ISBN : 978-602-14917-9-9

DEMAND FOR ANIMAL FOOD IN THE RURAL AND URBAN OF MALUKU, INDONESIA

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Abstract. Protein deficiency has a permanent and long-term effect, which is a decrease in intelligence, abnormal growth, and stunting. Maluku is the province with the lowest protein consumption in Indonesia. The purpose of this study is to analyze the impact of price, income, and demographic factors on animal protein food demand, using the Quadratic Almost Ideal Demand System approach. The research data used 2016 Susenas data of 4,811 households. The results showed that an increase in animal food prices by one percent decreased demand for eggs, chicken, beef, fresh fish and milk powder, respectively, by 0.452%, 2,024%, 4,382%, 2,507%, and 0.969%. The most elastic beef was followed by chicken, fresh fish, milk powder, and eggs with income elasticities of 3,928%, 2,278%, 1,752%, 1,456%, and 0.562%, respectively. All animal foods are luxury items, except eggs are normal goods. In urban areas, beef, fresh fish and milk power are complementary, whereas in rural areas all animal foods are substitutes. Moreover, the impacts of socio-demographic factors on the demand for animal products were found to be very low. To increase protein consumption, the Maluku government needs to maintain the stability of animal food prices, especially eggs. Price policies are more effective than income policies both in urban and rural areas

Keywords: food demand system, food price, protein, Maluku-Indonesia

1. Introduction

The second objective of Sustainable Development Goals (SDGs) is to eliminate hunger, achieve food security and proper nutrition, and improve sustainable agriculture. Two indicators in the SDGs objectives that are directly related to nutritional status are the prevalence of energy shortages (prevalence of undernourishment) and the prevalence of populations with moderate or severe food insecurity. The adequacy level of energy and protein consumption can be used as an indicator to look at the nutritional conditions of the community and also the success of the government in integrated food, agriculture, health and socio-economic development [1]. Food sufficiency, including protein adequacy, is very important to realize the second goal of the SDGs [2].

The quantity and quality of food consumed by a household influences a person's nutritional status. Monthly average expenditure (quantity and value) of food items by urban rural classification in Maluku less than recommended dietary allowance for protein (BPS-Statistics Indonesia, 2016 Catalog: 3202001). However, when viewed in the third expenditure quintile, nationally protein consumption has met protein adequacy standards, but there are still 10 provinces in the third quintile not meeting protein consumption adequacy standards including Maluku is the province with the highest protein deficiency in Indonesia (52.46 gram). Total consumption and these expenditures can be used to describe the pattern

ISBN : 978-602-14917-9-9

of consumption of animal products [3], [4]. Animal products consumption patterns can be used to look at the ability of households to meet protein needs [5]. Protein supply is one of the indicators to explaine the household welfare [6] [3][5].

Research on food demand systems, food consumption preferences, and food consumption patterns has been carried out in various countries, among others at Mazandaran province, in the north of Iran **[8]**, in India **[9][10],** in Nigeria **[11][12],** in Ethiopia **[13]**, in Malaysia **[14]**, in Kenya **[15][16].** In Indonesia, research on the food demand system using the QUAIDS approach was carried out by [17] in 2009. However, the commodities studied included basic food, processed animal products, fruits, and vegetables. In this study, more focused on food sources of protein from animals. Therefore, this study sets the goal is to analyze the impact of rising prices, incomes, and demographic factors on animal food demand. The model approach uses QUAIDS with the SUR (Seemingly Unrelated Regression) method [18]. The results of the study will obtain price and income elasticity, which shows the percentage change in the amount requested as a result of the percentage change in price and income [3]. Demographic factors are also included in the QUAIDS model to see the effect of changes in the number of household members on changes in demand [13]. Through price elasticity information will be obtained whether animal food is elastic, inelastic or unitary elastic or the nature of animal food, whether substitution or complementary. Through income elasticity, it will be concluded that animal foods are normal, luxurious, or inferior. All of this information is expected to be valuable information in developing animal food policies in the context of fulfilling protein by national dietary recomended, especially Maluku.

2. Methods

2.1. Model Specification: Quadratic Almost Ideal Demand System (QUAIDS)

The most commonly used method in demand analysis in the last two decades is AIDS model developed by **[19]**. The AIDS model has a number of some demand properties such as testing for symmetry and homogeneity through linier restriction among the commodities **[20]**. In addrition, the QUAIDS model maintains the theory consistency and the demand properties of the AIDS model. Formally, the share equations of QUAIDS model **[20]** is:

$$\boldsymbol{w_i = \alpha_i + \sum_{j=1}^{n} \gamma_{ij} 1np_j + \beta_1 1n\left[\frac{m}{a(p)}\right] + \frac{\lambda_i}{b(p)}\left\{1n\left[\frac{m}{a(p)}\right]\right\}^2 + \varepsilon_i} \quad (1)$$

(1)

Where $\boldsymbol{w_i}$ is a household's expenditure share for commodity i, and it is defined as

$$\boldsymbol{w_i \equiv \frac{p_i q_i}{m} and \sum_{i=1}^{n} w_i = 1} \quad (2)$$

On the other hand, the demand theory requires the following restrictions:

- Adding-up: $\boldsymbol{\sum_{i=1}^{n} \alpha_1 = 1, \sum_{i=1}^{n} \beta_1 = 0, \sum_{i=1}^{n} y_{ij} = 0, \sum_{i=1}^{n} \lambda_i = 0,}$ (3)
- Homogeneity: $\boldsymbol{\sum_{i=1}^{n} y_{ji} = 0}$ (4)
- Slutsky symmetry: $\boldsymbol{\gamma_{ji} = \gamma_{ij}}$ (5)

The QUAIDS model in this study was carried out to account socio-demographic (z) effects to the animal products demand. Demographic factors can effect household behaviour in terms of demand and allocation of expenditure among goods **[21] [22]**. The 'demograpic scaling' method was used to take into account in this study. It reffered to **[23]**. In this approach, the effects of a change on the demographics are closed to the effect of the price changing of animal products [11].

Considering z as a vector of S household characteristics z is a scalar representing the household size in the simplest case. Let $\boldsymbol{e^R(p,u)}$ represent the expenditure function of a refference household with just single adult. For each household, Roy's method uses an expenditure function of household characteristics, without controlling for any changes in consumption patterns. The second term control for a change in relative prices and actual goods consumed.

Following Roy (1983), QUAIDS parameterized $\boldsymbol{\overline{m_o}(z)}$ as $\boldsymbol{\overline{m_o}(z) = 1 + \rho z}$ (6)

Where $\boldsymbol{\rho}$ is a vector of parameters to be estimated. The expenditure share expenditure equation takes the following form:

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$$w_i = \alpha_i + \sum_{j=1}^{K} \gamma_{ij} \ln p_j + (\beta_i + \eta_i z) \ln\left\{\frac{m}{\overline{m_o}(z)\alpha(p)}\right\} + \frac{\lambda_i}{b(p)c(p,z)}\left[\ln\left\{\frac{m}{\overline{m_o}(z)\alpha(p)}\right\}\right]^2 \quad (7)$$

Where $c(p,z) = \prod_{j=1}^{K} \rho_j^{n_{iz}}$ (8)

The adding-up condition requires that $\sum_{j=1}^{K} \eta_{rj} = 0$ for $r = 1, \ldots, s$. (9)

The uncompensated (Marshallian) price elasticity for the animal product group i with respect to changes in the price of animal product group good j is:

$$\varepsilon_{ij} = -\delta_{ij} + \frac{1}{w_i}\left(\gamma_{ij}\left[\beta_i + \eta_i z + \frac{2\lambda_i}{b(p)c(p,z)} \ln\left\{\frac{m}{\overline{m_o}(z)\alpha(p)}\right\}\right] * \left(\alpha_j + \sum_1 \gamma_{ij} \ln p_j\right) - \frac{(\beta_i + \eta_i z)\lambda_i}{b(p)c(p,z)}\left[\ln\left\{\frac{m}{\overline{m_o}(z)\alpha(p)}\right\}\right]^2\right) \quad (10)$$

The expenditure (income) elasticity for the animal product group i is:

$$\mu_i = 1 + \frac{1}{w_i}\left[\beta_i + \eta_i z + \frac{2\lambda_i}{b(p)c(p,z)} \ln\left\{\frac{m}{\overline{m_o}(z)\alpha(p)}\right\}\right] \quad (11)$$

The compesated (Hicksian) price elasticity are derived from the Slutsky equation:

$$\varepsilon_{ij}^{c} = \varepsilon_{ij} + \mu_i w_j \quad (12)$$

All the lowercase greek letters other than α_0 are the parameters to be estimated. Two demographic variable were finally used in this study, namely area (urban and rural), and household size (HH size). The parameters are estimated by iterated feasible generalized non-linier least which are equivalent to the multivariate normal maximum likelihood estimator for this class of problem via Stata's 'NLSUR' command as sugested by **[23]**.

2.2. Data

The data used in this research is secondary data of Susenas (Survai Sosial Ekonomi Nasional/National Socio-economics Survey) data (March 2016). The data analyzed were socio-demographic data (household residence status, total household member (HHsize), household consumption and expenditure, and total expenditure. The animal foods observed in this study were eggs (chicken eggs, local chicken eggs, and duck eggs), chicken (local chicken meat and chicken meat), beef, fish (fresh fish and shrimp including fish, shrimp, squid, and shellfish) as well as milk (milk powder and infant milk). The sample of this research is 4,811 households.

3. Results and Discussion

3.1. Factors affecting animal food demand

The results of the QUAIDS analysis show that prices, income, the square of income and demographic factors ie, the number of household members are almost all significant at alpha 1% to 5% (Table 1). It can be interpreted that all of these variables affect the demand for animal food. The model has also met the restrictions as in the AIDS demand system that is adding up, homogeneity and symmetry. Income squared variable is very significant at alpha 1%. This means that the square of income is very influential in animal food demand. The QUAIDS coefficient indicates whether animal foods are normal items that tend to be luxury, or luxury items tend to be normal [16]. The results of data analysis show that eggs are normal items that tend to be luxurious, indicated by positive signs on the income variable and the square of income. Whereas chicken, beef, fresh fish, and milk powder are luxury goods, indicated by the sign of the coefficient of the negative income. Variable demography is also very significant for animal food demand [24].

3.2. Marshallian (uncompensated) own and cross-price elasticities

The key determinants of the price elasticity of demand are a follows: availability of close substitutes, passage of time, luxurious versus necesseties, definition of market, and share of the good in the consumer's budget [25]. Table 2 shows the Marshallian own and cross-price elasticities. Marshallian own-price elasticity was negative. This is consistent with the economic theory that rising prices decrease demand. In Maluku, beef is the most elastic compared to other animal foods. Marshallian price elasticity of beef is 4,417%, followed by fish (2,573%), chicken meat (2,271%), milk (1,258%) and eggs (0.816%). Highly elastic beef is shown by the price elasticity of more than one [12] [6] [23]. In urban

ISBN : 978-602-14917-9-9

Maluku, beef is more elastic (5,747%) compared to in rural areas (3,829%). This is consistent with research [24] in Kenya, that urban households tend to be consumers, while in rural areas as well as consumers as well as producers so that urban households are more sensitive to price changes. However, it is different from chicken meat; in rural households, it is more elastic (3.103%) compared to urban areas (1,707%). This might be because households in rural areas prefer chicken meat because the price is lower, whereas in urban households prefer beef.

Table 1. QUAIDS Parameter estimates of animal food demand

Parameter (Coefficient and SEM)	Eggs (1)	Chicken (2)	Beef (3)	Fresh fish (4)	Milk powder (5)
Constant	-0,069	0,631*	0,195**	0,126**	0,1179**
α	(0,085)	(0,067)	(0,037)	(0,023)	(0,0401)
Income	0,2476*	-0,0547**	-0,0298***	-0,0052***	-0,1579***
β	(0,0642)	(0,0464)	(0,0127)	(0,0065)	(0,0151)
Price	0,2255**	-0,1841**	-0,0102***	0,0239***	-0,0550***
γ_1	(0,0448)	(0,0367)	(0,0122)	(0,0071)	(0,0116)
	-0,1841**	0,1267**	0,0048***	0,0069***	0,0456***
γ_2	(0,0367)	(0,0339)	(0,0114)	(0,0066)	(0,0114)
	-0,0102***	0,0048***	-0,0272***	-0,0092***	0,0417***
γ_3	(0,0122)	(0,0114)	(0,0135)	(0,0057)	(0,0084)
	0,0239***	0,0069***	-0,0092***	-0,0151***	0,0051***
γ_4	(0,0071)	(0,0066)	(0,0057)	(-0,0067)	(0,0055)
	-0,0550***	0,0456***	0,0417***	0,0051***	-0,0257***
γ_5	(0,0116)	(0,0114)	(0,0084)	(0,0055)	(0,0131)
Income-squared	0,0129***	-0,0034***	-0,0016***	-0,0003***	-0,0077***
λ	(0,0007)	(0,0011)	(0,0005)	(0,0003)	(0,0007)
Demography	-0,0020***	0,0018***	0,0004***	0,00001***	-0,0002***
η_hhm_tot	(0,0006)	(0,0004)	(0,0002)	(0,0001)	(0,0004)
Demography	0,00006***	0,00006***	0,00006***	0,00006***	0,00006***
	(0,00003)	(0,00003)	(0,00003)	(0,00003)	(0,00003)

Source: March 2016 Susenas, standart errors in parentheses (* p<0.1, ** p<0.05, *** p<0.01)

Table 2 also shows cross-price elasticity, indicate the relationship between animal food, whether substitution or complementary. If positive, means that there is a substitution relationship between animal food. Conversely, if negative, means there is a complementary relationship between animal food [26][27]. In Maluku, both in urban and rural areas, cross-price elasticity is mostly positive. This means, in general, there is a substitution relationship between animal foods, only eggs are complementary [28]. In other words, households in Maluku consume animal food as limited to one kind of group, and only eggs are consumed in together with others animal food. A 1% increase in chicken meat prices increases fresh fish demand by 71%. This means that households in Maluku consume fresh fish when there is an increase in the price of chicken meat. In urban areas, there was an increase in fresh fish consumption by 102% and in rural areas by 55% when there was an increase in the price of chicken meat. The 1% increase in beef prices was followed by an increase in fish consumption (36%), chicken meat (7.3%), eggs (1.4%) and milk powder (0.3%). It can be concluded that the preference of households in Maluku when there is an increase in beef is to susbtitute to the consumption of fresh fish, chicken, eggs, or milk

ISBN : 978-602-14917-9-9

powder. Based on urban or rural areas, the elasticity of cross-prices of animal food in urban households is greater than that in rural areas. It can be interpreted that changes in animal food consumption as a result of price increases, in rural areas, are lower than in urban households [29][30].

Table 2. Marshallian own and cross-price elasticities: urban-rural-all HH

Animal food group	Eggs	Chicken	Beef	Fresh Fish	Milk powder
			All HH		
Eggs	-0.816	0.142	0.014	0.047	0.051
	(0.003)	(0.003)	(0.001)	(0.002)	(0.002)
Chicken	-0.438	-2.271	0.073	0.192	0.166
	(0.017)	(0.021)	(0.008)	(0.009)	(0.013)
Beef	-1.330	0.575	-4.417	1.293	-0.050
	(0.099)	(0.103)	(0.113)	(0.070)	(0.091)
Fresh fish	-0.267	0.713	0.357	-2.573	0.019
	(0.025)	(0.027)	(0.017)	(0.023)	(0.022)
Milk powder	-0.251	0.070	0.003	-0.020	-1.258
	(0.007)	(0.007)	(0.004)	(0.004)	(0.008)
			Urban		
Eggs	-0.766	0.103	0.032	0.041	0.066
	(0.004)	(0.004)	(0.002)	(0.002)	(0.002)
Chicken	-0.464	-1.707	0.034	0.177	0.160
	(0.014)	(0.019)	(0.007)	(0.007)	(0.009)
Beef	-0.983	0.187	-5.747	1.687	-0.660
	(0.133)	(0.143)	(0.147)	(0.092)	(0.115)
Fresh fish	-0.420	1.023	0.461	-3.010	0.061
	(0.033)	(0.035)	(0.022)	(0.029)	(0.028)
Milk powder	-0.175	0.060	-0.014	-0.011	-1.228
	(0.005)	(0.005)	(0.003)	(0.003)	(0.006)
			Rural		
Eggs	-0.846	0.162	0.004	0.049	0.042
	(0.003)	(0.003)	(0.001)	(0.001)	(0.002)
Chicken	-0.427	-3.103	0.145	0.219	0.210
	(0.026)	(0.032)	(0.012)	(0.012)	(0.018)
Beef	-1.440	0.842	-3.829	1.114	0.131
	(0.086)	(0.089)	(0.095)	(0.059)	(0.079)
Fresh fish	-0.195	0.553	0.307	-2.345	0.006
	(0.022)	(0.022)	(0.014)	(0.019)	(0.019)
Milk powder	-0.344	0.094	0.016	-0.029	-1.311
	(0.009)	(0.010)	(0.006)	(0.005)	(0.010)

Source: March 2016 Susenas, standart errors of means in parentheses

3.3. Hicksian own and cross-price elasticities

ISBN : 978-602-14917-9-9

Hicksian (compensated) price elasticity is price elasticity when there is only the effect of price changes. Table 3 presents the elasticity of Hicksian prices both own and cross. In Maluku, the price elasticity of Hicksian beef is the most elastic compared to other animal foods, with a price elasticity of 4,382%, followed by fish, chicken, milk, and eggs respectively 2.507%, 2.024%, 0.969%, and 0.452 %.

Table 3. Hickisan own and cross-price elasticities: urban-rural-all HH

Animal food	Eggs	Chicken	Beef	Fresh fish	Milk powder
			All HH		
Eggs	-0.452	0.203	0.019	0.068	0.162
	(0.003)	(0.003)	(0.001)	(0.002)	(0.002)
Chicken	1.036	-2.024	0.094	0.277	0.617
	(0.018)	(0.021)	(0.008)	(0.009)	(0.013)
Beef	1.213	1.000	-4.382	1.440	0.728
	(0.097)	(0.104)	(0.112)	(0.070)	(0.091)
Fresh fish	0.867	0.902	0.372	-2.507	0.365
	(0.024)	(0.027)	(0.017)	(0.023)	(0.022)
Milk powder	0.692	0.227	0.016	0.034	-0.970
	(0.006)	(0.007)	(0.004)	(0.004)	(0.008)
			Urban		
Eggs	-0.471	0.180	0.035	0.057	0.200
	(0.004)	(0.004)	(0.002)	(0.002)	(0.002)
Chicken	0.549	-1.443	0.047	0.229	0.618
	(0.015)	(0.019)	(0.007)	(0.007)	(0.009)
Beef	2.122	0.997	-5.709	1.847	0.744
	(0.132)	(0.143)	(0.147)	(0.092)	(0.115)
Fresh fish	0.641	1.300	0.474	-2.956	0.541
	(0.032)	(0.036)	(0.022)	(0.029)	(0.028)
Milk powder	0.595	0.261	-0.005	0.028	-0.879
	(0.005)	(0.005)	(0.003)	(0.003)	(0.006)
			Rural		
Eggs	-0.426	0.208	0.011	0.075	0.132
	(0.003)	(0.003)	(0.001)	(0.001)	(0.002)
Chicken	1.683	-2.873	0.177	0.349	0.663
	(0.028)	(0.032)	(0.012)	(0.012)	(0.018)
Beef	0.832	1.089	-3.795	1.254	0.619
	(0.087)	(0.089)	(0.095)	(0.059)	(0.078)
Fresh fish	1.000	0.683	0.325	-2.271	0.263
	(0.021)	(0.023)	(0.014)	(0.019)	(0.019)
Milk powder	0.780	0.216	0.033	0.041	-1.070
	(0.009)	(0.010)	(0.006)	(0.005)	(0.010)

Source: March 2016 Susenas, standart errors of means in parentheses

ISBN : 978-602-14917-9-9

In urban areas, the price elasticity of Hicksian fish and eggs is more sensitive than in rural areas, while chicken meat and milk are more sensitive in rural areas than in urban areas. It can be interpreted that when prices increase, urban households are more responsive to fish and egg commodities, while in rural areas, more responses to fish and milk commodities. In urban areas, animal foods most sensitive to price changes are beef, followed by fish, chicken, milk, and eggs with a demand elasticity of 5.709%, 2.956%, 1.443%, 0.879%, and 0.471%. Whereas in rural areas, the most elastic demand elasticity is beef, followed by chicken, fish, milk, and eggs with demand elasticity of 3,795%, 2,873%, 2,271%, 1,069%, and 0.425%. All positive income elasticities mean an increase in income increases the consumption of animal protein source food. Alternatively, in other words, Maluku people both in urban and rural areas increase the consumption of animal protein when income increases.

All Hicksian cross-price elasticities are positive in Maluku both in urban and rural areas. Can be interpreted that among animal foods are a substitution, or in other words, an increase in animal food prices increase demand for other animal foods. In Maluku province, beef is the most elastic. The 1% increase in beef prices increased consumption of fresh fish, chicken, eggs or fresh milk by 37.24%, 9.36%, 1.91%, and 1.58%, respectively. The increase in beef prices has resulted in households changing their consumption of beef with fresh fish. The household preferences for sequential animal food as follows starts from the most elastic animal food, followed by fresh fish, chicken, eggs and milk powder.

3.4. Expenditure elasticity

Income is an important factor in the demand for goods and services. Table 4 shows the income elasticity of eggs, chicken meat, beef, fresh fish, and milk by region type and by the number of household members. All income elasticities are positive, and it can be interpreted that an increase in income increases the demand for animal food. Animal food is far more elastic in urban areas compared to rural areas. In other words, the elasticity of animal food income in urban areas is higher than in rural areas. This means that with an increase in income, urban households consume more animal food than in rural areas.

Table 4. Expenditure elasticity

Animal food group	Eggs	Chicken	Beef	Fresh fish	Milk powder
Maluku	0.563	2.278	3.928	1.752	1.456
	(0.001)	(0.007)	(0.032)	(0.008)	(0.002)
Urban	0.524	1.801	5.516	1.884	1.368
	(0.013)	(0.005)	(0.038)	(0.011)	(0.002)
Rural	0.589	2.957	3.181	1.674	1.574
	(0.001)	(0.011)	(0.029)	(0.008)	(0.003)
<=2 people	0.618	2.893	9.249	1.605	1.803
	(0.005)	(0.012)	(0.114)	(0.007)	(0.004)
3-4 people	0.562	2.048	3.163	1.879	1.488
	(0.012)	(0.006)	(0.021)	(0.014)	(0.002)
>=5 people	0.545	2.372	4.324	1.722	1.391
	(0.006)	(0.008)	(0.035)	(0.008)	(0.002)

Source: March 2016 Susenas, standart errors of means in parentheses

Eggs are inelastic with income elasticity almost the same in all regions in Maluku. The results of the analysis show that eggs are a normal item and are a basic need of the people of Maluku. Chicken, beef, sega fish, and milk powder are luxury goods. Nationally and by region type, beef is the most elastic with the highest income elasticity of 3.93% in Maluku province, in urban areas at 5,516% and in rural

ISBN : 978-602-14917-9-9

areas at 3,181%, followed by chicken (2.28%), fresh fish (1.75%) and milk powder (1.46%) in Maluku. There is an interesting finding that chicken meat and milk powder in urban areas are more elastic than in rural areas. However, unlike in rural areas, beef and fresh fish are more elastic. It can be assumed that Maluku urban households prefer beef and milk, whereas households in rural Maluku prefer chicken and fresh fish [8].

The number of household members (HHsize) also influences animal protein food consumption. Eggs are also inelastic in all groups of household members, the highest egg income elasticity in households with 1 to 2 people. Only egg commodities are normal goods and become necessity household needs in all groups of household members. The findings are very different is in beef in HH size 1 to 2 people, the highest elasticity reaches 9.25%, meaning that this group of households increases meat consumption the highest beef if there is an increase in income. Chicken meat is the number two commodity consumed after beef, then fresh fish and milk powder. Chicken meat elasticity is also high, at 2.89% in HHsize of 1 to 2 people. It can be concluded that small households consume more animal food when compared to large HHsize.

4. Conclusion

This paper focuses on analyzing the impact of changes in prices, incomes, and demographic factors on animal food demand in Maluku, both urban and rural, using the QUAIDS model with parameter estimation using Iterated non-linear SUR. The research data used BPS data in the form of 2016 Susenas data of 4,811 households. The results showed that in Maluku, the most elastic Marshallian own-price elasticity was beef, followed by fresh fish, chicken, milk powder, and eggs. By region, beef is very elastic, reaching 5,747% in urban areas and 3,829% in rural areas. Likewise, fresh fish is also more elastic in urban areas, which is 3.010% and 2,345% in rural areas. Whereas chicken meat, milk powder, and eggs are more elastic in rural areas compared to urban areas with elasticities of 3,103%, 1,311% and 0.846% in rural areas, and 1,707%, 1,227% and 0.766% in rural areas. Hicksian own price elasticity, beef is also the most elastic, which is 4,382%, then fresh fish (2,507%), chicken meat (2,024%), milk powder (0.969%), and eggs (0.452%). Beef (5,709%) and fresh fish (2,956%) are more elastic in urban areas compared to rural areas, namely 3,794% (beef) and 2,271% (fresh fish). Animal food in Maluku is a substitution, both in urban and rural areas. Pricing policies are more effective in urban areas, whereas income policies are more effective in rural areas.

5. Acknowledgment

Acknowledgment is submitted to the Ministry of Research, Technology and Higher Education for the funds through the Doctoral Program of Doctoral Dissertation 2018.

References

[1] M. Ariani, "Analisis konsumsi pangan tingkat masyarakat mendukung pencapaian diversifikasi pangan," *Gizi Indones.*, vol. **33**, no. 1, 2010.

[2] K. W. Robert, T. M. Parris, and A. A. Leiserowitz, "What is sustainable development? Goals, indicators, values, and practice," *Environ. Sci. Policy Sustain. Dev.*, vol. **47**, no. 3, pp. 8–21, 2005.

[3] T. Andreyeva, M. W. Long, and K. D. Brownell, "The impact of food prices on consumption: a systematic review of research on the price elasticity of demand for food," *Am. J. Public Health*, vol. **100**, no. 2, pp. 216–222, 2010.

[4] A. Cupák, J. Pokrivčák, and M. Rizov, "Food demand and consumption patterns in the new EU member states: The case of Slovakia," *Ekon. Časopis*, vol. **63,** no. 4, pp. 339–358, 2015.

[5] M. Shibia, S. Rahman, and B. Chidmi, "Consumer demand for meat in Kenya: an examination of the linear approximate almost ideal demand system," *Available Online Updat. Httpageconsearch Umn Edu*, 2017.

[6] M. Motallebi and D. L. Pendell, "Estimating an Almost Ideal Demand System Model for Meats in Iran," in *2013 Annual Meeting, August 4-6, 2013, Washington, DC*, 2013.

[7] L. Vu and P. Glewwe, "Impacts of rising food prices on poverty and welfare in Vietnam," *J. Agric. Resour. Econ.*, pp. 14–27, 2011.

[8] S. A. Kaliji, S. M. Mojaverian, H. Amirnejad, and M. Canavari, "Factors Affecting Consumers' Dairy Products Preferences," *AGRIS -Line Pap. Econ. Inform.*, vol. **11**, no. 2, pp. 3–11, 2019.

ISBN : 978-602-14917-9-9

[9] P. Kumar, A. Kumar, S. Parappurathu, and S. S. Raju, "Estimation of demand elasticity for food commodities in India.," *Agric. Econ. Res. Rev.*, vol. **24**, no. 1, 2011.
[10] P. Kumar, M. M. Dey, and F. J. Paraguas, "Demand for fish by species in India: Three-stage budgeting framework," *Agric. Econ. Res. Rev.*, vol. 18, no. **2**, pp. 167–186, 2005.
[11] A. Elijah Obayelu, V. O. Okoruwa, and O. I. Y. Ajani, "Cross-sectional analysis of food demand in the North Central, Nigeria: The quadratic almost ideal demand system (QUAIDS) approach," *China Agric. Econ. Rev.*, vol. **1,** no. 2, pp. 173–193, 2009.
[12] O. Sola, "Demand for food in Ondo state, Nigeria: using quadratic almost ideal demand system," *J. Bus. Manag. Econ.*, vol. 4, no. **1,** pp. 1–19, 2013.
[13] Y. Alem and G. Köhlin, "The impact of food price inflation on subjective well-being: Evidence from urban Ethiopia," *Soc. Indic. Res.*, vol. **116**, no. 3, pp. 853–868, 2014.
[14] A. Z. Bharumshah and Z. A. Mohamed, "Demand for Meat in Malaysia: An Application of the Almost Ideal Demand System Analysis," *Pertanika J. Soc. Sci. Humanit.*, vol. **1,** pp. 91–99, 1993.
[15] H. K. Bett, M. P. Musyoka, K. J. Peters, and W. Bokelmann, "Demand for meat in the rural and urban areas of Kenya: a focus on the indigenous chicken," *Econ. Res. Int.*, vol. **20,** 2012.
[16] L. Korir, M. Rizov, and E. Ruto, "Analysis of household food demand and its implications on food security in Kenya: an application of QUAIDS model," in *92nd Annual Conference, April 16-18, 2018, Warwick University, Coventry, UK*, 2018.
[17] E. H. Pangaribowo, "Food Demand Analysis of Indonesian Households: Do They Eat Better or SmoNe When They Get Richer," in *International Conference on Eurasian Economies*, 2010.
[18] A. Zellner, "An efficient method of estimating seemingly unrelated regressions and tests for aggregation bias," *J. Am. Stat. Assoc.*, vol. **57,** no. 298, pp. 348–368, 1962.
[19] A. Deaton and J. Muellbauer, "An almost ideal demand system," *Am. Econ. Rev.*, vol. **70,** no. **3**, pp. 312–326, 1980.
[20] J. Banks, R. Blundell, and A. Lewbel, "Quadratic Engel curves and consumer demand," *Rev. Econ. Stat.*, vol. **79**, no. 4, pp. 527–539, 1997.
[21] M. A. Alboghdady and M. K. Alashry, "The demand for meat in Egypt: An almost ideal estimation," *Afr. J. Agric. Resour. Econ.*, vol. **4,** no. 1, pp. 70–81, 2010.
[22] N. U. Tefera, M. D. Desta, and S. Rashid, "A Dynamic analysis of food demand patterns and habit effects: panel evidence from rural households in Ethiopia," *J Agr Econ Open Access*, vol. **1**, no. 1, pp. 1–13, 2018.
[23] B. P. Poi, "Easy demand-system estimation with quaids," *Stata J.*, vol. **12**, no. 3, p. 433, 2012.
[24] L. Bopape and R. Myers, "Analysis of household demand for food in South Africa: Model selection, expenditure endogeneity, and the influence of socio-demographic effects," in *African econometrics society annual conference", Cape Town, South Africa*, 2007.
[25] G. Hubbard, A. Garnett, P. Lewis, and T. O'Brien, *Microeconomics. Frenchs Forest*. NSW: Pearson Education, 2009.
[26] Z. ul Haq, H. Nazli, and K. Meilke, "Implications of high food prices for poverty in Pakistan," *Agric. Econ.*, vol. **39**, pp. 477–484, 2008.
[27] N. Khoiriyah, R. Anindita, N. Hanani, and A. W. Muhaimin, "Analisis Permintaan Pangan Hewani Rumah Tangga Perkotaan Indonesia" Sebuah Pendekatan Quadratic Almost Ideal Demand System (QUAIDS)," in *Prosiding Seminar Nasional dan Internasional*, 2018, pp. 155–163.
[28] M. Z. Dhraief, M. Oueslati, and B. Dhehibi, "Income, education and age effects on meat and fish demand in Tunisia," *Int. J. Food Agric. Econ. IJFAEC*, vol. **1**, no. 1128-2016–92009, p. 1, 2013.
[29] C. O. A. Ugwumba and J. A. L. Effiong, "Analysis of Household Demand for Beef in Owerri Metropolis of Imo State, Nigeria," *J. Chem. Biol. Phys. Sci. JCBPS*, vol. **3**, no. 2, p. 1201, 2013.
[30] A. M. Al-Shuaibi, "An Economic Study of the Demand for Red meat in the Kingdom of Saudi Arabia using almost Ideal demand system," *Trends Agric. Econ.*, vol. **4**, no. 1, pp. 30–40, 2011.