

Mathematical Model of Factors Influencing the Consumption of Brown Sugar in Southeast Sulawesi

WEKA GUSMIARTY ABDULLAH¹, USMAN RIANSE¹, RADEN MARSUKI ISWANDI¹,
SITTI AIDA ADHA TARIDALA¹, ILMA SARIMUSTAQIYMA RIANSE¹, ZULFIKAR
LA ZULFIKAR¹, WEKA WIDAYATI², LA RIANDA BAKA¹, ABDI LA ABDI¹, EDY
CAHYONO³

¹Faculty of Agriculture, Universitas Halu Oleo
Kampus Hijau Bumi Tridharma Anduonohu, Kendari 93232
INDONESIA
wkgusmiarty09@yahoo.com and usman.rianse@gmail.com <http://uho.ac.id>

²Faculty of Forestry and Environment, Universitas Halu Oleo
Kampus Hijau Bumi Tridharma Anduonohu, Kendari 93232
INDONESIA
weka_widayati@yahoo.com <http://uho.ac.id>

³Faculty of Mathematics and Natural Science, Universitas Halu Oleo
Kampus Hijau Bumi Tridharma Anduonohu, Kendari 93232
INDONESIA
edi_cahyono@innov-center.org <http://uho.ac.id>

Abstract: This paper is about supply-chain of brown sugar in Southeast Sulawesi. The focus is to obtain determinants of consumer behavior in the purchase of brown sugar, and to analysis demand elasticity of brown sugar. We found five factors that affect the consumption of brown sugar in Southeast Sulawesi: age of consumers, the price of brown sugar, housewife's education, family income and sex. Regression analysis shows that the age has negative influential to the brown sugar consumption, the olders consume more brown sugar than the youngers do. The price has negative influential to the brown sugar consumption. Housewife's education has positive influential to the consumption, as does the family income. Contribution of these four factors to the sugar consumption agrees with the underlying theory of marketing as expected. The sex factor, however, show that female consume more brown sugar than male, which is expected the other way. The fact is that female (housewife) decide to buy brown sugar for the male consumption (husbands). The implication of this research is the determination of brown sugar marketing segmentation based on socio-economic factors of consumers.

Keywords: Mathematic model, consumption of brown sugar, age, price, education, income, sex

1 Introduction

Sugar is a strategic commodity, because sugar as the main sweetener in a diversified range of food and drink around the world. Singsoong et al. (2010) said that sugar has been widely used as an ingredient in daily food and beverages in Asian communities. Brown sugar is the main alternative of white sugar and has many advantages. Therefore, brown sugar is getting more attention nowadays due to worldwide interest in traditional taste and research findings about new health facts of sugar,

especially. According to Tablan, 2008 and Philippine Coconut Authority (2004) that coconut sugar has low a Glycaemic Index (GI) so it is good for diabetics and suitable for weight maintenance. Some coconut sugar producing countries are Malaysia, Thailand, Philippines, Cambodia, India and Indonesia.

Diversification program of palm-based national sugar industry such as coconut brown sugar and palm brown sugar has strategic role as an effort to decrease dependency of the government and society toward refined (cane) and synthetic sugars

that most of them imported. It is based on Indonesian potential as country that has largest coconut area in the world, namely 3,707 million ha (31.2% of area total, 11,909 million ha). The other country, Philippine is 3,077 thousands ha (25.8%), India is 1,908 thousands ha (16.0%), Srilangka is 442 thousands ha (3.7%), Thailand is 372 thousands ha (3.1%). Besides the large area factor and the low of brown sugar raw price, the technology used to produce the brown sugar is categorized as low cost and low tech or it does not need high cost and technology. It is different to the technology used to produces refined sugar (cane). Therefore, diversification program of palmed sugar industry is very suitable and strategic to develop coconut plant centers in all areas of Indonesian (Mustaufik, 2010).

Brown sugar comoditas has specific characteristics in terms of taste, aroma, and its form, and it is different to white sugar (cane). Brown sugar that produced from coconut sap is one of materials that gives nice taste and delicious of the food or beverages. This is causes brown sugar has the important role in society's consumption and it can be the main substitution of white sugar.

Southeast (SE) Sulawesi is one of provinces as the brown sugar producers. Potential areas as the palm sugar producers are Kabaena, Kolaka, Poleang, South Konawe, Muna, and Pinanggo. Most of brown sugar productions by sugar craftsman in SE Sulawesi are brown sugar produced from palm sap, except South Konawe that produces brown sugar from coconut sap. Every areas has specific brown sugar characteristics.

Brown sugar with a different characteristic also have different prices as the result of research of Rianse and Abdullah (2012) that the price of Munabrown sugar was in the range of \$2.27/kg until \$2.45/kg, while preliminary observations in Kendari traditional market, indicated that Kabaena brown sugars had ever raised up to 100%. In the market, the selling price of brown sugar reached \$1.36/kg, whereas on previous sale it was only \$0.64/kg. The brown sugar that reaches the price increasing for more than 100% is Kabaena's brown sugar. The Kabaena's brown sugar is sold with high price, while the brown sugar price from Kendari is still stable. Now, producer of Muna's and Kabaena's brown sugar compete with Bugis' brown sugar producer from South Sulawesi that its price is relatively cheaper than brown sugar price of Muna and Kabaena. This causes the consumer tend to buy the brown sugar with lower price, while it is as threat for producer of Muna and Kabaena's brown sugar in their production persistence.

Sugar processing is home industry that is mostly done by people in the Kabaena, Kolaka, South Konawe, and Muna. Sugar processing business is one source of villager's revenue and it can increase local revenue. Brown sugar production is sugar diversification effort. It has been increasing of coconut sap use economically, and stimulate the society to actively participate in its production for either small industry or bigger scope. This is can be the alternative income although it still uses traditional tools in the production of brown sugar by the limited human resources (quantity and quality).

In the early of 1980, both brown sugar from Muna and Kabaena dominated brown sugar market in SE Sulawesi, but brown sugar coming from Kolaka also dominate market this time, mainly markets in Kendari. Besides that, the producers also compete with Bugis brown sugar production with lower price than brown sugar prices from several areas in SE Sulawesi. It gives negative effect to brown sugar demand level in SE Sulawesi, and this condition becomes a threat for their business persistence. Thus, necessary to study the factors that influence sugar consumption society SE Sulawesi as a strategies to anticipate threats to the sustainability of the agribusiness of brown sugar. Focus of this paper were to obtain determinants of consumer behavior in the purchase of brown sugar, and to analysis demand elasticity of brown sugar.

2 Problem Formulation

2.1 Demand theory

Deaton dan Muelbauer (1980) suggest some properties of Hicksian and Marshallian demand functions as follows:

(1) *Adding-up*

Adding-up is the total value of the Hicksian and Marshallian demand functions. It is also defined as the total cost of a household to consume goods and services. Mathematically:

$$\sum p_i q_i(p, Y) = Y \quad (1)$$

$$\sum p_i h_i(p, U^*) = Y \quad (2)$$

Derivative of equation (1) to Y and p respectively are:

$$\sum p_i \partial q_i / \partial Y = 1 \quad (3)$$

$$\sum p_i \partial q_i / \partial p_i + q_i = 0 \quad (4)$$

In the form of elasticity, Engel aggregation in equation (3) can be written as follows:

$$\sum w_i \varepsilon_{iv} = 1 \quad (5)$$

Equation (5) shows the entire available budget been spent, and if an increase in income will be allocated proportionally to all commodities consumed. Cournot aggregation properties of the equation (4) in the form of elasticity can be written as follows:

$$\sum w_i \varepsilon_{iy} + w_i = 0 \quad (6)$$

Cournot aggregation properties is related to the nature that if the prices of other commodities is remain, so the price changes on one of the commodities consumed will impact on budget reallocation. It caused demand for commodities will change.

(2) Homogeneity

Hicksian demand function will be homogeneous of degree zero on prices, whereas for Marshallian demand function will be homogeneous of degree zero on prices and household expenditures. This shows if the price changes and spending proportionately, then the household demand for goods or services will not change. In elasticity form, the homogeneous nature can be written as follows:

$$\sum \varepsilon_{ij} + \varepsilon_{iy} = 0 \quad (7)$$

(3) Symmetric

The decrease in the coefficient of the cross-price Hicksian demand is symmetric. Symmetrical nature of the demand function means that if the real income constant, the effect of price increases on demand goods j to demand goods i is equal to the effect of price increases on goods i to demand goods j.

Substitution effect of the commodity i and j are symmetric. Symmetry condition is indicated by the resulting cross-price coefficient is the same, which can be written as follows:

$$s_{ij} = s_{ji} \quad (8)$$

Equation (8) means that the commodity do not influence each other, but when $s_{ij} = s_{ji} > 0$, among commodities substitute each other, and if $s_{ij} = s_{ji} < 0$, between complementary commodities, the form of elasticity can be written as follows:

$$\varepsilon_{ij} = w_j / w_i (\varepsilon_{ij}) - w_j (\varepsilon_{iy} - \varepsilon_{jy}) \quad (9)$$

(4) Negative

There is a negative relationship between the price of a commodity and the amount requested. Demand for commodities will decline or at least constant if the price of a commodity increases by fixed utility assumptions. This is in accordance with the law of demand. The properties obtained from the convex nature of the indifference curve as a result of maximizing utility or minimizing costs.

The fourth function of the nature of the request, the nature of the adding-up and homogeneity is a consequence of the linear budget constraint specification demonstrated through the budget line, whereas property of negative and symmetry are derived from consumer preferences consistent.

2.2 Demand elasticity

Demand elasticity describes the degree of sensitivity to changes in the influence factors (Papas dan Hirschey, 1995; Salvatore, 2001; Widodo, 2002). Three kinds of demand elasticity, such as:

(a) Price elasticity

The price elasticity is the percentage change in quantity demanded of goods because of changing its price (*ceteris paribus*). Mathematically:

$$\varepsilon_p = \frac{\Delta Q / Q}{\Delta P / P} = \frac{\Delta Q}{\Delta P} \cdot \frac{P}{Q} \quad (10)$$

The price elasticity is larger than one ($\varepsilon_p > 1$) called elastic, equal to one ($\varepsilon_p = 1$) called unitary elastic, less than one ($\varepsilon_p < 1$) called inelastic. The coefficient of price elasticity of demand is always negative marked. (Nicholson, 1995; Widodo, 2002).

(b) Cross elasticity

Cross elasticity is the percentage change of demanded goods in Q, because of changing prices of other goods (P2). Mathematically:

$$\varepsilon_{12} = \frac{\Delta Q_1 / Q_1}{\Delta P_2 / P_2} = \frac{\Delta Q_1}{\Delta P_2} \cdot \frac{P_2}{Q_1} \quad (11)$$

Elasticity is negative ($\varepsilon_{12} < 0$) shows the complementary goods, positive ($\varepsilon_{12} > 0$) shows substitution goods. Two of goods or services can be complementary if consumers require a goods and services and there are several kinds of options. Two of goods or services may have a complementary relationship when two or more goods are consumed together (Papas dan Hirschey, 1995; Salvatore, 2001; Widodo, 2002).

(c) Income elasticity

The income elasticity is the percentage change in quantity demanded of goods due to changes in consumer income. Mathematically:

$$\varepsilon_Y = \frac{\Delta Q / Q}{\Delta Y / Y} = \frac{\Delta Q}{\Delta Y} \cdot \frac{Y}{Q} \quad (12)$$

Income elasticity is positive ($\varepsilon_Y > 0$) for normal goods, negative ($\varepsilon_Y < 0$) for inferior goods, and more than one ($\varepsilon_Y > 1$) for luxury goods.

2.3 Consumption theory

Consumption theory is used to explain and predict the products selected by the consumer (household) at a given price level. This theory is also used to get the demand curve (Arsyad, 1999).

Widodo (2002) there are some basic assumptions of the theory of consumption, namely: First, the full knowledge that consumers have perfect knowledge about the goods and services that will be consumed which consists of several assumptions that (a) consumer's aware of the goods and services, (b) the consumer has the response to the presence of goods and services, so

that consumers prefer goods/services rather than specific goods/services provided, and (c) consumers have a certain amount of money that causes the response becomes evident in the market. Second, he preference function which consists of assumptions: (a) ranking ordering, consumers have the list of ranking ordering or market basket, (b) two kinds or groups of goods A and B, there are three possibilities, namely; (1) A prefer than B, (2) B prefer than A dan (3) A indifferent to B. Third, transitivity if A prefer than B, and B prefer than C, so A prefer than C. Fourth, unsatiaty or unsaturity is the group of goods which comprises a number of more specific items would be preferred.

2.4 Consumer behavior

Consumer behavior will determine the purchase decision process. The process is a problem-solving approach consists of five phases, namely (1) analyze or recognize needs and desires (2) information retrieval and assessment resources, (3) assessment of selection to the alternative of purchase, (4) the decision to buy and (5) behavior after purchase. All that process is not always done by the consumer in the purchase. It happens on an emotional purchase (Swastha dan Handoko, 1987).

Algifari (2003) analyze the consumers behavior using cardinal utility model by several assumptions, namely: (a) consumer satisfaction is derived from consuming a product can be measured in money, (b) consumers try to maximize the total satisfaction (total utility) of the product is consumed, and (c) consumers consume products based *Goosen law*, the law of additional satisfaction (utility) of diminishing (*The law of diminishing marginal utility*), It means that any additional amount of product consumed will create the lower marginal satisfaction (down) continuously.

The theory of consumer behavior starts with three basic assumption are: (1) preference of consumers is complete, which means that the consumer is able to compare and sort the goods or services consumed on the basis of preference (2) consumers are rational and consistent, and (3) consumers prefer goods in large quantities. In general, consumer behavior is explained with satisfaction function approach (*utility function*) (Pindyck dan Rubinfeld, 1994).

The main factors that influence consumer behavior include cultural, social, personal, and psychological. Culture is reflected in the existence of social classes is one determinant of a person's desires and behaviors of the most fundamental Purchasing decisions are also influenced by personal characteristics, such as age and stage in the life

cycle of the buyer, jobs, economic circumstances, lifestyle, and the concept of personal identity. Options to buy one also will be affected by a major psychological factors, namely motivation, perception, learning, and trust (Kotler, et al. 2007).

2.5 Data analysis

Analysis of the factors affecting the consumption of sugar is done with non-linear analysis by methods OLS (*Ordinary Least Square*). Hypothesis: sugar consumption is influenced by age of the respondent, the price of brown sugar, housewife education, family income, and sex. Hypothesis testing is done by using a form of the demand function approximated by a non-linear analysis with OLS (*Ordinary Least Square*). In these functions, regression coefficients is the coefficient of elasticity of each variable, directly (Gujarati, 1997). Mathematically:

$$\ln Q_d = \ln b_0 + b_1 \ln A + b_2 \ln P + b_3 \ln E_d + b_4 \ln I + b_5 D_s + e \quad (13)$$

Where:

Q_d = the amount of sugar consumed

b_0 = intersep

A = age of respondent

P = *price* of brown sugar

I = family income

E_d = housewife's education

D_s = dummy for sex, 1 = female; 0 = male

e = *error term*

3 Problem Solution

3.1 Testing Assumption of *Ordinary Least Square* (OLS)

Testing criteria in econometrics is done to see any deviations from the assumptions of classical linear regression models. This is done in case of detection of the influence of multicollinearity and heteroscedasticity. Multico-linearity is the condition of the existence of a linear relationship between the independent variables. Detection of multicollinearity can be seen from the magnitude of the correlation between the independent variables (lower than 0.5). Table 1 as follow is the regression analysis for multico-linearity test.

Tabel 1. Multicollinearity test with correlation between independent variable

Correlation of Independent Variables	Demand of brown sugar	age	Priceof brown sugar	Housewife education	Family Incomes	Sex
Demand of brown sugar	1.000	0.159**	-0.265**	0.172**	0.033	-0.132**
Age	0.159**	1.000	-0.094**	0.184**	-0.010	0.002
Priceof brown sugar	-0.265**	-0.094**	1.000	-0.164**	0.027	0.064**
Housewife education	0.172**	0.184**	-0.164**	1.000	-0.143**	-0.072**
Family Incomes	0.033	-0.010	0.027	-0.143**	1.000	-0.025
Sex	-0.132**	0.002	0.064**	-0.072**	-0.025	1.000

Based on the analysis of correlation between the independent variables that is presented in Table 1 shows the value of a positive correlation. This indicates that the addition of these variables will increase the coefficient value of other variables that affect the brown sugar consumption. Conversely, a negative correlation value indicates that the addition of these variables will decrease the value of the coefficient of other variables that affect the consumption of sugar. In Table1 above, it can be seen that all correlations between the independent variables under (+/-) 0,5. It can be concluded that there is no multicollinearity problem in the model were regressed.

3.2 Mathematical Model of Factors Influencing the Consumption of brown sugar in the Southeast

Factors influencing the consumption of brown sugar in the Southeast Sulawesi were analyzed by using a form of the demand function approximated by a non linear regression analysis with OLS approach (*Ordinary Least Square*). The results of the regression analysis are shown in Table 2.

Table 2. Factors Influencing the consumption of brown sugar in the southeast

Independent variables	Expected sign	Coefficient	SE	t-count	Prob
constant (C)	+/-	5.492	0.621	8.844	0.000
Ln (age of respondent)	+	0.077	0.025	2.993	0.003
Ln (price of brown sugar)	-	-0.251	0.022	-11.502	0.000
Ln (Housewife education)	+	0.121	0.018	6.397	0.000
Ln (family income)	+	0.081	0.019	4.275	0.000
Ds (sex)	+	-0.148	0.023	-6.207	0.000
R-Squared	0.132				
Adjusted R-Squared	0.129				
Durbin-Watson	1.159				
F-count	65.48				
Probability of F-count	0.000				

Based on Table 2, can be prepared mathematical models, as below:

$$\ln Q_d = 5.492 - 0.077 \ln A - 0.251 \ln P + 0.121 \ln Ed + 0.081 \ln I - 0.148 D_s + e \tag{14}$$

Based on the mathematic model, the value of probability is used to determine the level of significance of independent variables consisting of age (A), brown sugar prices (P), housewife's education (Ed), family income (I), and sex (Ds). The level of significance is indicated by each of the partial regression coefficient of the independent variables against the brown sugar (Qd).

Hypothesis testing is done with statistical tests performed with less R², F-test and T-test below.

a. Determination coefficient (R²)

The resulting regression models in Table 2 have the Adjusted R-Square value of 0.129. It means that approximately 87.100% of the factors that influence the consumption of sugar is not analyzed. Independent variables in the regression is only able to explain about 12.900% of all the factors which affect the consumption of sugar.

b. F-test

F-test is used to determine the overall significance level of the independent variables simultaneously to the dependent variable. The results of multiple linear regression factors affecting sugar consumption showed F-test equal to 65.481 with probability 0.000. This indicates that all variables significantly affect the consumption of brown sugar.

c. T-test

T-test is used to determine the level of significance of each individual independent variable to dependent variable. The results of the analysis of regression showed that all independent variables that significantly affect the consumption of brown sugar.

3.3 Factors Influencing the Consumption of Brown Sugar

The consumers activity in consuming brown sugar are influenced by several factors. These factors can be derived from the attributes of brown sugar, consumer socioeconomic factors, and other factors around commodities and consumers of commodities. Some of the factors that influence brown sugar consumption are analyzed here is age, brown sugar price, housewife's education, family income, and sex.

Age of consumer

Age on the results of the regression variables have a minimum percentage of probability below 5% (see Table 2), thus it can be concluded that the variables of age influence brown sugar consumption significantly. Regression results showed expected sign, which is positive. This means that age has a positive effect on brown sugar

consumption. The increasing age of respondents will increase the consumption of brown sugar.

Regression coefficient of age variable is equal to 0.08. The meaning is that every age by 1% will increase the consumption of sugar by 0.08% assuming other factors held constant (*ceteris paribus*). It can be explained that the mean age increased health risk that can be used by improper sweetener consumption. Consumption of brown sugar is good for food or drink is considered to be safer for health because it is made from coconut or palm sap of plants that are free of pesticides. It is suitable with Malik et al. (2006) who stated that there is a positive association between greater intakes of sugar-sweetened beverages (SSBs) and weight gain and obesity in both children and adults.

Price of brown sugar

Price variable of brown sugar on the regression results also have a percentage probability below 5% (see Table 2). Thus it can be concluded prices variable of brown sugar influence brown sugar consumption significantly. Regression results show that the appropriate sign theory or expected sign is negative. This means that the price of brown sugar has a negative effect on its consumption. Brown sugar consumption will decline if the price of brown sugar increase.

Regression coefficient of brown sugar price is equal to -0.251. This means that brown sugar consumption decreased by 0.251% for each 1% increase in the price of brown sugar by assuming that other factors held constant (*ceteris paribus*). In other words, if the price of sugar increase 100% can affect the reduction in sugar consumption by 2.510%. This is consistent with the theory that the higher price caused a lower demand for goods. It can be explained that if an increase in the price of brown sugar consumer will reduce the use of sweeteners (sugar) in food and drink them.

The effect of price on the demand of sugar for consumption in accordance with the results of the research of Department of Economics School of Economics and Commercial Law, and School of Technology and Society (2005). The results of these studies also showed that the effect on the price of sugar is only valid in the short term, while quality of sugar is determining the number of requests in the long term.

Housewife's education

Housewife's Education variable in the regression results have a minimum percentage of probability below 5% (see Table 2). Thus it can be concluded that these variables have a significant effect on the consumption of brown sugar. Regression results show that the appropriate

sign theory or expected sign, which is positive. This means that housewives education positively influences to the brown sugar consumption. The higher the education level of the respondent, it will increase the amount of sugar consumption.

Housewife's education variable regression coefficient is equal to 0.121. This means that each level of education increased by 1% then it will increase the amount of sugar consumption at 0.12% assuming other factors held constant (this means that each level of education increased by 1% then it will increase the amount of sugar consumption at 0.12% assuming other factors held constant (*ceteris paribus*)). These results are consistent with the theory that the education effect on household consumption decisions. Education will establish a more rational mindset regarding the decision to consume brown sugar. An educated consumer can decide what kind of sweetener that will be consumed with consideration for the health benefits of the products for themselves and their families.

Family income

Family income variable on the regression results have a percentage probability below 5% (see Table 2). Thus it can be concluded that family income variable influence brown sugar consumption significantly. Regression results show that the appropriate sign theory or expected sign is positive. It means that the family income variable has a positive effect on its consumption. Brown sugar consumption increased while family income variable increased, too.

Regression coefficient of brown sugar is equal 0.081. This means that brown sugar consumption increased by 0.12% for each 1% increase in family income. Assuming that other factors held constant (*ceteris paribus*). This is consistent with the theory that the increase of wage will increase the consumption.

These results are consistent with the theory that a person's wage rate increase the amount of demand for consumer goods. The higher wage rates will have an impact on consumer behavior with purchasing power is increasing as well. It can also be stated that consumers increase consumption of brown sugar by 0.12% if there is an increase family income by 0.12%.

Sex of consumer

Dummy variable of sex in the regression results also have a minimum percentage probability below 5% (see Table 2). It can be concluded that this variable have the significant influence to the consumption of brown sugar, however the regression results showed sign or not in accordance with the theory of expected sign, i.e. negative.

Dummy variabel of sex between female and male indicate that the actual decision makers by consumption are male. It can be explained that although that did buy brown sugar are female (housewife), however the decision to consume sugar is motivated by the gratification of male (husband) as heads of households. It could be explained that the selection of products (including the quality and quantity of brown sugar) is made by the respondents in the shop is based on the head of their household tastes.

Demand elasticity of brown sugar

The elasticity of demand for brown sugar studied to analyze the changes in the demand for consumption of brown sugar caused by changes in its prices (price elasticity) and changes in family income (income elasticity). The elasticity values obtained through the mathematical model for the factors which affect the consumption of brown sugar that had been analyzed previously.

The price elasticity are shown with regression coefficient of the brown sugar price at -0.251 (see Table 2). There seems a negative relationship between price and quantity of brown sugar consumption that less than 1. This means that the demand for brown sugar consumed is inelastic demand. If the price of brown sugar increase 100% so that the brown sugar demand for consumption will be increase 2.50%, only. It refers to brown sugar is a primary goods. Therefore, the sustainability of brown sugar agribusiness will be happen if the producer give attention to its stocks and to the income and education of consumer that related with brown sugar's quality.

The income elasticity is indicated by family income variable regression coefficient is equal to 0.081. This value indicates a positive relationship between family incomes by the amount of sugar consumption is less than 1. This means that the brown sugar classified as normal goods, where changes in family income of 100% will only affect changes in the amount of brown sugar demand of 0.81%.

The results of this study indicate that an pricing strategy is not appropriate for business development of brown sugar. This is because brown sugar is a normal goods. It will be different if brown sugar could be modified in model and size so that it can be applied diversification price. This study is similar to Genchev, and Yarkova (2010) that Knowledge of managers on the elasticity of demand for its products on the market and the factor that influence it would give her enough great competitive advantage, and hence profits, the company will be financially stable and profitable,

while those who do not handle this analysis will suffer continuous losses and eventually fail.

4 Conclusion

Several things can be concluded in this study. First, factors influencing the consumption of brown sugar in the Southeast Sulawesi are the age of the consumer, the price of brown sugar, housewives education, family income and sex. Mathematically:

$$\begin{aligned} \text{LnQd} = & 5,492 - 0,077 \text{LnA} - 0,251 \text{LnP} \\ & + 0,121 \text{LnEd} + 0,081 \text{LnI} \\ & - 0,148 \text{Ds} + e \end{aligned}$$

Age and brown sugar prices have a negative effect on sugar consumption, while education and family income has a positive effect on the consumption of brown sugar. Sex factors show that female consuming more sugar than male, other things are also expected. In fact, women (housewife) decided to buy sugar for consumption male (her husband). Second, brown sugar demand for consumption is inelastic demand. Another thing that brown sugar is categorized as normal goods.

The implication of this research is the determination of brown sugar marketing segmentation based on socio-economic factors consumers.

The study recommends to the agribusiness of brown sugar to maintain the existence and develop brown sugar agribusiness with determining the market segments based on socio-economic factors that collaborated other factors that have not been examined in this study, for example, factor attributes of brown sugar.

This study suggest to the government could improve the capacity of consumer about the benefit and quality of brown sugar.

References

- [1] Algifari. *Ekonomi Mikro; Teori dan Kasus*. STIE YKPN, Yogyakarta. 2003. (In Indonesian)
- [2] Arsyad, L. *Ekonomi Manajerial: Penerapan Ekonomi Mikro Untuk Manajemen Bisnis*. BPFE, Yogyakarta. 1999. (In Indonesian)
- [3] BBPP Lembang. *Kontribusi Sektor Pertanian terhadap PDB*. <http://www.bbpp-lembang.info/index.php/arsip/artikel/artikel-pertanian/561-kontribusi-sektor-pertanian-terhadap-pdb>. Downloaded on August 2012.
- [4] Budiningsih, S. *Efisiensidan Faktor Internal Eksternal Agroindustri Gula Kelapa di Kecamatan Cilongkok Kabupaten Banyumas*.

- Tesis. UniveritasGadjahMada. Yogyakarta. 2004.
- [5] Buwono H.X. *Otonomi Pembangunan Pertanian dalam Pembangunan Pertanian dalam Otonomi Daerah*. Edisi Revisi. LP2KP Pustaka Karya, Yogyakarta. 2001. (In Indonesian)
- [6] Browning, E. K and M.A. Zupan. *Microeconomic Theory and Applications*. Fifth Edition. Texas A & M University and University of Southern California; HarperCollins College Publishers, California. 1996.
- [7] Deaton, A. and J. Muellbauer. *Economic and Consumer Behavior*. Cambridge University Press, New York. 1980.
- [8] Department of Economics School of Economics and Commercial Law, and School of Technology and Society. *Demand for Coffee: Prices, Preferences and Market Power*. RAND Journal of Economics. 29(2):p 1-27. 2005.
- [9] Kotler, P. dan K.L. Keller. *Manajemen pemasaran*. (Edisi 12 jilid 2). Alih Bahasa Benyamin Molan. Indeks, Jakarta. 2007. (In Indonesian)
- [10] Genchev, E., and Yarkova. *Analysis of Price Elasticity of Food Products (for the period 1999-2009)*. Trakia Journal of Sciences. 8(3):pp191-194. 2010.
- [11] Lurry, C. *Budaya Konsumen*. Yayasan Obor Indonesia, Jakarta. 1998. (In Indonesian)
- [12] Malik, V.S., Schulze, M.B., and Hu, F.B. *Intake of Sugar-Sweetened Beverages and Weight Gain: a Systematic Review*. The American Journal of Clinical Nutrition. 2006(84);pp 274-278. 2006.
- [13] Mustaufik. *Pengembangan Agroindustri Gula Kelapa Kristal Sebagai Sumber Gula Alternatif untuk Mengurangi Ketergantungan Dunia terhadap Gula Tebu*. Jurusan Teknologi Pertanian Fakultas Pertanian Unsoed Purwokerto. 2010. (In Indonesian)
- [14] Nazar, F. *Ekonomi Mikro untuk Negara Sedang Membangun*. UI Press, Jakarta. 1990. (In Indonesian)
- [15] Nicholson, W. "*Microeconomic Theory*." *Basic Principles and Extensions*, Seventh Edition. Amherst College, Dryden Press USA. 1998.
- [16] Pappas, J.L. dan Hirschey, M. *Ekonomi Manajerial*. Edisi Keenam. Binarupa Aksara, Jakarta. 1995. (In Indonesian)
- [17] Pindyck, R.S. and Rubinfeld, D.L. *Mikro Ekonomi*. Edisi Keempat. PT. Prenhallindo, Jakarta. 1994. (In Indonesian)
- [18] Rianse, U. dan W.G. Abdullah. *Analisis Dampak Kerusakan Jalan Poros Kendari-Torobuludan Tempo-Wamengkoli Terhadap Eksistensi dan Keberlanjutan Agribisnis Aneka Palma di Provinsi Sulawesi Tenggara*. Laporan Penelitian Pakar 2012. Universitas Haluoleo, Kendari. 2012. (In Indonesian)
- [19] Rianse, U., La Rianda, and Abdi. *Kajian Perilaku Konsumen Gula Merah di Sulawesi Tenggara*. Laporan Penelitian Unggulan Perguruan Tinggi. Universitas Halu Oleo. Kendari. (In Indonesian), 2013.
- [20] Salvatore, D. *Managerial Economics dalam Perekonomian Global*. Edisi Keempat. Erlangga, Jakarta. 2001. (In Indonesian)
- [21] Singsoong, K., Benjapong, W., Nitithamyong, A., Tavichatwitayakul, R., Karnpanit, W., Moungrichan, N. & Prakobsil, J. 2010. *Preservatives Used In Coconut Sap*. Toxicology Letters. 196S(2010), 2010, pp337-351.
- [22] Sukirno, S. *Makro Ekonomi, Perkembangan Pemikiran dari Klasik Hingga Keynesian Baru*. PT. Raja Grafindo Persada, Jakarta. 2000. (In Indonesian)
- [23] Swastha, B.Dh. dan T.H. Handoko. *Manajemen Pemasaran; Analisa Perilaku Konsumen*. Liberty, Jakarta. 1987. (In Indonesian)
- [24] Tablan, E. *Benefits of coco sugar*. *Agribusinessweek*. Retrieved 9 October, 2008. <http://www.agribusinessweek.com>. Access on April 2014.
- [25] Widodo, S. *Ekonomi Mikro. Hand Out*. Program Pascasarjana. Universitas Gadjah Mada. 2002. (In Indonesian)