Factors Affecting Food Waste In Traditional Markets In Prabumulih City of South Sumatra, Indonesia

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FACTORS AFFECTING FOOD WASTE IN TRADITIONAL MARKETS IN PRABUMULIH CITY OF SOUTH SUMATRA, INDONESIA

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ABSTRACT
The supply chain stage requires a place that accommodates the process of transactions and interactions, for example, in the market, especially the traditional market. The traditional market plays an essential role in driving the economy of the people throughout Indonesia. Traditional markets offer many advantages, such as lower prices, and for a particular product, the price is also negotiable. This advantage is very suitable for Indonesian society. In this regard, the products sold in the market are generally stapled foods that are closely related to public consumption. However, the fulfillment of this need still faces many obstacles, for example, the population's density. On the other hand, globally, various countries are experiencing a crisis, especially the global food crisis. The rate of food waste increases each year, both at the merchant level and the consumer level. Food waste occurs due to the lack of effective and efficient use of food. These problems indicate that the marketing of vegetables in the Indonesian market is not well managed by traders. The average expenditure per capita of Prabumulih's people is around 533,832 rp/per capita/month. While, the total spending on vegetables in Prabumulih city is 44,775.81 rp/per capita/month. With a relatively high level of vegetable consumption (4th highest), the risk of food waste in this type of food increases.

KEY WORDS
Food waste, economic value, agriculture.

According to Malano (2011), fulfilling the supply chain stage requires a place that accommodates the process of transactions and interactions, for example, in the market, especially the traditional market. The traditional market plays an essential role in driving the economy of the people throughout Indonesia.

This inadequate condition of traditional markets has made many communities choose to shop in modern markets, such as malls, convenience stores, or supermarkets. People with modern lifestyles today tend to shop at a place that is organized, clean, comfortable, and with a strategic management system.

Whereas traditional markets offer many advantages, such as lower prices, and for a particular product, the price is also negotiable. This advantage is very suitable for Indonesian society, especially people with middle to the lower economy, who generally prefer to buy goods at the lowest possible price.

In this regard, the products sold in the market are generally stapled foods that are closely related to public consumption. However, the fulfillment of this need still faces many obstacles, for example, the population's density. Indonesia has a population of around 268,583,016 million people (Central Bureau of Statistics, 2020),

On the other hand, globally, various countries are experiencing a crisis, especially the global food crisis. The issue of the World Food Crisis is closely related to the problem of Global Climate Changes and the dynamics of the worldwide economy, which is characterized by the economic crisis in developed countries and the volatility of food and energy prices (Directorate General of Horticulture, 2012).

However, these efforts are still considered not providing a sense of security for the Indonesian people's survival. In their implementation, there are still many challenging factors to overcome. The factor in question is the prevention of food waste. Food waste is the loss of food that occurs at the endpoint of the food chain, both from the sales process and the final consumption, which is often related to sellers and consumers' behavior. It can be concluded

that food waste is food that is lost or wasted in the supply chain where the food product can still be eaten or consumed (Parfitt et al., 2010).

The rate of food waste increases each year, both at the merchant level and the consumer level. Food waste occurs due to the lack of effective and efficient use of food, such as buying many products but left unconsumed, so it is expired and unfit for consumption (Kariyasa and Suryana, 2012).

Apart from staple food such as rice, food waste also includes vegetables. According to the Directorate General of Horticulture (2010) data, the availability of vegetables produced in Indonesia shows an increase every year. In 2009, the availability of Indonesian vegetable crop products had reached 77.03 kg/capita/year. It means that horticultural farmers' production capacity is currently able to meet the needs of the level of vegetable consumption of Indonesians who still consume 40.66 kg/capita/year.

These problems indicate that the marketing of vegetables in the Indonesian market is not well managed by traders, considering that many unsold vegetables end up in landfills.

Based on Central Bureau of Statistics Prabumulih City (2017) data , the average expenditure per capita of Prabumulih's people is around 533,832 Rp/per capita/month. While, the total spending on vegetables in Prabumulih City is 44,775.81 Rp/per capita/month.

With a relatively high level of vegetable consumption (4th highest), the risk of food waste in this type of food increases. Furthermore, as a city that does not produce its horticultural product, the average level of vegetable consumption by the Prabumulih community is worth 44.775,81. It can be approved that vegetables are a type of commodity that is in demanding and needed daily. For this reason, it is necessary to know the comparison of the amount of vegetable food waste in the Prabumulih compared to the level of the economic value of vegetables that are imported to Prabumulih.

METHODS OF RESEARCH

This activity was carried out in Prabumulih City. The location selection was carried out purposively by considering that Prabumulih City is a densely populated area and has a total production of 2,084 horticultural crops in 2019.

The research method used in this research is a survey method. According to Sugiyono, (2016), the survey method is used to obtain data from certain natural (not artificial) places, where researchers perform data collection and data measurement on 82 vegetable traders and retailers in traditional markets,

The sampling method used to select sample locations for traditional markets in this study is the purposive method. Purposive sampling is a sampling technique that is used with specific considerations (Sugiyono, 2016).

This research uses data collection methods which include primary data and secondary data. Primary data were obtained through interviews with traders of vegetable in traditional market.

Data and information obtained in the field are then processed according to objectives. To answer the first objective of this study, which is to describe the process of the occurrence of food waste at traditional market in Prabumulih City, it has been carried out by direct interviews with research subjects using several questions and then described as descriptively how food waste can occur and the reasons behind it. After the results are obtained, it is explained descriptively about the process of food waste that is not sold out.

As for the answer of second objective, namely, calculating the weight and economic value of food wasted at traditional market in Prabumulih City by collecting food scraps that are not sold out and will be put into separate plastic packaging for each object, labeled, then weighed using a digital food scale with an accuracy level of 0.1 gram. To calculate the weight of leftover food wasted at each market is to add up each leftover food and divide by the total amount of vegetables wasted in traditional markets.

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$$\%\text{Unsold Food} = \frac{\text{Weight of Individual Unsold Vegetable (gr)}}{\text{Total Weight of Unsold Vegetable (gr)}}\ 100\%$$

Furthermore, as for the third objective, namely, to analyze the factors that influence food waste in various types of markets in the Prabumulih City is to use multiple linear regression analysis, as follows:

$$Y = \alpha + \beta 1\text{SLc} + \beta 2\text{SLmg} + \beta 3\text{SLs} + \beta 4\text{SLk} + \beta 5\text{TV} + \beta 6\text{PtV} + \beta 7\text{PgV} + \beta 8\text{S} + \beta 9\text{EL} + \beta 10\text{SStra} + \beta 11\text{NB}e$$

Where: α = intercept, β1-β10 = slope, Y = food waste, SLc = Shelf life of cabbage, SLmg = Shelf life of mustard greens, SLs = Shelf life of spinach, SLk = Shelf life of kale, TV = Types of Vegetables (dummy: tough=1, green=0), PtV = Prices of Though Vegetables, PgV = Prices of Green Vegetables, S = Storage (dummy: available=1, not available=0), EL = Education Level of Traders, SStra = Sales Strategy (dummy: available=1, not available=0), NB = New Business.

RESULTS AND DISCUSSION

Food waste, which is leftover vegetables that are thrown away due to the sorting process or because they are not sold out in one day, can be influenced by several factors. These factors can come from the vegetables themselves or the traders who carry out these vegetables' buying and selling process. The factors that come from vegetables include the shelf life, types of vegetables and vegetable prices. While the factors that come from traders,

among others, are Education, Storage Facilities and Sales Strategy. These factors can influence directly or indirectly the occurrence of food waste. The factors that affect wasted food, either directly or indirectly were analyzed using multiple linear regression models.

Table 1 – Results of Regression Analysis of Factors Affecting Food Waste at Traditional Market

Variable	Coef. Regresi	T	Sig
(Constant)	2783.124	1.360	.178
Packaging Condition	267.500	1.255	.213
Storage Condition	-466.179	-1.433	.156
Supply	671.618	2.371	.020
Education Level	-1136.238	-2.960	.004
Shelf Life Hard Veggie	429.850	2.837	.006
Shelf Life Green Veggie	133.127	.593	.555
New Business	692.926	2.250	.027
R^2 = .866			
Adjusted R^2 = .727			
F Statistic = 3.582			

Source: Primary Data Analysis Results, 2021.

Based on table above from the results of multiple linear analysis with the help of the SPSS program, three variables that affect the amount of food wasted in traditional markets are obtained, such as; supply, education level, shelf life of hard vegetable and new business. Meanwhile, the variables of packaging condition, storage condition, and shelf life of green vegetable have no significant effect on wasted food in the traditional market of Prabumulih City.

Furthermore, the F test is carried out to see whether these independent variables have a combined effect on food waste. It can be seen that the statistical F test value (F count) obtained in table 4.1 is 3,582, which is then compared with the F table value. To determine the value of table F, it is necessary to determine the value of the degrees of freedom (df). For degrees of freedom, the numerator (df1) is obtained using the formula df1 = k - 1, while for the degrees of freedom, the denominator (df2) is obtained using the formula df2 n - k, where n is the number of samples and k is the number of independent variables. So that the obtained df1 = 5 and df2 = 76. The value of the F table at a significance of 0.05 is 2.335, while the regression results obtained an F arithmetic value of 3.582 which means F count > F table. Then it can be decided to reject H0, which means that together the independent variables, packaging condition, storage condition, supply, education level, the shelf life of hard vegetables, and shelf life of green vegetables in the model have a significant effect on the dependent variable, in this case, are food waste.

Moreover, after the model estimation test, the classical estimation test was carried out. A classical assumption test is a statistical requirement that must be met in multiple linear regression analysis based on ordinary least squares (OLS). The tests carried out in this study include the multicollinearity test, heteroscedasticity test, and normality test. The following is the classic assumption test that has been done.

The multicollinearity test is generally carried out to see whether there is a relationship or high correlation between the independent variables in the multiple linear regression model. This test is carried out by looking at the value of the variance inflation factor (VIF) and the tolerance value, which is the statistically justified error value.

Table 2 – Multicollinearity Test Results

Model	Collinearity Statistics	
	Tolerance	VIF
(constant)		
SLGV	.969	1.032
SLHV	.681	1.469
SUP	.634	1.577
PACKCON	.133	7.520
STORCON	.740	1.351
EL	.758	1.319

Source: Primary Data Analysis Results, 2021.

An equation model can be seen as having multicollinearity if the tolerance value of each independent variable is greater than one and the VIF value is greater than 10. If the tolerance value is > 1 or VIF > 10, multicollinearity occurs. After being tested, no variable that has a high correlation or does not occur multicollinearity. So that the equation model used can be said to be statistically good as a factor that affects food waste in the traditional market in Prabumulih City.

In the multiple linear regression equation, one of the important things to do is to test whether or not the variance of the residuals is the same between one observation and another. If the residuals have the same variance, it is called homoscedasticity, and if the residuals have different variances, it is called heteroscedasticity. A good linear equation occurs if there is no heteroscedasticity in it. The researcher analyzes the heteroscedasticity assumption test as seen from the SPSS output through a scatterplot graph between Z prediction (ZPRED) for the independent variable (X = Y-axis predicted) and the residual value (SSID) is the dependent variable (Y = Y-axis prediction - real Y). Homoscedasticity occurs if the points resulting from data processing between ZPRED and SRESID spread below or above the origin point (number 0) on the Y-axis and do not have a certain pattern. The following is a scatterplot graph of the test results on SPSS.

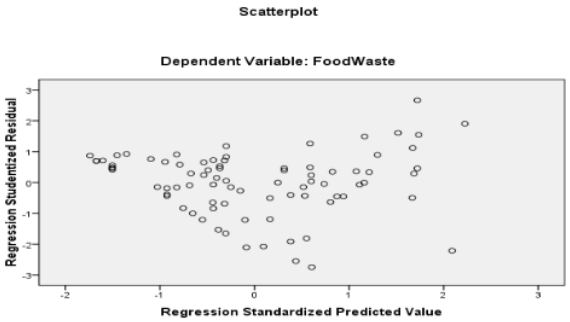

Figure 1 – Scatterplot Graph of Heteroscedasticity Test Results
(Source: Primary Data Analysis Results, 2021)

It can be seen that the equation does not occur heteroscedasticity or is homoscedastic because the points do not have a tendency to form a certain pattern. Heteroscedasticity occurs if the scatterplot points have a regular pattern, narrowing, widening, or wavy. So it can be concluded that the regression equation tested is good.

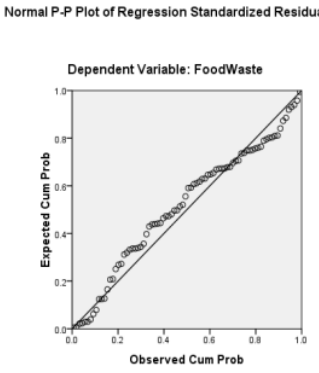

Figure 2 – Scatterplot Graph of Normality Test Results
(Source: Primary Data Analysis Results, 2021)

The results of the normality test can be seen from the Normal PP Plot image that was tested using SPSS. The normality assumption tested in the classical assumption is the residual (data) formed by a normal distributed linear regression model, not the independent variable or the dependent variable. The criteria for a residual (data) are normally distributed or not with the Normal PP Plot approach can be done by looking at the distribution of the points.

It can be seen that the distribution of these points is close to or close to straight-line data (diagonal). So it can be said that the residual data is normally distributed. This result is in line with the classical assumption of multiple linear regression used.

In addition, the conclusion of the classical assumption test on the multiple linear regression model is to see whether the equation used is good or not. Based on the results of the multicollinearity test, heteroscedasticity test, and normality test, it was found that there were no variables that had a correlation relationship, the equation model was homoscedasticity, and the data spread normally.

Based on the multiple linear regression analysis, the estimator equation can be formulated as follows:

$$Y = 2783.124 + 267.500PCn + (-466.179SCn) + 671.618S + (-1136.238EL) + 429.850SLGv + 133.127SLHv + 692.926NB$$

Where: α = intercept, β1-β6 = slope, Y = food waste, PCn = Packaging Condition, SCn = Storage Condition, S = Supply, EL = Education Level of Traders, SLGv = Shelf Life of Green Veggie, SLHv = Shelf Life of Hard Veggie, NB = New Business.

The results of the regression analysis obtained an estimator equation which shows that the variables that have a positive effect include packaging condition, storage condition, supply, education level, the shelf life of green vegetables, and shelf life of hard vegetables.

After doing the F test and classical assumption test on the multilinear regression model, then a t-test was then conducted to see the effect of each of these independent variables on the dependent variable, such as food waste in the traditional market. In this study, the t-test was carried out with the aim of seeing whether the independent variables partially have a positive or negative effect on the occurrence of food waste in the traditional market of Prabumulih City.

The packaging condition variable produces a regression coefficient value of 267,500 with a significance level of 0,213 which is greater than the significant level (α) used by 5 percent (0,213 > 0,05). This shows that the packaging condition has a negative but not significant effect on food waste in traditional markets in Prabumulih City. This indicates that the packaging condition has no influence in contributing to the amount of food waste.

The storage condition variable produces a regression coefficient value of -466,179 with a significance level of 0,156 which is greater than the significant level (α) used by 5 percent (0,156 > 0,05). This shows that the storage condition has a negative but not significant effect on food waste in traditional markets in Prabumulih City. This indicates that the storage condition has no influence in contributing to the amount of food waste.

The supply variable produces a regression coefficient value of 671,618 with a significant level of 0,020 which is smaller than the real level (α) used by 5 percent (0,020 <0,05). This shows that supply has a significant positive effect on food waste in traditional markets in Prabumulih City. This indicates that each addition of one unit of vegetable supply will increase the amount of food wasted in traditional markets by 671,618 with the assumption that the other independent variables in the regression model are fixed.

This is because supply is the amount purchased vegetables by traders from middlemen so that if traders supply too much product and exceed the consumer's ability to accommodate goods (Demand), the level of food waste will increase.

The education level variable produces a regression coefficient value of -1136,238 with a significant level of 0,004 which is smaller than the real level (α) used of 5 percent (0,004 < 0,05). This shows that education level has a significant positive effect on food waste in traditional markets in Prabumulih City. This indicates that each additional unit of education level will reduce the amount of food waste in traditional markets by -1136,238 with the assumption that

the other independent variables in the regression model are fixed.

This is because education level is the level of education possessed by a trader, which in this case is assumed to have a relationship with the mindset and behavior that will be taken by traders who act as market players in traditional markets. So the higher the education level of a trader in the traditional market assumed that the value of the number of food waste would also be small.

The shelf life of the hard vegetable variable produces a regression coefficient of 429,850 with a significant level of 0,006 which is smaller than the real level (α) used of 5 percent (0,006 <0,05). This shows that the shelf life of hard vegetables has a significant positive effect on food waste in traditional markets in Prabumulih City. This indicates that each additional unit of shelf life of hard vegetables will increase the amount of food waste in traditional markets by 429,850, assuming the other independent variables in the regression model are fixed.

This is because the shelf life of hard vegetables is the shelf life of hard-type vegetables, which in this case is usually 2-3 days, so the quality of shelf life of the vegetable will greatly affect the level of food waste.

The shelf life of the green vegetable variable produces a regression coefficient value of 133,127 with a significance level of 0,555 which is greater than the significant level (α) used by 5 percent (0,555 > 0,05). This shows that the shelf life of green vegetables has a negative but not significant effect on food waste in traditional markets in Prabumulih City. This indicates that the shelf life of green vegetables has no influence in contributing to the amount of food waste.

New business variable produces a a regression coefficient of 692.926 with a significant level of 0.027 which is smaller than the real level (α) used of 5 percent (0,027 <0,05). This shows that the new business has a significant positive effect on food waste in traditional markets in Prabumulih City. This indicates that each additional unit of new business will reduces the amount of food waste in traditional markets by 429,850, assuming the other independent variables in the regression model are fixed. This is because the new business is already common for some traders.

CONCLUSION

Based on the results of research and discussions that have been carried out, it can be concluded that additional research shows that the level of education plays a significant role in the level of food waste in the case of chili traders. This also affects the next steps they take to reduce the amount of waste. This is based on the regression results which show a significance level of 0.006 which indicates a relationship between the level of education and food waste.

Furthermore, the higher the level of education, the higher the opportunity to adopt and accept input and changes. Furthermore, the Barilla center points out that “wasted food is generally a consequence of improper ordering and improper projection of demand for food products resulting in a large amount of merchandise being unsold” but the traders have experience and keep the percentage of supply per day within level limits margin (10%) so that it will maintain market sustainability.

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