Analysis of willingness to pay organic vegetables in Medan

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Abstract. A healthy lifestyle is now internationally institutionalized and requires a guarantee that agricultural products must globally standardized and requires an assurance that farming items must have food safety, high nutritional and eco-labelling attributes. These things maters become motivation for living a healthy lifestyle. The research objective was to determine factors affecting willingness to pay for organic vegetables in Medan City, by using logistic regression analysis which sourced from primary data. The results show that value of Willingness to Pay consumers for organic vegetables (in the modern market of Medan City is higher by 10.40% - 12.89% of the price offered. The highest percentage of WTP increase in organic vegetable product consumers was spinach and the lowest was mustard greens. Income and product price have a significant effect on willingness to pay for organic vegetables meanwhile education level, age, and number of family members do not have significantly effect.

1. Introduction
According to the Decree of the Minister of Agriculture Number 64 /Permentan /OT.140/5/2013 Concerning the Organic Agriculture System states that the organic farming system is a holistic production management system to improve and develop the health of agroecosystems, including biodiversity, biological cycles and soil biological activities. Organic agriculture emphasizes the application of management practices that prioritize the use of inputs from cultivation activity wastes in the land by taking into account the adaptability to local conditions. If possible, this can be achieved by using cultural, biological and mechanical methods that do not use any synthetic materials to meet specials needs in the system.

Healthy lifestyle is now globally standardized and requires an assurance that farming items must have food safety, high nutritional and eco-labelling attributes [1]. Organic farming systems are not only applied to rice crops, but also widely applied to vegetable crops such as lettuce, mustard greens, water spinach and so on. Organic vegetables are starting to be found in modern markets; however, it is still very rare for traditional markets to sell organic vegetable products.

The factors that influence WTP universally are segment qualities, for example, sex, age, pay and training. Other main factors include the quality and safety of food offered by organic food products [2]. One of the reasons consumers are willing to pay more than the current price for organic food products is to ensure the quality of the product [3]. Organic vegetable product attributes such as taste, texture and freshness are one of the biggest factors in influencing consumers' willingness to pay[4].

Nationally, the consumption of organic vegetables has increased every year. In Medan, organic vegetables have become the Prima Donna for people who shop at modern markets. This is due to the awareness of the importance of a lifestyle that prioritizes health and other reasons such as more enjoyable taste. In addition to higher prices than non-organic vegetables, organic vegetables have their
own market segmentation for those who are interested. This is a consideration for researchers to see the characteristics of organic vegetable consumers and what are the factors that affect the Willingness to Pay for organic vegetables in Medan. The purpose of this study was to describe the characteristics of consumers of organic vegetable products in modern markets in Medan city, to analyse the Willingness to Pay value of organic vegetable products, and to analyse the factors that influence the Willingness to Pay of organic vegetable products.

2. Methods
The research area in Medan was determined purposively in accordance with the research objectives. Medan City, North Sumatra Province was chosen because it is the location of the research so that data collection runs well and smoothly. The data used in the analysis are primary data and secondary data obtained from respondents and other supporting data, namely the Central Statistics Agency (BPS). The results of the analysis of willingness to pay for organic vegetables in Medan City were processed using SPSS software.

The data analysis used is descriptive analysis, willingness to pay analysis using the contingent valuation method (CVM) to calculate the average value of WTP that consumers are willing to pay for organic vegetable products and logistic regression to analyse the factors that influence it. Estimating the average value of WTP. The average value of WTP is calculated using the following equation [5]:

\[
EWTP = \frac{\sum_{i=1}^{n} Wi}{n}
\]  

where:
EWTP = guesswork
Wi = value
n = number of respondents
i = respondent i who is willing to pay for organic vegetables

In this study the dependent variable is a categorical variable, so logistic regression analysis is used. Independent variables that are thought to affect consumers' WTP are income, education, dependents, age, and price.

\[
\ln \left( \frac{p}{1-p} \right) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \varepsilon
\]

\[
Y = \frac{e^{\beta_0+\beta_1 x_1+\beta_2 x_2+\beta_3 x_3+\beta_4 x_4+\beta_5 x_5}}{1+e^{\beta_0+\beta_1 x_1+\beta_2 x_2+\beta_3 x_3+\beta_4 x_4+\beta_5 x_5}}
\]

where:
Y = Willingness of consumers to pay more (Y/N)
\beta_0 = Regression constant
\beta_1 - \beta_5 = Regression coefficient
x_1 = Income
x_2 = Education
x_3 = Dependent
x_4 = Age
x_5 = Price
\varepsilon = Error Term
3. Results and discussion

3.1. Willingness to pay

The distribution of willingness to pay of respondents can be seen in Table 1.

| Respondents     | Frequency | Percentage | Valid Percentage | Cumulative Percentage |
|-----------------|-----------|------------|------------------|-----------------------|
| Willing to pay  | 124       | 59.05      | 59.05            | 59.05                 |
| Not willing to pay | 86       | 40.95      | 40.95            | 100.00                |
| Total           | 210       | 100.00     |                  | 100.00                |

The distribution of willingness to pay of respondents who are willing to pay more can be seen in Table 2.

| Percentage (%) | Frequency | Percentage (%) | Valid Percentage | Cumulative Percentage |
|----------------|-----------|----------------|------------------|-----------------------|
| 5              | 36        | 29.03          | 29.03            | 29.03                 |
| 10             | 51        | 41.13          | 41.13            | 70.16                 |
| 15             | 24        | 19.36          | 19.36            | 89.52                 |
| 20             | 13        | 10.48          | 10.48            | 100                   |
| Total          | 124       | 100            |                  | 100                   |

Source: Data primer processed (2020)

The calculation of the maximum average WTP is obtained from the multiplication of the initial product price or the WTP value with the relative frequency of each organic vegetable commodity and the WTP value used is the middle value. The results of the calculation of the maximum average WTP can be seen in Table 3. The percentage increase in the initial price with the average WTP of organic vegetables is as follows:

| Organic Vegetables | Initial price (IDR.) | Maximum Average WTP (IDR.) | Percentage Increase (%) |
|--------------------|-----------------------|-----------------------------|-------------------------|
| Spinach            | 5,500                 | 6,199                       | 12.89                   |
| Kale (leaf cabbage)| 4,150                 | 4,597                       | 10.91                   |
| Mustard            | 4,950                 | 5,459                       | 10.40                   |
| Pakcoy (bok choy)  | 7,350                 | 8,209                       | 11.74                   |

Source: Data processed (2020)

Spinach has the highest percentage increase, namely 12.89% because the frequency of consumers of organic spinach is also high. The high percentage increase in spinach, while the maximum average value of WTP is not too high, it could be because consumers' understanding of organic vegetables is increasing that to get the benefits of organic vegetables does not have to be at too extreme a price, this is evidenced by organic spinach which is in great demand by consumers.
3.2. **Processing logistic regression analysis**

The results of processing logistic regression analysis can be seen in Table 4.

**Table 4. Result logistic regression analysis**

| Omnibus test of model coefficients (model) | Chi-square | df | Sig. |
|-------------------------------------------|------------|----|------|
| 146.419                                   |            | 5  | 0.000|

| Model summary | 2 Log likelihood | Cox & Snell R square | Nagelkerke R square |
|---------------|-------------------|----------------------|---------------------|
| 137.788       | 0.502             | 0.677                |

| Hosmer and Lemeshow test | Chi-square | df | Sig. |
|--------------------------|------------|----|------|
| 13.184                   |            | 8  | 0.106|

| Classification table | Overall Percentage (%) |
|----------------------|-------------------------|
|                      | 88.60                   |

The independent variables that are thought to affect the willingness to pay of consumers for organic vegetable products are income, education, dependents, age and product price. Respondents used in the logistic regression analysis were 210 people. The results of the G test or test simultaneously are found in the Omnibus Test of Model Coefficients table showing the significance of the count of 0.000 <0.05, meaning that H0 is rejected or the independent variables simultaneously have a significant effect on the dependent variable or WTP. The output results in the Model Summary see the ability of the independent variable to explain the dependent. The Nagelkerke R Square value of 0.677 indicates that the ability of the independent variable to explain the dependent variable is 67.7% and there are 32.3% other factors that explain the dependent variable outside of this study. The Hosmer and Lemeshow Test is a test to determine the accuracy of the model that has been formed. The sig value of the Hosmer and Lemeshow Test (0.106> α = 0.05), meaning that H0 is accepted, that is, the logistic regression model is able to explain the data and there is no difference between the model and its observation value. This shows that the logistic regression equation can be used to explain the relationship between the independent variable and the dependent variable. Based on the results of the Classification Table output, it can be shown that the logistic regression model used is good because the accuracy of this research model is 88.60% of the conditions that occur so that this model is feasible.

To test partially with the Wald test can be seen in Table 3.5. Based on the Wald test results in Table 5, the independent variable which has a p-value <α (0.05) affects the dependent variable or willingness to pay partially. It is known that education, dependents and age have no effect on willingness to pay for organic vegetables, while the factors that affect willingness to pay are income and price.

**Table 5. Wald test**

| Variable      | Coeff (B) | Wald | P-value (sig.) | Odds Ratio (Exp(B)) | Results     |
|---------------|-----------|------|----------------|---------------------|-------------|
| Income ($x_1$) | 1.230     | 6.754| .009           | 3.423               | Effect      |
| Education ($x_2$) | .271     | 1.000| .317           | 1.311               | No Effect   |
| Dependants ($x_3$) | -.457   | .435 | .510           | .633                | No Effect   |
| Age ($x_4$) | .316      | 2.228| .633           | 1.372               | No Effect   |
| Price ($x_5$) | 1.181     | 5.558| .018           | 3.259               | Effect      |

The income factor has a significant / significant effect on willingness to pay for organic vegetables (0.009 <0.05). Based on the research, some consumers who have a higher amount of income will be able to better meet their needs, namely buying organic vegetables as a good quality food for themselves.
This is in accordance with the opinion of [6] who argued that high income allows consumers to carry out activities or other needs better because of the sufficient funds they have.

The odds ratio obtained from the test results in table 3.5 shows that in the income variable, the higher the income of the consumer, the chance that his willingness to pay for organic vegetable products at a higher price is 3.423 times greater than that of consumers with a lower income level. This is in line with the research of [7] which found that consumers with higher income levels are more likely to be willing to spend most of their income as an investment in buying organic agricultural products that are considered safer and more affordable food products, better quality.

The product price variable significantly affects willingness to pay (0.018 < 0.05), indicating that consumers consider the price factor in their decision to be willing or not to buy organic vegetables and pay higher prices for food products with better quality. This result is consistent with other studies which show that consumers in relatively affluent countries are more likely to buy organic food than consumers in other countries [8,9]. Price is an important factor and very sensitive to consumers' willingness to pay.

Meanwhile, with regard to the Odd ratio value on the price variable, consumers who provide a higher value or score for the price of organic vegetable products have a 3.259 times greater chance of being willing to pay higher than the current price. Most consumers feel that they are getting a healthy and good quality product when buying organic vegetable products, so they are willing to pay more than the current price.

Education level does not significantly affect willingness to pay for organic vegetable products (0.317 > 0.05). This is not in accordance with the opinion of [10] which states that the level of education is a positive contributor to the willingness of consumers to pay for organic food products in order to eliminate chemical elements in food products in the research area. This negative relationship shows that the higher the educational background of a consumer, it does not guarantee the higher the tendency to be willing to pay for organic vegetables at a higher price than the current price. Although consumers with higher education levels tend to have a desire to live a healthy life by consuming organic vegetables, they must also have a large income. It turns out that in the research area, education has less effect on willingness to pay.

Dependent variable or number of family members is also a factor that does not significantly affect the willingness to pay consumers for organic vegetable products p-value > α (0.510 > 0.05). This is in line with the opinion of [3] which states that the number of family members and the presence of children in the household do not affect the frequency of purchases and willingness to pay a premium for obtaining organic food products. The age variable obtained a calculated significance value of 0.633 (p sig > A), thus indicating that the willingness to pay for consumers of organic vegetable products was not significantly influenced by age. These results confirm the research results of [2] which found that age is not an important factor in the willingness to pay for a consumer of organic food products, even though younger consumers tend to show willingness to pay with a higher value. Consumers of organic vegetable products consist of various age groups, but the age factor has no effect on willingness to pay.

4. Conclusions
Value of Willingness to Pay consumers for organic vegetables (in the modern market of Medan City is higher by 10.40% - 12.89% of the price offered. The highest percentage of WTP increase in organic vegetable product consumers was spinach and the lowest was mustard greens. Income and product price have a significant effect on willingness to pay for organic vegetables meanwhile education level, age, and number of family members do not have significantly effect.

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