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The Knowledgement of Green Marketing and Consumer Decisions in Buying Organic Product with Fuzzy Analysis

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Abstract: *In an effort of environment friendly, all elements related to the environment must be considered from producers to consumers. The problem is that even though people understand the importance of protecting the environment, behavior in protecting the environment and purchasing environmentally friendly products is still not appropriate. The purpose of this study is to analyze the clusters of consumers in the buying behavior of organic products, the knowledge matrix of green marketing, the prediction of consumers to buy organic products and what is most dominant factors of green marketing encourages consumers in purchasing organic products. The study was conducted from September to December 2019 in Bandung and , the sample was taken by random sampling of 205 respondents. Research finding, the prediction using Fuzzy Naive-Bayes (FNB) is a significant answer according to the theory proposed, namely that the higher the knowledge about green marketing, the higher the interest in buying green products. Research implication for further research, new variables allow for addition, and also the engineering of determining the degree of Fuzzy membership can be expanded. The originality of this research is to determine consumer decision with fuzzy, so the results will be closer to the natural characteristics of the respondents This research is useful for policy makers, market participants and stakeholders in educating consumers.*

Keywords*: Green marketing, decision making, organic product, Fuzzy analysis*

I. INTRODUCTION

Green marketing is very important in supporting sustainable agriculture, as well as in helping environmentally friendly. Green marketing came into prominence in the late 1980s and early 1990s; it was first discussed much earlier. Green marketing is a buzzword these days. Even the top of the companies are focusing on products which are environment friendly. The usage of organic product can by default generate products which are environment friendly and causes less harm to environment during their production process (Aggarwal, 2014). The results of Deliana et al (2017) research generally understand respondents about green marketing. The distribution of the residence of the respondents is in the city (73.77%), then in the city border (15.85%) and a small portion of the village (10.38%). People know and understand that littering or using plastic bags causes flooding, the environment is not environmentally friendly. Even though his knowledge and attitudes are good, but his behavior is not good, still littering, burning of plastic that causes air pollution, still uses plastic bags, and others.

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Marketing starts from distributing products or services from producers to consumers, as well as green marketing. All of these components must be interrelated to realize green marketing in supporting sustainable agriculture. If one component does not work well, green marketing will not be achieved and finally there will be no sustainable agriculture

Green marketing starts from green products, green finance, green living, green transportation, green producers, green consumer and green communication (Deliana *et al*, 2017).

The problem is that even though people understand the importance of protecting the environment, behavior in protecting the environment and purchasing environmentally friendly products is still not appropriate. The purpose of this study is to analyze the clusters of consumers in the buying behavior of organic products, the knowledge matrix of green marketing with the decision of consumers to buy organic products, the prediction of consumers to buy organic products and what is most dominant factors of green marketing encourages consumers in purchasing organic products

II. Literature Review

"Consumer behavior is the study of how individuals make decisions to spend their available resources (time, money, effort) on consumption-related items. It includes the study of what they buy, why they buy it, when they buy it, where they buy it, and how often they buy it.*"* (Engel et al , 1994; Schiffman and Kanuk, 1997).

Measurement of consumer lifestyle can be done using the AIO indicator, which includes activity, interest, and opinions. AIO indicators or components are as follows:

1. Activities are what consumers do, what products are purchased or used, and what activities they do to fill their free time;
2. Interest is what preferences, interests, and priorities in the consumer's life; and
3. Opinion is the views and feelings of consumers in responding to global, local, moral, economic and social-cultural issues.

Purchasing decisions are influenced by external and internal factors. External factors can be in the form of cultural factors and social factors. While internal factors are personal factors and psychological factors (Kotler and Keller, 2009; Solomon, 2009).

Cultural factors : culture, sub-culture, and social class.

Social Factors : reference group, family, role, and status.

Personal factors : age, occupation, and the state of the economy, personality, self-concept, lifestyle, and value.

Psychological factors : motivation, perception, learning, and memory.

The Logical Framework

Green marketing is essentially marketing products or services by paying attention to the environment. Green marketing distributes products or services starting from green producers that produce green products, green finance, green living, green transportation, green consumer, and green communication. Knowledge of green marketing will certainly influence consumer decisions in buying green products. The purchase decision depends on the needs, information seeking, and alternative evaluation. Similarly, the decision to purchase organic products. The logic is that the higher the knowledge of green marketing, the more willing to buy organic products. The theory said that attitudes and behavior must be in line. If the attitude is positive towards something, then the behavior is also positive. Although the results of Deliana (2019) said that attitude is not always in line with the behavior. Respondents' knowledge about green marketing is positive, but their behavior is still littering, not protecting the environment, using plastic packaging or bagging, using an-organic fertilizer,

using transportation that pollutes the environment and so on. Thus, this study wants to analyze more specifically whether the knowledge of green consumers is in line with their behavior in buying organic products

III. RESEARCH METHODOLOGY

The study was conducted in September - December 2019 in Bandung, West Java. The data in this study are primary and secondary data while the sampling technique is simple random sampling of 205 respondents. Variables for green marketing are green products, green finance, green living, green transportation, green producers, green consumers, and green communication. While other variables are the consumer's decision whether to buy or not buy organic products. Variable indicators use a Likert scale from 1 to 5.

Data collection techniques were carried out by observation, interviews, questionnaires, and literature studies. The research objective is to analyze clusters of green marketing knowledge of consumer behavior buying organic products, green marketing knowledge matrix with the decision of consumers buy organic products, green marketing knowledge what is the most dominant encourage consumers to purchase organic products. In this case the organic product is a commodity that does not use an organic fertilizer and contains no pesticides, such as organic rice and organic vegetables. Data were analyzed by Fuzzy c-means (for clusters) and Fuzzy-Naive Bayes to find out the knowledge matrix of green marketing with the decision of consumers to buy organic products. Fuzzy c-means and Fuzzy-Naive Bayes are as follows:

3.1 Prediction of Purchasing Organic Products with Fuzzy Naive-Bayes

Fuzzy Naive-Bayes (FNB) classifier is a development of the Naive-Bayes Classifier method. Bezdek (1981) , and Storr et.al (2002) describes the use of FNB. FNB has a processing step where the value of the variable will be fuzzy-right first and then classified using a classification method. The approach to the FNB, the degree of truth value is recognized as a probability value for $P(x_i|a) = \mu_{x_i}$ and $P(c|a) = \mu_c$. Although the degree of truth value shows a membership value of a class versus probability, FNB allows the natural development of the Naive Bayes equation. This natural development also uses Bayes rules and it is assumed that each attribute is independent. Here are the Naive Bayes equations used in the FNB.

$$P(c|a) = \sum_{x_1 \in X_1, \dots x_n \in X_n} P(c|x_1 \dots x_n)\ P(x_1|a) \dots P(x_n|a) \quad \text{eq. 3}$$

$$P(c|a) = \sum_{x_1 \in X_1, \dots x_n \in X_n} [[P(x_1|c) \dots P(x_n|c)\ P(c)] / [P(x_1) \dots P(x_n)]]\ \mu_{x_1} \dots \mu_{x_n} \quad \text{eq. 4}$$

The development of FNB, taken from eq. 2, thus forming a new equation into:

$$FNB(a) = argmax_{c \in C}\ P(c) \sum_{x_{ij} \in X_1} \left[P(x_{ij}|c)/P(x_{ij})\right] \mu_{x_{1j}} \dots \sum_{x_{ij} \in X_n} \left[P(x_{nj}|c)/P(x_{nj})\right] \mu_{x_{nj}} \quad \text{eq. 5}$$

where $j = 1..D(X_i)$ and $\mu_{x_{ij}} \in [0,1]$ as a membership function or degree of truth of a variable $x_{ij} \in x_i$ in a calculation of conditions a. All degrees of truth value must be normalized that each $\sum_{x_{ij} \in X_i} \mu_{x_{ij}} = 1$, for all attributes i = 1...n. Probability calculations use the fuzzy model with the same calculations as the classic Naive Bayes.

$$P(C = c) = \left[\left(\sum_{e \in L} \mu_c^e\right) + 1\right] / [|L| + |D(C)|] \quad \text{eq. 6}$$

$$P(X_i = x_i) = \left[\left(\sum_{e \in L} \mu_{x_i}^e\right) + 1\right] / [|L| + |D(X_i)|] \quad \text{eq. 7}$$

$$P(X_i = x_i|C = c) = \left[\left(\sum_{e \in L} \mu_{x_i}^e\, \mu_c^e\right) + 1\right] / \left[\left(\sum_{e \in L} \mu_c^e\right) + |D(X_i)|\right] \quad \text{eq.8}$$

Laplace-correction necessary to avoid the extreme value calculation on training data. L is a set of training data in example e, where e = {$X_1 = x_1$, $X_n = x_n$, C=c},

|L| refer to the example$e \in L$,

$\mu_c^e \in [0,1]$ record the value of truth for c ∈ C in the example e ∈ L,

$\mu_{x_i}^e \in [0,1]$ is the membership of the attribute $x_i \in X_i$,

The degree of truth value must be normalized that each $\sum_{c \in C} \mu_c^e = 1$ dan $\sum_{x_i \in X_i} \mu_{x_i}^e = 1$

IV. FINDINGS

1. Consumer Characteristics

Respondents are generally between the ages of 25-35 years old, their jobs are private sectors, women, their education is an undergraduate and their income is between IDR 11-15 million per month. Respondents who often buy organic products 59.51%, the category of buying often in this case is to buy between 6-8 times a month, while organic products purchased include organic vegetables or organic rice. Whereas categories rarely buy organic products if only 1-2 times buy in one month. From the results of the study revealed that the younger generation between the ages of 19-25 years more understood the concept of green marketing than the previous generation, this is because the young generation appears to be more active than other groups to the environmental issues. A key reason for this is that they have ability to use borderless technology to communicate and exchange information. The social network of young people has a tendency to dominate their perception, and this reinforces their personal affective response and refines their ecological knowledge

2. Actual Cluster Buy and Not Buying Organic Products

Table 18. Cluster recapitulation based on job categories, results from FCM

The Occupation	**Cluster 1**	**Cluster 1**	**Total**
Private sector	35	43	78
Housewife	14	7	21
Student	29	36	65
Entrepreneur	14	27	41
Total Responden	**92**	**113**	**205**

Note: Cluster 1 . Consumer not buying organic product

Cluster 2. Consumer t buying organic product

In Table 18, it can be seen that product knowledge is better known among these. While for housewives it only reaches 15%. This can be understood from the variables X1 to X7, where the results of filling out the questionnaire lead to knowledge of the green product are still too far for housewives.

3. The Green Marketing Knowledge Matrix Actually Buying and Not Buying based on Occupation

Table 19. Actual Green Marketing Knowledge Clusters Buy and

Not Buying Based on Occupation

	Cluster	X_1	X_2	X_3	X_4	X_5	X_6	X_7
Private	C1	3,84	2,97	4,10	3,90	3,80	4,30	3,77

sector	C2	3,66	2,52	3,83	3,62	3,68	3,76	3,98
Housewife	C1	4,18	2,78	4,17	3,90	3,81	3,99	3,61
	C2	3,91	2,76	3,87	3,74	3,61	3,90	3,47
Student	C1	4,03	3,48	4,32	3,97	3,83	4,06	3,87
	C2	3,67	2,85	3,53	3,58	3,50	3,71	3,82
Entrepreneur	C1	4,23	3,04	4,17	3,91	3,61	4,07	3,53
	C2	3,87	2,73	3,50	3,36	3,33	3,66	3,90

In Table 19, it can be said that the C1 cluster for variables X1 to X6 is green products (X_1), green finance (X_2), green living (X_3), green transportation (X_4), green producers (X_5), and green consumers (X_6). has an average answer on the C2 cluster. But for the green communication variable (X_7), the answer shows cluster C1 under the C2 cluster. Thus the knowledge of green consumers is high for consumers who buy compared to consumers who do not buy. Green marketing knowledge from the side of green communication is lower, meaning that the cluster of consumers who buy organic products often use mobile phones and social media in seeking information on organic products. If you look at the FCM results with an average answer, it can be concluded that the cluster with FCM succeeded in providing knowledge about the research test for Clustering.

4 The most dominant factors of green marketing encourage consumers in purchasing organic products

From 113 consumers who buy organic products provide the answer that the factors that encourage consumers to buy organic products is that the product does not contain preservatives (38.05%), the product does not contain pesticides (27.43%), the product can be recycled (22.12%), using edible packaging (8.85%) or using environmentally friendly packaging, not made from plastic or paper (3.50%).

V. DISCUSSION AND CONCLUSION

The actual cluster that buys organic products is 92 people, while those who don't buy 113 people. Consumer knowledge about green marketing that buys organic products is higher than the knowledge of consumers who do not buy organic products. Knowledge of green marketing is seen from the knowledge of green products, green finance, green living, green transportation, green producers, green consumer, and green communication. From consumer knowledge about Green Marketing, the prediction of buying organic products is 197 people and not buying 8 people. Prediction using FNB is a significant answer according to the theory proposed, namely that the higher the knowledge about green marketing, the higher the interest in buying green products. he dominant factor that encourages consumers to buy organic products is that the product does not contain preservatives, does not contain pesticides, products can be recycled, packaging can be eaten or environmentally friendly packaging.

The results and discussion using FCM and FNB are still possible to be improved to get accuracy close to 100% (Nursikuagus, 2017). New variables allow for addition, and also the engineering of determining the degree of Fuzzy membership can be expanded. This will allow you to prove again about the prediction of purchasing decisions. The involvement of identity and job variables of respondents, still allows for testing. So that the results will be closer to the natural characteristics of the respondents. The use of other methods in evaluation and prediction is still possible to help answer research problems.

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