

The Willingness to Pay for Green Packaged Foods to Support Sustainable Agribusiness

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Abstract. Food packaging from plastic materials becomes an environmental contamination problem, but the price of environmentally friendly packaging is more expensive. The research aimed to analyze the influence of product attributes, environmental concerns, and consumption situations on the purchase of food with green packaging, as well as the influence of these variables on willingness to pay for green packaged food. The survey was conducted in Malang Raya on a total of 150 household samples. The data was analyzed with the PLS-SEM model. The results showed that product attributes and consumption situations had a positive effect on the selection of the green packaged foods. Environmental concerns negatively affect the purchase of food in green packaging. Furthermore, environmental concern and consumption situation have a positive effect on WTP of food products with green packaging. The green packaged foods also affect WTP, but the influence is weak. The recommendations are the importance of public education on the use of green food packaging and the improvement of WTP as a form of environmental concern. The food agribusiness actors have to increase the use of green food packaging. The education and introduction to consumers is done by giving written label "eco-friendly packaging" or "green packaging".

Keywords: Environmental concern, green consumer, green packaging.

1 Introduction

Plastic food packaging becomes an environmental contamination problem [1]. Therefore, eco-friendly food packaging such as paper, cassava bags, and bioplastics began to be used to package processed foods [2–4]. Ready meals from some restaurants are also starting to be packed with eco-friendly boxes.

The price of various eco-friendly packaging is still more expensive than plastic packaging. Consumers who concerns on the environmental sustainability are willing to bring reusable food places for ready-to-eat food purchases [5]. Even consumers are willing to pay more expensive for the environmentally friendly (green) packaged foods [6, 7].

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Willingness to pay (WTP) is a concept initiated from the environmental economy. WTP is generally aimed at the premium price of environmentally friendly products including pro-environmental public goods [8, 9]. The premium price for the pro-environment products is generally as the form of consumer's concern to maintain the environmental sustainability [10–12].

Some previous studies have stated that environmental concerns affect or mediate the purchasing decisions and consumption behavior of the environmentally friendly products [13, 14]. Even younger age groups and women in Europe are reducing meat consumption for their environmental concerns, even if they are not vegetarians [15].

The green packaging of food products has also been studied by many previous research. Nanocellulose technology produces eco-friendly food packaging because it is easy to degrade, and can be used for food [16]. Corn husk waste and cane bagasse can also be used as environmentally friendly packaging paper [17].

Previous research on WTP found that WTP is one of the factors that influence the buying intention of products with environmentally friendly packaging [18, 19]. However, other research shows that WTP is not always followed by purchasing behavior [20]. Consumers of the antioxidants eggs also have WTP more expensive than the conventional eggs [21]. The WTP of organic vegetables range from (IDR 5 870 to IDR 6 000) 200 g⁻¹, this price is 17.4 % to 20.0 % more expensive than the current selling price [22]. In other studies, WTP was influenced by factors such as demographics, income, and environmental concerns [23, 24]. Another factor that encourages consumers to buy the green products is that the companies who market the green products allocate some of the profit for the environmental preservation [25].

The purchasing and consumption situation has also affected the pro-environmental consumers behavior [26], whether the consumer is at far distance or close from home. The situation of consumption individually or with family, in the sports center or on trip, at home or in the park is also be a finding of consumer segmentation of main foods and snacks [27]. Two consumption situations, namely hedonics (attribute assessment) and utilitarian (based on feelings) have an effect compromise, where the effect of compromise is stronger under the situation of utilitarian consumption [28].

Some previous studies have reviewed the purchasing situation in purchasing decisions, but have not reviewed the situation of consumption in the purchase of packaged food, whether the difference in the situation is concerned with environmentally friendly packaging or ignoring it. The novelty of this study adapts the purchasing situation from Onwezen et al. [27], i.e. being a consumption situation at home, outdoors, and on an out-of-town trip. The purchasing of packaged food for home consumption allows consumers to freely choose green packaging. While consumption outside home, even those on trips outside the city need more practicality in the selection of packaged food. The research urgency is that different consumption situations are taken into consideration by marketers of environmentally friendly packaged food products.

Previous research has tested WTP as a dependent variable, but has not been applied to WTP food products in green packaging. This study places WTP as a dependent variable, i.e. modifying research done by McFadden and Huffman [23], also Ali and Ali [24]. The novelty is the study examine the influence of several independent variables on food packaging options, namely product attributes, environmental concerns, and consumption situations; further testing its effect on WTP. The urgency is beneficial in pricing of food products packed in green packaging.

This study aimed to analyze consumers' willingness to pay for green packaged foods; influence of product attributes, environmental concerns, and consumption situations on the selection of green food packaging, as well as the influence of such variables on willingness to pay (WTP).

The research hypothesis are as follows:

- H1: product attributes affect packaging choice
- H2: environmental concern affects packaging choice
- H3: consumption situation affects packaging choice
- H4: environmental concern affects WTP
- H5: packaging choice affects WTP
- H6: consumption situation affects WTP

2 Methods

A household survey was conducted in Malang Raya on a total of 150 household samples. Each of the 75 respondents was obtained from Malang City and Malang Regency. The number of samples has met the adequacy of the sample or met the assumptions of warppls software used in the analysis. The minimum sample count of 100 in resampling has met the central limit evidence, or statistics are close to normal distribution [29].

Primary data obtained by interview and or filling out questionnaires by respondents according to the agreement, data analyzed with PLS-SEM model (Partial Least Square – Structural Equation Model). Details of latent variables and manifest variables are presented in Table 1.

Table 1. The research variables.

No	Latent variables	Manifest variable *
1	Pro-Enviro (Environmental concern)	Environmental concern Environmental attitude Self control
2	Product (Product attributes)	Flavor Nutrition Expired date
3	Situation (Consumption situation)	At home Out home On travelling
4	Packaging (Green packaging)	Paper/carton White aluminium foil No plastic
5	WTP (Willingness to pay)	WTP (Willingness to pay)

* All manifest variables were measured with a Likert Scale ranging from one (strongly disagree) to five (strongly agree).

The hypothesis tests use the significance criteria (*P* value) of each coefficient path on the PLS-SEM. The hypothesis is accepted if the *P* value of < 0.05 or significant at a significance level of 5 %.

3 Results and discussion

The results of the study discussed include respondent characteristics, validity and reliability of research instruments, accuracy of PLS-SEM models, and hypothetical test results. Discussion of the results of the analysis is attached to each result to be more efficient.

3.1 The respondents characteristic

The gender distribution of respondents included 40 % of men and 60 % of women. Respondents were representations of household members who knew about packaged food spending. Questionnaires are not specifically addressed to housewives, but the fact that questionnaire fillers are 60 % female. This is an indication that in society there has been a division of gender roles, that shopping is the duty of women.

The age range of respondents ranging from 25 yr to 68 yr. Respondents ages are divided by five intervals (with a range of 10 yr). The most age intervals are between 31 yr to 40 yr (32 %). That age is the adult age that falls into the category of productive age [30].

3.2 Validity and reliability of the instrument

The validity of the instrument is tested from the amount of loading and cross loading value on the PLS-SEM test result. Loading value of each manifest variable greater than 0.3 means meeting convergent validity, and loading value greater than cross loading value means fulfilling discriminant validity [29].

Instrument reliability is tested with composite reliability coefficients. The value of this CRC in product variables, environmental concerns, consumption situations, packaging, and WTP respectively amounted to 0.751; 0.845; 0.812; 0.522; and 1.000. The CRC value more than 0.7 is fulfill the reliability criteria [29]. The WTP variable has CRC = 1 because it is an observed variable. In general variables meet reliability requirements even though packaging variables have a CRC of less than 0.7 but are already greater than 0.5.

3.3 Goodness of fit of the PLS_SEM model

Some indicators of the accuracy of the model are presented as follows. An average coefficient path (APC) value of 0.213 with a *P* value of 0.002 means that the path coefficient value is very significant in small errors (0.2 %). The Average R-squared value (ARS) = 0.178, with a *P* value of 0.006 and an Average Adjusted R-squared (AARS) = 0.161 with a *P* value of 0.011 means significant even though the model's ability to describe the influence of independent variables on dependent variables is relatively small (17.8 % or 16.1 %).

The average block VIF (AVIF) value is 1.10, with acceptable value if ≤ 5 , and ideally ≤ 3.3 . The figures show no symptoms of multicollinearity. Based on some of the accuracy tests of these models, in general the PLS-SEM model is used appropriately to test the research hypothesis.

3.4 The hypothesis test results

The results of PLS-SEM analysis are presented in Figure 1 and Table 2. Figure 1 visually shows the direction of the relationship between latent variables. Table 2 shows more details of coefficient and *P* value path values.

Figure 1 shows that environmental concerns, product attributes, and consumption situations affect the selection of environmentally friendly food packaging. Each *P* value is less than 0.05. Furthermore, environmental concern, packaging selection and purchasing situation also affect WTP food products with environmentally friendly packaging. Environmentally friendly packaging options affect WTP exactly at the limit of significance level 5 %.

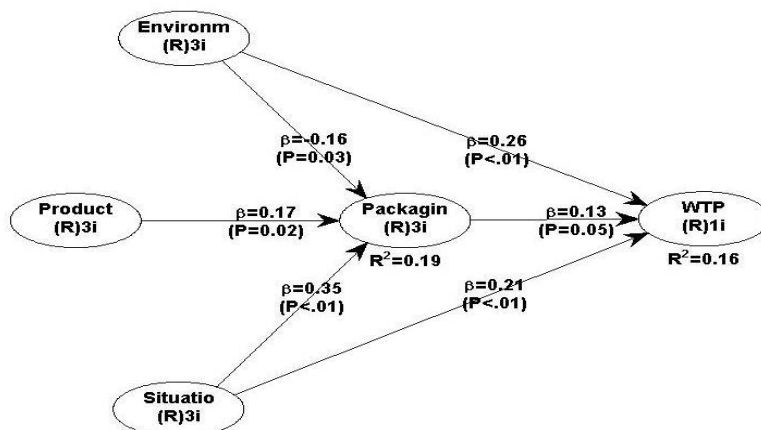


Fig. 1. The result of PLS-SEM.

Table 2 presents coefficient and *P* value path values (in parentheses) to further detail the visualization of Figure 1. The largest coefficient path value (0.348) is on the effect of the consumption situation on packaging options. Almost all *P* value < 0.05. The effect of packaging on WTP is exactly at the limit of significance so that in Figure 1 there is a value of *P* = 0.05 (0.046 in Table 2). These results show that the overall effect of independent variables on dependent variables in the PLS-SEM model is significant. The detailed results of each hypothesis test are presented in the following sections.

Table 2. The path coefficient and *P* value.

	Product	Environmental concerns	Situation	Packaging
Packaging	0.170 (0.016)	-0.156 (0.025)	0.348 (< 0.001)	
WTP		0.259 (< 0.001)	0.208 (0.004)	0.135 (0.046)

Hypothesis 1 on the influence of product attributes on packaging options has a coefficient path of 0.170 with a *P* value of 0.016. This means that the hypothesis is accepted at a significance rate of 1.6 %. Path coefficient is positive, meaning that product attributes (taste, nutrient content, and expiry information) positively affect the selection of food in environmentally friendly packaging. The greater consumer's positive assessment of the indicator further strengthens the purchase of environmentally friendly packaged foods. The results support previous research that product attributes remain a consumer consideration in preference to recyclable packaging [12, 31].

Hypothesis 2 on the influence of environmental concern on packaging options has a coefficient path of -0.156 with a *P* value of 0.025. Means the hypothesis is accepted at an error rate of 2.5 %. Path coefficient is negative, meaning that environmental concern negatively affects the selection of food in environmentally friendly packaging. The higher consumer concern for the environment (concern, attitude, self-control) the weaker the consumer's decision in buying food in environmentally friendly packaging.

The results of the hypothesis test are not in line with the theory of environmental economics, that the more concerned about the environment a person will support environmentally oriented economic activities [11, 12]. However, these results support previous research that environmental concerns are not always followed by environmentally friendly purchasing behavior [20]. The field explanation that can be discussed is that eco-friendly packaging is still less well known among consumers. Czajkowski et al. [8] states that

the consumer experience in recognizing and using environmentally friendly products is essential to support the purchase of environmentally friendly packaging.

Hypothesis 3 on the effect of consumption situation on packaging options has a coefficient path of 0.348 with a *P* value of < 0.001. Means the hypothesis is accepted at an error rate of 0.1 %. This means that the consumption situation, whether consumers consume packaged food at home, outdoors, or on the go affects the consideration of purchasing packaged food. Although with different indicators, some previous studies have found that the consumption situation affects the purchase of environmentally friendly packaging [27].

Hypothesis 4 on the influence of environmental concern on WTP has a coefficient path of 0.259 and *P* value < 0.001. Means the hypothesis is accepted at an error rate of 0.1 %. This means that increasingly consumers care about the environment will increase the willingness to pay for food products with environmentally friendly packaging. The results of this study are in line with several previous studies that stated that environmental concerns have a positive effect on WTP and purchase [23, 24, 32].

Hypothesis 5 on the effect of packaging options on WTP has a coefficient path of 0.135 and *P* value of 0.046. Means the hypothesis is accepted at an error rate of 4.6 %. These findings support the results of previous research that bio-based eco-friendly packaging improves WTP [12]. This level of significance includes approaching the 5 % threshold, barely close to insignificant. The availability of eco-friendly packaged foods in the market is still limited so that consumers who care about the environment can not always buy food in eco-friendly packaging as expected [21].

Table 3. The path coefficient and *P* value.

Latent variables	Manifest variables	Loading	Average score
Product	Flavor	0.609	4.00
	Nutrition	0.830	3.81
	Expired date	0.675	4.43
Environmental concern	Environmental concern	0.772	4.61
	Environmental attitude	0.863	4.42
	Self control	0.772	4.39
Situation	At home	0.715	3.48
	Out home	0.752	3.61
	On travelling	0.835	4.05
Packaging	Paper/karton	0.580	3.56
	White aluminium foil	0.798	3.10
	No plastic	-0.715	2.80
WTP	Willingness to pay	1.000	3.94

Hypothesis 6 on the effect of consumption situation on WTP has coefficient path of 0.208 and *P* value = 0.004. Means the hypothesis is accepted at an error rate of 0.4 %. The purchasing situation affects the amount of willingness to pay for eco-friendly packaged food. The results of this study are in line with the results of previous studies, albeit with different indicators, that the purchasing situation affects the behavior of environmentally friendly [26]. People on travel or consumption at home or recreation areas differ in purchasing behavior, including willingness to pay.

After the explanation of the hypothetical test results, it is necessary to describe the average field condition of each indicator or manifest variable. Table 3 presents the loading value on each manifest variable along with the average score. Its usefulness is to formulate recommendations for improving the current condition based on the priority scale of the loading value and the average condition of the indicator is still low.

Product attribute variables that have the lowest average score on the nutrition content indicator. This means that the average score that consumers consider the nutritional content in purchasing eco-friendly packaged foods has an average score of 3.81 from a maximum

score of 5. Loading this indicator is also the largest in latent variables, i.e. 0.830 meaning the correlation of this indicator with the highest latent variable and contributes strongly to the influence on dependent variables eco-friendly packaging [29]. The implication that can be contributed to the marketing practices of environmentally friendly packaged foods is the inclusion of more attractive nutritional content in order to be the attention of consumers in the purchase of packaged foods.

Table 2 presents coefficient and *P* value path values (in parentheses) to further detail the visualization of Figure 1. The largest coefficient path value (0.348) is on the effect of the consumption situation on packaging options. Almost all *P* value < 0.05. The effect of packaging on WTP is exactly at the limit of significance so that in Figure 1 there is a value of *P* = 0.05 (0.046 in Table 2). These results show that the overall effect of independent variables on dependent variables in the PLS-SEM model is significant. The detailed results of each hypothesis test are presented in the following sections.

Variable consumption situations that have the lowest average score on the indicator of the situation of consumption at home (3.48). That is, the average score of consumption of food in eco-friendly packaging for home consumption is 3.48 from a maximum score of 5. The score is for an eco-friendly packaged food purchase approval statement for home consumption, on average less than a score of 4 (answer agreed). The consumer's answer can have two meanings, first that consumers do not agree with the purchase of environmentally friendly packaged foods. Second, consumers are less amenable to the purchase of packaged foods for consumption situations at home.

Indicator of consumption situation that has a higher score but is still relatively low, namely consumption outside the home (3.61). This means that consumption outside the home but not out-of-town travel, if consumers buy packaged food does not agree to consider eco-friendly packaging. Loading this indicator is also not the highest but it is enough to amplify the correlation in latent variables (0.752). The implications that can be contributed to the marketing practices of eco-friendly packaged foods are to raise awareness of consumers who buy packaged food to choose paper/carton packaging, or eco-friendly white aluminum packaging.

The indicator that has the lowest score on latent variables of eco-friendly packaging is approval of unpackaged plastics (2.8) i.e. answers under hesitation, tending to disagree. Even the loading value of this indicator is negative (-0.715), meaning it correlates negatively with the environmentally friendly packaging options variable.

The consumer's disapproval score of statements without plastic packaging is meaningless entirely because of consumer attitudes. But the airy fact of the availability of food in environmentally friendly packaging is very limited, on the contrary food in plastic packaging still dominates the market. Therefore, consumers (including green consumers) still have difficulty avoiding purchasing food with plastic packaging. The implication for agribusiness marketers of packaged foods is that you should not hesitate to continue to implement the use of eco-friendly packaging for availability in the market and support environmental sustainability.

Latent WTP variables have a loading of one, because WTP only has one manifest variable that is WTP itself. The average score is 3.94 from the maximum score of 5. This average score is lower than 4 for the agreed statement against WTP, which is to pay more for green food packaging. The implication on food marketing is the importance of raising consumer awareness to contribute to environmental sustainability in the form of willingness to pay for products with green packaging. The importance of education is in lign with the disposal behavior of food packaging [33]. Education can be done by many parties (researchers, marketers, governments, environmental activists) through various media (social media, advertising media, counseling).

4 Conclusion and recommendation

Product attributes and purchasing situations have a positive effect on the selection of environmentally friendly food packaging. Environmental concerns have not been followed by the selection of environmentally friendly packaging. Furthermore, environmental concerns, packaging options and purchasing situations have a positive effect on WTP food products with environmentally friendly packaging. Consumers have not been able to avoid at all without food in plastic packaging, because the availability of environmentally friendly packaged foods in the market is still limited.

The recommendations given are the importance of public education about the use of environmentally friendly food packaging and the improvement of WTP as a form of environmental concern. The existence of food agribusiness actors is to continue to increase the use of environmentally friendly food packaging. A form of education and introduction to consumers is to write the label "green packaging".

References

1. G. Liu, F. Agostinho, H. Duan, G. Song, X. Wang, B.F. Giannetti, et al., *Waste Manag.*, **117**: 157–169 (2020) <https://doi.org/10.1016/j.wasman.2020.07.028>
2. K. Molina-Besch, *Br. Food. J.*, **118**,10: 2512–2533 (2016) <https://doi.org/10.1108/BFJ-12-2015-0462>
3. H.N. Salwa, S.M. Sapuan, M.T. Mastura, M.Y.M. Zuhri, *Int. J. Recent Technol. Eng.*, **8**,2 Special Issue 4: 450–459 (2019) <https://doi.org/10.35940/ijrte.B1088.0782S419>
4. C.M.N. Romagnolli, G.P. Leite, T.A.R. Rodrigues, C.L. Morelli, *Polym. From Renew. Resour.*, **11**,1-2: 3–14 (2020) <https://doi.org/10.1177/2041247920952641>
5. P.M. Coelho, B. Corona, R. ten Klooster, E. Worrell, *Resour. Conserv. Recycl.*: X, **6**,100037: 1–11 (2020) <https://doi.org/10.1016/j.rcrx.2020.100037>
6. Y. Sun, C. Xu, H. Zhang, Z. Wang, *Int. J. Clim. Change Strateg. Manag.*, **9**,3: 352–373 (2017) <https://doi.org/10.1108/IJCCSM-05-2016-0061>
7. G. Singh, N. Pandey, *Australas. Mark. J.*, **26**,3: 221–230 (2018) <https://doi.org/10.1016/j.ausmj.2018.06.001>
8. M. Czajkowski, N. Hanley, J. LaRiviere, *Am. J. Agric. Econ.*, **97**,1: 333–351 (2014) <https://doi.org/10.1093/ajae/aau087>
9. F. Katt, O. Meixner, *Trends Food Sci. Technol.*, **100**: 374–388 (2020) <https://doi.org/10.1016/j.tifs.2020.04.029>
10. T. de-Magistris, A. Gracia, *J. Clean Prod.*, **118**: 97–104 (2016) <https://doi.org/10.1016/j.jclepro.2016.01.050>
11. N.H.D. My, M. Demont, E.J.V. Loo, A. de Guia, P. Rutsaert, T.H. Tuan, et al., *Food Policy*, **79**: 283–296 (2018) <https://doi.org/10.1016/j.foodpol.2018.08.004>
12. J. Wensing, V. Caputo, L. Carraresi, S. Bröring, *Ecol. Econ.*, **178**,106783: 1–16 (2020) <https://doi.org/10.1016/j.ecolecon.2020.106783>
13. B. Yue, G. Sheng, S. She, J. Xu, *Sustainability*, **12**,5: 1–16 (2020) <http://dx.doi.org/10.3390/su12052074>
14. E.R. Lestari, H.K. Putri, C. Anindita, M.B. Laksmiari, *J. Teknol. Pertan.*, **21**,1: 1–10 (2020) [in Bahasa Indonesia] <https://doi.org/10.21776/ub.jtp.2020.021.01.1>
15. R. Sanchez-Sabate, J. Sabaté, *Int. J. Environ. Res. Public Health*, **16**,7: 1–37 (2019) <https://doi.org/10.3390/ijerph16071220>
16. F. Vilarinho, A.S. Silva, M.F. Vaz, J.P. Farinha, *Crit. Rev. Food Sci. Nutr.*, **58**,9: 1526–1537 (2018) <https://doi.org/10.1080/10408398.2016.1270254>
17. O.A. Manasikana, A. Mayasari, N. Af'idah, J. Zarah, **7**,2: 79–85 (2019) [in Bahasa Indonesia] <https://doi.org/10.31629/zarah.v7i2.1457>

