Asia-Africa Journal of Agriculture
A Publication of International Association for the Promotion of Asia-Africa Research
Vol. 1, 2022
DOI:
ISSN: 2814-0397

https://journals.iapaar.com/index.php/AAJMR

WILLINGNESS TO PAY (WTP) FOR ORGANIC FOOD: THE CONSUMER PERSPECTIVE

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Abstract

Consumption of organic food among consumers in Phillipines has increased in recent times due to increased awareness of health benefits of organic food. The purpose of this paper is to estimate the average amount a consumer is willing to pay in Philippine for fresh organic milk. This paper used the Double Bounded Dichotomous Choice (DBDC) model to identify key determinants of consumers' willingness to pay (WTP) for fresh organic milk. The results showed that organic product label, consumers' awareness about nutritional benefits of organic milk, agility, and income were key determinants of consumers' WTP for fresh organic milk. The paper estimated average consumers' willingness to pay for one litre of fresh organic milk to be SAR 14 while the nonparametric estimates of WTP ranged in values from as low as SAR 10 to as high as 12 SAR. The results are important to the domestic dairy companies and existing European organic long-life milk exporters to Philippine to initiate business ventures on organic fresh milk business.

Keywords: Double Bounded Dichotomous Choice, Organic, Willingness to Pay, Philippine.

Introduction

The increasing awareness about the health benefits of organic food has led to the flourishing of the organic food industry. It is expected to generate a revenue of over USD 110 billion in 2025 from a market size of around USD 30 billion in 2015 and it is expected to generate an estimated revenue of over USD 110 billion by 2025(Grand View Research, 2017).

Globenewswire, (2019) indicated that about 80% of organic food in the Philippines is sourced from Western countries. This has led to the increasing consumption of organic food in the country. The Philippines is known to be self-sufficient in terms of milk production. In 2019, the country's dairy companies produced approximately 136 million tons of camel milk (Ministry of Environment, 2019). In 2014, the total production of goat milk reached 65 million tons. During the period from 2004 to 2019, the average annual production of camel milk was about 107.9 million tons. It is noted that the main source of traditional milk production in Philippine is cow's milk followed by camel milk and then goat milk (FAO, 2021).

Unfortunately, due to the lack of organic milk production in the country, and the influx of foreign producers, the Philippines imports long-life organic milk. It is difficult to determine the average price of a commodity in the Philippines since there is no market for fresh organic milk. This is the main factor that a domestic investor and business owner consider when deciding to invest in the organic milk industry. The rising prices of organic food have caused concern for potential consumers. In 2013, Padilla Bravo et al., (2013) suggested that implementing a price reduction may motivate people to buy organic food.

A study conducted by Ward et al., (2012) in Australia revealed that organic food is less common in households with two and more children. In China, however, urban consumers are not aware of the concept of organic food (Chen and Lobo, 2012). A study conducted by Krystallis and Chryssohoidis (2005) revealed that a 12% of Greek consumers were willing to pay over 120 percent more for organic milk. A study conducted in the same year revealed that socioeconomic factors such as age, income, and household size affected the WTP of organic milk in the United

Arab Emirates. According to Akaichi, Nayga and Gil (2012), the main reasons why consumers do not buy organic milk are due to its price and lack of nutritional information.

Aside from the organic label, other factors such as the age of the consumers and the level of education were also taken into account to determine the average price of organic milk. As mentioned by Amirnejad and Tonakbar (2015), the estimated average consumers' WTP for organic milk was significantly affected by the consumers' age, income, and education level. In addition, the estimated average consumers' WTP for organic milk was 28,600 Iranian Riyal per liter. This paper aims to determine the average price of organic fresh milk in the Eastern Region of the Philippines. It also aims to analyze the various characteristics of organic milk that consumers might buy. The study also focused on the impact of various demographic and socioeconomic factors on the demand for organic milk.

Materials and Methods

The most common type of valuation survey conducted for new products or services is the SBDC or the DBDC. These surveys ask consumers if they would be willing to pay a specific price for a new product or service. Although the concept of the SBDC is very easy to collect, the method is typically inefficient compared to the DBDC. In this case, the consumers' WTP was derived through the DBDC method. In the DBDC, the consumer was asked if he or she would be willing to pay a certain amount for organic, fresh milk. The consumers were then asked if they would accept the first bid. The bid was designed to take into account the prices of organic long-life milk compared to the prices of fresh conventional milk. This method helps prospective dairy firms enter the organic fresh milk market. The starting bid was computed based on the prices of imported organic long-life milk in grocery stores. The second bid was then calculated based on the difference

between the first and second bid prices. In case of the SBDC, the probability that a consumer accepts, PY, the offered bid (s) in logit model is (Aizaki, Nakatani and Sato, 2014):

$$P^{Y}(s)=\frac{1}{exp(-a+\beta s)} \quad \text{---------- 1}$$

The log-likelihood function is expressed as below:

$$\ln L = \sum_{n=1}^{N}\left[d_n \ln\left\{\frac{1}{exp(-a+\beta s)}\right\} + (1-d_n)\ln\left\{1-\frac{1}{exp(-a+\beta s)}\right\}\right] \quad \text{---------- 2}$$

Where dn is a dummy variable that equals one if a consumer accepts the bid, and zero if a consumer rejects the bid. The parameters of the logit model are then used to calculate the mean consumers' WTP for organic fresh milk as below:

$$mean\ WTP=\int_0^{\infty}[1-F(s)ds] \quad \text{-------- 3}$$

Where F(s) is the cumulative distribution function of the consumers' WTP.

Economic theory states that a consumer's WTP should not exceed his/her income level. However, equation (3) implies that some consumers may be willing to pay an amount that exceeds his/her income level (Aizaki, Nakatani and Sato, 2014). Thus, it is recommended to report the truncated mean WTP, which is calculated as below (Boyle, Welsh and Bishop, 1988):

$$Truncated\ mean\ WTP = \int_0^{s\ max}\left[\frac{1-F(s)}{F(s_{max})}\right]ds \quad \text{--------- 4}$$

The median consumers' WTP is usually reported because it is more robust to include outliers and errors compared to the mean WTP (Hanemann, 1984).

$$median\ WTP=F^{-1}\ (0.5) \quad \text{---------- 5}$$

For the case of DBDC, the probability that a consumer accepts the first and second bid, *PYY*, is:

$$P^{YY}(s) = \frac{1}{exp(-a+\beta s_n^h)} \quad \text{---------- 6}$$

And the probability that a consumer rejects the first and second bid, *PNN*, is:

$$P^{NN}(s) = 1 - \frac{1}{exp(-a+\beta s_n^L)} \quad \text{---------- 7}$$

The probability that a consumer accepts the first bid and rejects the second bid, P*YN*, is:

$$P^{YN}(s) = \left\{1 - \frac{1}{exp(-a+\beta s_n^h)}\right\} - \left\{1 - \frac{1}{exp(-a+\beta s_n)}\right\} \quad \text{-------- 8}$$

The probability that a consumer rejects the first bid and accepts the second bid, P*NY*, is:

$$P^{NY}(s) = \left\{1 - \frac{1}{exp(-a+\beta s_n)}\right\} - \left\{1 - \frac{1}{exp(-a+\beta s_n^L)}\right\} \quad \text{-------- 9}$$

Where s_n^h and s_n^L denotes the second higher and lower bid respectively. Lastly, the log-likelihood function for the DBDC model is:

$$\ln L = \sum_{n=1}^{N}[d_n^{YY} \ln\{exp(a - \beta s_n^h)\} + d_n^{NN} \ln\{1 - exp(a - \beta s_n^L)\} + d_n^{YN} \ln\{exp(a - \beta s_n) - exp(a - \beta s_n^h)\} + d_n^{NY} \ln\{exp(a - \beta s_n^L) - exp(a - \beta s_n)\}] \quad \text{--------- 10}$$

Where $d_n^{YY}$is a binary variable that will equal one, if a consumer n accepts the first and second bids and zero otherwise; d_n^{YN} will equal one, if a consumer n accepts the first bid but rejects the second bid and zero otherwise; d_n^{NY} will equal one, if a consumer n rejects the first bid but accepts the second bid; and d_n^{NN} will equal one, if a consumer n rejects the first and second bid and zero otherwise.

The sample size was decided according to the guidelines established by Vaughan and Darling, 2000. It was composed of 500 consumers.

RESULTS AND DISCUSSION

The results of the survey in Table 1 and 2 revealed that almost everyone who participated was from the Philippines, and almost half of them were women. They also learned about organic milk.

52% of the respondents preferred to buy one-liter milk, while the others preferred the plastic packaging. They also stated that the quality of the milk and the organic label on it influenced their decision to buy organic milk. The majority of respondents (over 80%) were aware about the nutritional benefits of organic milk and preferred fresh milk over long-life milk. Moreover, most of respondents agreed that both quality and "organic product" labels on milk packaging influenced their intention to purchase organic milk.

Almost half of the respondents stated that they bought organic milk because they believed it was good for their health. They also accepted the first bid. However, the results of consumers' response to second bid differed based on bid group and the bid that was given to them.

The results of the study indicate that the organic label is statistically significant in both the SBDC and the DBDC models. It indicates that the consumers who reported being influenced by organic products' labels were more likely to buy organic milk.

The income level of the respondents also affects their willingness to pay for organic, fresh milk. Those who attributed their purchase of organic long-life milk to maintain their agility were less likely to pay for organic, fresh milk.

The two models-SBDC and the DBDC also confirm that consumers who are familiar with the nutritional value of organic milk are more likely to buy it. Those who are not are also more likely to avoid buying organic milk.

Also, those who prefer long-life milk were less likely to pay for organic, fresh milk. Lastly, single consumers are more likely to be willing to pay for organic, fresh milk than married consumers.

Table 1: Summary of respondents' demographic and socioeconomic characteristics

Variable	N	%	Variable	N	%
Age	52	11%	If you have purchased an organic milk before, what was the reason for your purchase?	262	52.40 %
<20 years old	273	54%		99	19.80 %
20 – 30 years old	106	21%		70	
31 – 40 years old	50	10%		36	
41 – 50 years old	16	3%	Health maintenance and treatment. It tastes better	33	14 %
51 – 60 years old	3	1%			

Above 60 years old			than traditional products Just to try Agility To conserve the environment		7.20 % 6.60 %
Marital status	242	48.40%	Does the quality of your milk affect your purchase?		
Married	258	51.60%			
Single					93.25 %
			True	467	
			False	33	6.75
Sex	201	39.74%	Are you aware of the nutritional value of fresh, organic milk?		
Male	299	60.26%			
Female					
			True	410	82 %
			False	90	18 %
Education			Favorite packaging		54.20 %
Primary school	6	1.20%	Plastic	271	
Middle school	17	3.40%	Glass	107	21.40 %
Secondary school	115	23%	Cartons	122	24.40 %
University	362	72.40 %			
Income			Does "Organic Product" label affect your decision to purchase organic milk?		
< 1000 R.S	60	12.56%			
1000 – 6000 R.S	297	58.14%			82.20 %
6001-12000	79	16.09%	True		
12001-20000	53	10.71%	False	411	17.80 %
>20,000 R.S	11	2.15 %		89	
Nationality			Which do you prefer?		81.70 %
Saudi			Fresh milk		
Falsen-Saudi	458	91.70%	Long-Life Milk	408	18.30 %
	42	8.30%		92	
Do you have prior kFalsewledge about the meaning of “organic product”?			How much do you spend on milk in a week?		
			<SAR 20	139	28 %
			SAR 20-SAR 30	185	37 %
True			SAR 31-SAR 40	45	9 %
False	428	85.60%	SAR 41-SAR 50	57	11 %
	72	14.40%	>SAR 50	74	15 %

Favorite size			On average, how many milk packs do you purchase per week?		
Very large (2.85 liters)	38	7.60%			
Large (2 liters)	125	25.00%			
Medium (1 liter)	259	51.80%	<5	342	69 %
Small Size (500 ml)	78	15%	5-8	137	26 %
			> 8	21	5 %

Table 2: Summary of WTP

Variable	**N**	**%**	**Variable**	**N**	**%**
Does the quality of your milk affect your purchase?			Are you willing to pay 11.4 SAR to purchase fresh, organic milk (1 liter)?		89.62 %
True	467	93.25%	True	95	10.38
False	33	6.75%	False	11	%
Are you aware of the nutritional value of fresh, organic milk?			Are you willing to pay 8.63 SAR to purchase fresh, organic milk (1 liter)?		27.78 %
True	410	82%	True	5	72.22
False	90	18%	False	13	%
Are you willing to pay 9.50 SAR to purchase fresh, organic milk (1 liter)?			Are you willing to pay 11SAR to purchase fresh, organic milk (1 liter)?		80.33 %
True	109	84.35%	True	98	19.67
False	19	15.65%	False	24	%
Are you willing to pay 10,75 SAR to purchase fresh, organic milk (1 liter)?			Are you willing to pay 12.63 SAR to purchase fresh, organic milk (1 liter)?		
True	84	77.36%	True	62	60 %
False	25	22.64%	False	36	40 %
Are you willing to pay 8,25 SAR to purchase fresh, organic milk (1 liter)?			Are you willing to pay 9.38 SAR to purchase fresh, organic milk (1 liter)?		
True	6	31.58%	True	12	50 %
False	13	68.42%	False	12	50 %

Are you willing to pay 10 SAR to purchase fresh, organic milk (1 liter)?			Are you willing to pay 12 SAR to purchase fresh, organic milk (1 liter)?		69.84 %
True	106	85.48%	True	88	30.16
False	18	14.52%	False	38	%

Table 03: Parametric Estimation of SBDC and DBDC Models

Variable	**DBDC**	**SBDC**
Intercept	-4.56239	-1.40256
	(4.83274)	(6.02361)
Gender	0.33850	0.18513
	(0.22655)	(0.28319)
Organic Label	0.63999**	(0.87820***
	0.24868)	(0.29980)
Log (age)	-0.74976	-1.49491**
	(0.53547)	(0.63882)
Log (income)	3.24754***	2.87429**
	(1.16020)	(1.39209)
Log (income)^2	-0.20116***	-0.17017*
	(0.07321)	(0.08728)
Reason: Just to try it	-1.04629**	-1.15270**
	(0.42476)	(0.57201)
Reason: Health maintenance and treatment	0.24455	-0.10265
	(0.38680)	(0.54174)
Reason: It tastes better than conventional milk	-0.26855	-0.42059
	(0.41479)	(0.57230)
Reason: To conserve the environment	-0.51669	-0.24178
	(0.48307)	(0.68894)
Social status: Single	0.47627*	0.32831
	(0.25200)	(0.32466)
Favorite Packaging: glass	-0.75960*	-0.44077
	(0.30447)	(0.37066)
Favorite Packaging: Plastic	-0.26317	-0.10666
	(0.26212)	(0.32286)

Long-life milk preference	-0.45096*	-0.15727
	(0.25297)	(0.32996)
Nutritional value	0.44072*	0.56573*
	(0.25137)	(0.31273)
BID	-0.47745***	-0.45234***
	(0.03770)	(0.12672)
Log-Likelihood	-482.918	-218.323

*Note: Standard errors are in parenthesis. *,**,*** denote significance level at 10%,5%, and 1 % respectively.*

The parametric estimation of consumers' WTP for fresh, organic milk is shown in Table 4 along with their bootstrapped confidence intervals for both the SBDC and DBDC models. We used the bootstrap method to construct consumers' WTP because it is robust to model misspecification and noisy data (Hole, 2007). The average consumers' WTP for one liter of fresh, organic milk based on the DBDC model is SAR 13.75. With a 95% confidence level, the average consumers' WTP for fresh, organic milk is in the range of SAR 13.23 ─ SAR 14.34. The truncated mean WTP is SAR 12.37 while the median WTP is SAR 13.74.

Table 04: WTP Parametric Estimates

	DBDC Mode l			**SBDC Mode l**		
WTP Estimate		Lower Confidence Interval	Upper Confidence Interval	Estimate	Lower Confidence Interval	Upper Confidence Interval
Mean	13.75104	13.234	14.341	14.23315	12.914	19.432
Truncated Mean	12.37385	12.187	12.647	11.31606	10.940	11.585
Median	13.74809	13.233	14.339	14.22961	12.914	19.309

Table 05: Consumers' Mean WTP using Turnbull Nonparametric Methods

Method	DBDC	SBDC
Kaplan-Meier	SAR 11.740	SAR 10.062
Spearman-Karber	SAR 12.095	SAR 10.825

On the other hand, the SBDC model estimates the mean consumers' WTP for one liter of fresh, organic milk to be SAR 14.23 with a 95% confidence interval in the range of SAR 12.91 ─ SAR 19.43. Moreover, the SBDC estimated the truncated mean and median WTP to be SAR 11.31 and SAR 14.22, respectively.

The mean WTP of the proposed method is approximated by taking into account the Spearman-Karber method for both the DBDC and SBDC models. It is similar to the WTP that was estimated using the standard logistic distribution. However, the Kaplan-Meier mean WTP seems to underestimate average consumers' WTP compared to its parametric counterpart for the DBDC and SBDC models, respectively. The results of our study are consistent with the findings of other studies that investigated the impact of the organic label on the willingness of consumers to pay for organic products (Huang and Lee, 2014) and (Scozzafava et al., 2020). This study disagrees with (Zohra Ghali-Zinoubi, 2020) conclusion that pleasure had a greater impact on the desire to pay for organic food because our results showed that the elements of a healthy life style such as agility are also considered by consumers when deciding to purchase organic milk.

Conclusions and Recommendations

The Philippines is a self-sufficient country that relies on imports for its milk production. However, it is not yet clear how long the shelf life of organic milk will last. This paper aims to estimate the WTP of consumers for organic milk in the eastern region of the country. The results of the survey revealed that organic milk's nutritional benefits are widely promoted by consumers. Awareness about these benefits also influenced the WTP of organic milk.nThe paper estimated that the average WTP of organic milk consumers was about SAR 14/liter.

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