Very strong correlation : 0,71 – 0,90
3. Strong correlation : 0,41 – 0,70
4. Weak correlation : 0,21 – 0,40
5. Very weak correlation : 0,00 – 0,20

(Nugroho, 2005)

3 Results and Discussion

3.1 Characteristic of samples

In this study, the farmers' characteristic consisted of (i) age; (ii) formal education; (iii) family size; (iv) landholding for cocoa trees; and (v) the experiences on cocoa cultivation. Based on the survey toward 40 farmers as samples, it was known that the average age of farmers is 52.80 years with the interval between 32 years to 62 years (see Table 2).

Table 2
Characteristics of farmers

No	Item	Average	Interval
1	Age (year)	52.80	32 - 62
2	Formal education (year)	12.40	6 - 16
3	Family size (person)	5.40	4 - 7
4	Land holding (ha)	0.68	0.45 - 1.20
5	Experiences on cocoa cultivation (year)	22.50	6 - 36

Source: Analysis of primary data

Land holding of farmers is relatively small for planting cocoa trees, in which its average is 0.68 ha. The size of land has significant influence to the production of cocoa beans (Wessel, *et al*, 2015; Ruf, 2011). Moreover, the experiences of farmers on cocoa cultivation is relatively long, it is about 22 years. In this study, the age of cocoa trees was more than 16 years in average, so this might also influence the productivity of trees to produce cocoa pods and good quality of beans (Dormon, et al, 2007). The age of farmers is relatively old, thus is needed to provide particular extension in order that they might be able to easier understand the information or innovation disseminated by the extension workers. Their formal education is seemingly supported the acceleration of innovation adoption introduced by the government agents or the other agents who have interest in the cocoa development, especially on the organic cocoa beans fermentation.

In the site, farmers had relative long experiences on the cocoa farming due to their farms are suitable to cultivate the cocoa trees. The average year of their experiences was 22 years. This indicates that they have skill on cocoa farming even though their skill are still relatively limited. Therefore, they

need innovation and technology (good agricultural practices) on cocoa farming and fermentation process, too.

3.2 Attitude of farmers toward fermentation of organic cocoa beans

The results of the survey conducted on 40 sample of farmers in *Subak-abian* Buana Mekar showed that the average score of farmers' attitude toward the fermentation of organic cocoa beans is 78.50 % out of the maximum score, with an interval between 66.25 % to 90.40 %. This means that their attitude is agreed. Most of the farmers had a category of agree toward the fermentation of organic cocoa beans (80.00 %). In more detail, the frequency distribution of sample farmers based on their attitude categories on fermented cocoa beans can be seen in Table 3.

Table 3
Distribution of the frequency of farmers in each attitude category fermentation of cocoa beans

No	Category	Frequency (person)	Percentage (%)
1	Strongly agree	4	10.00
2	Agree	32	80.00
3	Hesitate	4	10.00
4	Disagree	0	0.00
5	Strongly disagree	0	0.00
	Total	40	100

Sourcer: Analysis of primary data

Seeing the data shown on the Table 3, it could be mentioned that there is no farmer having disagreed and strongly disagreed attitude toward the organic cocoa beans fermentation. There is only 10.00 % of farmers who still hesitates on the fermentation process. The indicators measured in this attitude variable are (i) benefits of fermentation; (ii) techniques of fermentation; (iii) quality of cocoa beans; and (iv) marketing of fermented beans. Fermented cocoa bean is ensured by farmers to have higher quality and price (Kresnowati, *et al*, 2013; Mgumia, *et al.*, 2015). Consequently, it could increase the income of cocoa farmers (Quarmin, *et al*, 2014; Nmadu, *et al*, 2015).

3.3 Knowledge of farmers on the organic cocoa beans fermentation

Based on the survey conducted in the site, it was found that the average knowledge of farmers about the organic cocoa beans fermentation is within the high category with the score 76.80 % out of maximum score. The interval score of their knowledge is between 64.25 to 90.40 %. The distribution of farmers based on the their categories is shown in the Table 4.

Table 4
Distribution of the frequency of farmers in each attitude category fermentation of cocoa beans

No	Category	Frequency (person)	Percentage (%)
1	Very high	4	10.00
2	High	32	80.00
3	Moderate	4	10.00
4	Low	0	0.00
5	Very low	0	0.00
	Total	40	100

Sourcer: Analysis of primary data

Regarding data mentioned in the Table 4, it could be said that most of farmers (80.00 %) has high knowledge about the fermentation of organic cocoa beans. There is no farmer has low and very low knowledge about the fermentation. Through the interview, the sources of information about fermentation of organic cocoa beans are from agricultural extension agents coming from government and non-government (facilitators of project management unit under the AMARTA Project). Besides, farmers also got information about the fermentation from the field staff of exporters that always bought the organic fermented beans, such as Big Tree Farm company.

Information gained by farmers is regarded useful to making proper fermentation process in order to produced qualified fermented beans. They were also given information about the standardization of

fermented beans which are needed by the international market. Participatory extension and training were conducted by the extension agents through the Productive Unit Processing owned by the farmers' group (*subak-abian*). Spreading information of organic cocoa beans fermentation was supported by the good atmosphere of farmers' group. This group had created closed interaction among the farmers to meet each other in the meeting hall of group and also in the field or cocoa farm area. They could discuss about the cocoa beans fermentation aside from good agricultural practices on cocoa farming. Another supporting aspect of this group to process fermentation is the facilities possessed by the group, such as fermentation boxes, drying machine, solar dryer which are important for doing fermentation. These equipment were provided by government at the regency and provincial levels. In order to make optimal operation of these equipment for fermentation, government staff at the two levels have intensive agricultural extension to farmers through their group.

3.3 Correlation between the farmers' characteristics and attitude

Characteristic of farmers have influenced their behavior on the innovation disseminated by the agricultural extension workers and other institutions' agents (Adesina and Zinnah, 2003; Napier, 2000, Sule, et al., 2002). In this study, the correlation among the independent variables (age, length of formal education, family size, land holding size and experiences on cocoa farming) and dependent variable (attitude) shows different strengths. Only the length of formal education and experiences on cocoa farming have strong correlation with the attitude of farmers regarding organic cocoa beans fermentation process. The correlation of these variables are presented in the Table 5.

Tabel 5
Correlation among the independent variables and attitude

No	Independent variable	Correlation (r)	Remarks
1	Age	0,03	Very weak correlation
2	Length of formal education	0,64	Strong correlation
3	Family size	0,20	Very weak correlation
4	Knowledge	0,70	Strong correlation
5	Land holding size	0,62	Strong correlation
6	Experiences on cocoa farming	0,50	Strong correlation
Remarks :			
Very very strong correlation: if r is between 0,91 – 0,99			
Very strong correlation: if r is between 0,71 – 0,90			
Strong correlation: if r is between 0,41 – 0,70			
Weak correlation: if r is between 0,21 – 0,40			
Very weak correlation: if r is between 0,00 – 0,20			

Seeing the Table 4 above, factors of age, family size and land holding size of farmers has very weak correlation with their attitude toward the organic cocoa beans fermentation. This indicates that the younger farmers should be focused on the extension and training conducted by the extension agents and facilitators. This practice is addressed to make a cadres of farmers who have ability and capability to disseminate and motivate the older farmers to adopt the innovation of fermentation.

4. Conclusion

Based on the discussion above, it is pointed out that the average of farmers' attitude toward the fermentation of organic cocoa beans is agreed. Their knowledge is high in average about the organic cocoa beans fermentation. Farmers get information about fermentation from the government staff, project staff, facilitators and other farmers. The characteristics of farmers, such as formal education, knowledge, land size and experiences on cocoa farming have strong correlation to their attitude toward an application of organic cocoa bean fermentation. Meanwhile, age, and family members of farmers have very weak correlation to their attitude toward an application of cocoa bean fermentation. It is recommended that government should conduct more intensively extension and training on fermentation practices and ensure the proper price of fermented bean at the farmers level in order to motivate farmers to have fermentation on their cocoa beans.

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