

Effect of Volatile Foods Deflation on Foods Consumption Patterns and Welfare in South Kalimantan: LA / AIDS application on SUSENAS-based data March 2015 and March 2017

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Abstract: The movement of commodity prices at the consumer level is known as inflation. Inflation means an increase in prices, whereas deflation means a decline in prices. In 2016, South Kalimantan experienced very low inflation, even the lowest since last four years. The low inflation of South Kalimantan is contributed by very low inflation and even deflation in volatile foods. Low inflation according to opinion in the community usually increases utility or welfare. But on the other hand low inflation can also represent a declining public purchasing power.

There is an element of uncertainty in the welfare condition as a result of the volatile foods deflation. To unravel the uncertainty, we need a research that can answer whether there is welfare loss or welfare gain after deflation of volatile foods. The analytical method used is Compensating Variation (CV) measure derived from the Linear Approximately Almost Ideal Demand System (LA/AIDS) model. The data used are National Socio-Economic Survey (Susenas) of South Kalimantan period March 2015 and March 2017.

The results obtained indicate that there is a decrease in the welfare level around Rp169,539 after the deflation of volatile foods in 2016. The findings of this study concluded that is not the lowest inflation that can improve the welfare of society, but the inflation is under control.

Date of Submission: 22-08-2018

Date of acceptance: 04-09-2018

I. Introduction

The year 2016 is a year of recovery for South Kalimantan Province. From the economic side, South Kalimantan is slowing down from 2012 to 2015. The year of 2016 records South Kalimantan breaks the chain of slowdown after reaching its lowest point in 2015. Until the end of 2017, South Kalimantan Province is cumulatively able to generate 5.29 percent economic growth. This performance improvement can not be separated from changes in coal prices in the global market. South Kalimantan's economy is dominantly contributed by mining sector, therefore its economic is not immune from global change.

Another macroeconomic indicator that can be used to evaluate the current state of the economy is inflation. Inflation is an indicator of price headway of goods and services consumed by the community. South Kalimantan inflation in 2016 is relatively low compared to previous years. The province of South Kalimantan recorded inflation in 2016 was 3.57 percent.

The Central Bureau of Statistics divides inflation based on its component group. Inflation commodity groups are the core inflation, the administered price component, and the volatile goods component. Volatile goods component consists of food commodities so often called volatile foods component. The relatively low inflation in 2016 was triggered by the low inflation of almost all volatile foods commodities, even in some of the existing commodities that experienced deflation. The Governor of Central Bank of Indonesia acknowledged the weakening of public purchasing power to be one of the factors that weakened inflationary pressures. However, better price control by the government contributes to reducing inflation. Low price trends or even deflation can be good news and vice versa. Based on the above background it can be said that there has been a change in general economic conditions that contain elements of uncertainty: whether the deflation effects improve the welfare of society or vice versa. One method that can be used to measure the level of welfare that is Compensating Variation (Chipman and Moore, 1992). Compensating Variation (CV) is the amount of money needed to bring consumers to the level of satisfaction (utility) or the level of initial welfare with a new price. From the value of CV can be seen whether there is welfare loss or welfare gain.

Table 1. Inflation Headway of Some Commodities in South Kalimantan (2013-2017)

Group/Sub group	Inflation				
	2013	2014	2015	2016	2017
General	6.98	7.28	5.14	3.57	3.73
Cereals/ Grains	9.87	14.32	5.88	-0.55	0.11
Meats and its products	-1.56	7.4	10.5	1.45	4.14
Fresh fish	12.18	14.23	-1.0	0.67	4.04
Fish preserved	7.73	14.71	9.09	3.94	3.00
Eggs, milk, and the results	6.34	9.34	6.65	-0.49	6.95
Vegetables	20.3	0.89	11.02	-6.29	4.69
Nuts	6.17	-2.14	4.55	-5.51	4.50

Source :BPS-Statistic, 2017

A macro inflation and welfare assessment that is represented by economic growth or Gross Regional Domestic Product (GRDP) has also been widely implemented. Some researchers conclude there is a negative relationship between inflation and economic growth such as Jung and Marshall (1986) and Smyth (1992). Other researchers found a positive reverse relationship as concluded by Liwan and Lau (2007). Therefore, it is necessary to do research that has several objectives:

1. To analyze the food consumption pattern of the people of South Kalimantan (2017) that accommodate the occurrence of volatile foods deflation and before experiencing deflation of volatile foods (2015).
2. To analyze the impact of the occurrence of volatile foods deflation by paying attention to the direction or sign of the value of Compensating Variation.

II. Material And Methods

This research uses secondary data, that is National Socio-Economic Survey (Susenas) Data Consumption March 2015 and March 2017 for South Kalimantan collected by BPS, and South Kalimantan inflation series data. Susenas Data Consumption module is cross section data with sampling of household unit and number of household sample as many as 7,520 households. The 7,520 households were obtained from 752 census blocks. In each census block, 10 stratified sampling samples were taken.

Data analysis methods used to answer the first and second objectives of Linear Approximately/ Almost Ideal Demand System with Stata/SE 11.0 and the results used to calculate Compensating Variation (CV). This model is known as the LA/AIDS model formulated as follows (Deaton, 1980):

$$w_i = a_0 + \sum_j \gamma_{ij} \ln P_j + \beta_i \ln \frac{y}{P} + u_i \dots \dots \dots (1)$$

where

- i, j : 1,2,3,4,5,6 (commodity group)
- w_i : expenditure proportion of ith group commodity to total food household
- ln P_j : natural logarithmic of ith group commodity
- ln(y/P) : ln total household food expenditure deflated by price stone index
- P : price stone index, with ln P = Σ w_i ln p_i

The LA / AIDS model is semilogous so that the households that can be analyzed are households that consume the type of food analyzed or no zero in each food group being analyzed. Therefore, aggregation or merging of food commodities into larger groups so that the number of eligible data to be analyzed becomes more. So far there are no standard that can be used in determining the number of commodity groups that can be formed or the composition of commodity types that can be grouped into one group for the purposes of the analysis. The formation of commodity groups by researchers is usually based on previous research, study needs, local food, nutritional content of food, policy goals, and other considerations (Moeis, 2003).

In this research, food groups were formed based on food commodity groups experiencing deflation and inflation. The six food groups analyzed are as follows:

1. Group of rice and tubers.
2. Group of eggs, milk, and the results.
3. Group of vegetables, nuts, fruits, spices, fats and oils.
4. Group of fish and meat.
5. Group of finished foods and drinks.
6. Group of beverage ingredients, cigarettes, and others

The food groups of one to four are food groups belonging to the volatile foods category in the calculation of inflation. Volatile foods commodities are commodities whose price movements are dominantly affected by shocks in food stuffs such as crops, natural disturbances, or domestic food commodity price growth factors and international food commodity price headway. Price changes are assumed to be faster (usually weekly) than other commodities incorporated in core and administered inflation commodities.

Based on the parameters generated by the AIDS model, it can be calculated the own price elasticity, cross price elasticity, and income elasticity. The formula for the elasticity of income/expenditure (e_i), own-price elasticity (ϵ_{ii}) and cross price-elasticity (ϵ_{ij}) Marshallian (uncompensated) and compensated (ϵ_{ij}^*) price elasticity as defined by Alston (1990):

$$\epsilon_{ii} = -(1 + \beta_i) + \gamma_{ij} / w_i \dots\dots\dots(2)$$

$$\epsilon_{ij} = \gamma_{ij} / w_i - \beta_i \left(\frac{w_j}{w_i} \right) \dots\dots\dots(3)$$

$$\epsilon_{ij}^* = \epsilon_{ij} w_j e_i \dots\dots\dots(4)$$

and e_i defined by

$$e_i = 1 + \beta_i / w_i \dots\dots\dots(5)$$

The elasticity of the food group demand for the total food expenditure obtained from the LA / AIDS model above is the demand elasticity of each food group for the total food expenditure, not the total household expenditure. To obtain the magnitude of the elasticity of each food group's demand for total household expenditure (as a proxy for household income), the total elasticity of food expenditure from the calculation by the LA/AIDS model is multiplied by the total elasticity of food expenditure on total household expenditure. This total elasticity is required for compensating variation calculations. The total elasticity of food expenditure on total household expenditure (household income) is assumed by the linear logarithm model as follows:

$$\ln y_{food} = a + b \ln y_{total} + u_i \dots\dots\dots(6)$$

$$e_p = \frac{d \ln y_{food}}{d \ln y_{total}} = b \dots\dots\dots(7)$$

where:

y_{food} : total food expenditure household for a month

y_{total} : total household expenditure a month

The elasticity of the particular food group's demand for total household expenditure or income elasticity is calculated based on the following formula:

$$e_{il} = e_i \times e_p \dots\dots\dots(8)$$

where:

e_{il} : elasticity of group demand food i to income/ total household expenditure

e_i : elasticity of group demand food to total food expenditure (LA / AIDS model analysis results)

e_p : the total elasticity of food expenditure of total expenditure household

$$\Delta \ln e = \sum_i w_i \Delta \ln P_i + \frac{1}{2} \sum_j \sum_j w_j \epsilon_{ij}^* \Delta \ln P_i \Delta \ln P_j \dots\dots\dots(9)$$

where:

w_i : average of budget share proportion in i^{th} group commodities in beginning period or before deflation (March 2015)

$\Delta \ln P_i$: average proportional change price of commodity group i

$\Delta \ln P_j$: average proportional change commodity group price j

ϵ_{ij}^* : compensated price elasticity commodity group i

Associated with Compensating Variation (CV), CV can be a positive value can also be negative. A positive CV means a decrease in welfare and vice versa if a negative value means an increase in welfare. (Huffman, K. Sonya and S.R, 2000). The calculation using the formula above will produce the CV value as the proportion or percentage of the total initial expenditure, in this case is the total expenditure before the deflation of volatile foods that is 2015. To get the value of rupiah from CV, this proportion is multiplied by the average value of total household expenditure in 2015.

III. Result and Discussion

Budget Share

Table 2 shows the value of budget share for each commodity group by 2015 and 2017. By 2015, the largest proportion of South Kalimantan is in the food group (w_5) and the smallest proportion is in the egg and milk group (w_2). Food consumption in 2017 still has the same pattern as 2015. An interesting pattern to observe is that there is a decrease in the average budget share of each food group, except the finished food group (w_5) from 2015 to 2017 which has increased portion. By 2015 the proportion of expenditures for the grain group

reaches nearly 15%, then this proportion decreases in 2017 to less than 12%. Along with a reduction in the proportion of expenditure on grains, spending on commodities grouped 2 (eggs and milk), group 3 (vegetables, fruits, nuts, spices, fats and oils) and group 4 (fish and meat) also decreased. The egg and milk food group in 2015 got a proportion of 7.19% and then in 2017 decreased to less than 7% (6.05%). Food commodities belonging to group 3 (vegetables, fruits, nuts, spices, fats and oils) received a share of 16.44% by 2015 and by 2017 decreased to 14.75%. The commodity 4 group consisting of fish and meat also decreased from 14.75% in 2015 to 13.79% in 2017.

The biggest decline occurred in the grain group. The decrease in all food groups was accommodated in the finished food and beverage group (group 5). This is in line with the increasing budget share in the finished food and beverage group. By 2015 the contribution of food to reach about more than one quarter of South Kalimantan food expenditure (29.54%). Entering 2017 its contribution has increased to more than one third of South Kalimantan food expenditure (budget share of group 5 reaches 37.72%).

Table 2. Budget Share of Food Groups Commodities in 2015 and 2017 (Percent)

Budget Share	Year 2015	Year 2017	Changes
w ₁	14.64	11.44	-21.87
w ₂	7.19	6.05	-15.81
w ₃	16.44	14.75	-10.26
w ₄	14.75	13.79	-6.50
w ₅	29.54	37.72	27.70
w ₆	17.45	16.25	-6.86

Source: Susenas 2015 and 2017 (processed)

Note:

- w₁: Grain/cereal
- w₂: Egg and milk
- w₃: Vegetables, fruits, nuts, spices, fat and oil
- w₄: Fish and meat
- w₅: Finished food and beverage
- w₆: Beverage ingredients, cigarettes, and other consumption

When viewed from the data in Table 2, it is indicated that the people of South Kalimantan began shifting the consumption of raw food in the direction of the finished food. This indication is supported by the phenomenon that occurred in South Kalimantan since the beginning of 2017 which began to operate food delivery services (in the form of finished food) through android-based applications. The rise of interpersonal services is coloring South Kalimantan's economy since 2017. The increasing number of South Kalimantan residents working with relatively high education status has occurred. By 2015, the percentage of working population with senior high school education is 33.99%. This number rises again in 2017 to 35.08%. Lifestyle of educated people usually more interested in instant think, especially for food.

Estimation on Demand System

The demand system estimate in this research uses Seemingly Unrelated Regression (SUR). The SUR model facilitated by Stata ensures the fulfillment of the restrictions required on the LA / AIDS request system of adding-up, homogeneity and symmetry restrictions. The model formed in 2015 is as follows:

$$\begin{aligned}
 w_1 &= 0.4010 + 0.1122\ln P_1 - 0.01698\ln P_2 - 0.0275\ln P_3 - 0.0266\ln P_4 - 0.0401\ln P_5 - 0.0011\ln P_6 - 0.0627\ln Y_{perP} \\
 w_2 &= 0.1967 - 0.01698\ln P_1 + 0.0314\ln P_2 - 0.0072\ln P_3 - 0.0086\ln P_4 - 0.0042\ln P_5 + 0.0056\ln P_6 - 0.0205\ln Y_{perP} \\
 w_3 &= 0.3264 - 0.0275\ln P_1 - 0.00726\ln P_2 + 0.0496\ln P_3 - 0.0056\ln P_4 - 0.0320\ln P_5 + 0.0228\ln P_6 - 0.0287\ln Y_{perP} \\
 w_4 &= 0.2952 - 0.0266\ln P_1 - 0.0086\ln P_2 - 0.0056\ln P_3 + 0.0621\ln P_4 - 0.0232\ln P_5 + 0.0019\ln P_6 - 0.0494\ln Y_{perP} \\
 w_5 &= 0.3299 - 0.0401\ln P_1 - 0.0042\ln P_2 - 0.0320\ln P_3 - 0.0232\ln P_4 + 0.1018\ln P_5 - 0.0023\ln P_6 + 0.0079\ln Y_{perP} \\
 w_6 &= -0.5494 - 0.0011\ln P_1 + 0.0056\ln P_2 + 0.0228\ln P_3 + 0.0019\ln P_4 - 0.0023\ln P_5 - 0.0268\ln P_6 + 0.1535\ln Y_{perP}
 \end{aligned}$$

Model in the year 2017 is:

$$\begin{aligned}
 w_1 &= 0.2694 + 0.0850\ln P_1 - 0.0098\ln P_2 - 0.0150\ln P_3 - 0.0283\ln P_4 - 0.0481\ln P_5 + 0.0158\ln P_6 - 0.0106\ln Y_{perP} \\
 w_2 &= 0.1332 - 0.0098\ln P_1 + 0.0281\ln P_2 - 0.0046\ln P_3 - 0.0046\ln P_4 - 0.0065\ln P_5 - 0.0027\ln P_6 - 0.0051\ln Y_{perP} \\
 w_3 &= 0.4129 - 0.0150\ln P_1 - 0.0046\ln P_2 + 0.0352\ln P_3 - 0.0173\ln P_4 - 0.0246\ln P_5 + 0.0264\ln P_6 - 0.0190\ln Y_{perP} \\
 w_4 &= 0.2879 - 0.2833\ln P_1 - 0.0046\ln P_2 - 0.0173\ln P_3 + 0.0585\ln P_4 - 0.0215\ln P_5 + 0.0133\ln P_6 - 0.0166\ln Y_{perP} \\
 w_5 &= 0.1633 - 0.0481\ln P_1 - 0.0065\ln P_2 - 0.0246\ln P_3 - 0.0215\ln P_4 + 0.0947\ln P_5 + 0.0061\ln P_6 + 0.0238\ln Y_{perP} \\
 w_6 &= -0.2669 + 0.0158\ln P_1 - 0.0027\ln P_2 + 0.0263\ln P_3 + 0.0133\ln P_4 + 0.0061\ln P_5 - 0.0588\ln P_6 + 0.0275\ln Y_{perP}
 \end{aligned}$$

In general, price and income variables have a significant influence in determining the proportion of food group expenditure. To see the effect of price and earnings on demand, we recommend looking at the magnitude of demand elasticity.

Own Price Elasticity

In accordance with the law of the demand that if the price rises, the demand for the goods will decrease. The absolute value of price elasticity alone whose value is more than one indicates that the commodity price is elastic. If the price increases 1% then the demand for the commodity has decreased more than 1% (if its elasticity is more than one). This condition occurs in commodities belonging to group of 6 that is beverage ingredient, cigarette, and other food.

Cross Price Elasticity

Cross price elasticity can be seen in Table 3 other than the main diagonal. The relationship between food groups is either a substitute or complementary group of goods can be seen from the mark of elasticity (read by column). It is said to be a substitute if the value of elasticity is positive, and it is called complementary if the value of elasticity is negative (Nicholson, 1994).

By 2015, all goods groups from group 2 to group 6 are complementary items for grain and tuber groups. By 2017, the grain group has substitutes of goods in group 6. This is likely because the grains are replaced by one of the commodities found in group 6 of instant noodles.

The commodity group of eggs and milk by 2015 does not have substitutes. Goods in groups other than eggs and milk are the complement of this commodity group. A similar pattern occurs in 2017, there is no substitute for the egg and milk group. Fruits, vegetables, nuts, fats and oil (group 3) groups in 2015 do not have substitutes. Goods other than group 6 are complementary items for commodities of fruits, vegetables, beans, fats and oils by 2017. Goods in group 6 are substitutes for group 3 by 2017.

Groups of fish and meat commodities (group 4) by 2015 do not have substitutes. A similar pattern occurs in 2017, but group 6 turns into a substitute for fish and meat groups. In line with the findings of group 6, which are also substitutes of clusters 1 and 3, substitutes for group 4 are also group 6. This is possible because rice and its complement such as fish and vegetables, its function is replaced by instant noodles contained in group 6.

Table 3. Price Elasticity

Food Group	To Price					
	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
The year of 2015						
Group 1	-0.1707	-0.0852	-0.1176	-0.1183	-0.1472	0.0672
Group 2	-0.1945	-0.5419	-0.0540	-0.0779	0.0263	0.1275
Group 3	-0.1419	-0.0316	-0.6697	-0.0081	-0.1432	0.1691
Group 4	-0.1311	-0.0344	0.0173	-0.5297	-0.0585	0.0714
Group 5	-0.1396	-0.0160	-0.1128	-0.0825	-0.6632	-0.0125
Group 6	-0.1351	-0.0312	-0.0140	-0.1188	-0.2732	-1.3074
The year of 2017						
Group 1	-0.2420	-0.0801	-0.1176	-0.2348	-0.3859	0.1531
Group 2	-0.1523	-0.5288	-0.0628	-0.0645	-0.0752	-0.0314
Group 3	-0.0871	-0.0231	-0.7426	-0.0997	-0.1183	0.1996
Group 4	-0.1917	-0.0262	-0.1080	-0.5590	-0.1108	0.1158
Group 5	-0.1349	-0.0210	-0.0746	-0.0658	-0.7729	0.0060
Group 6	0.0778	-0.0271	0.1372	0.0584	-0.0262	-1.3894

Source: Susenas 2015 and 2017 (processed)

The group of finished food and beverage commodities (group 5) in 2015 has substitute goods that is eggs, milk, and the results. For 2017, there are no substitutes for food and beverage category. This is likely because in 2015 the contribution of expenditures on food and beverages will not be as high as in 2017, so the most expensive commodities to replace the function of food and beverages are eggs, milk and their products.

The group of commodities belonging to group of 6 by 2015 has four substitute goods groups namely group 1, group 2, group 3 and group 4. Besides it is complementary goods. By 2017 the substitutes are group 1, group 3, group 4, and group 5. Group 5 begins to emerge as a substitute item of group 6 is suspected because the cigarette which is one of the commodity components in group 6 still rises relatively high in 2017. While the finished food and drink group experienced a relatively small price increase even for beverages so instead experienced deflation.

Income Elasticity

The magnitude of the income elasticity referred to in this discussion is the income elasticity approximated by expenditure. The expenditure referred to in this case is the total expenditure of all consumption commodities, not just expenditures on food commodities. The total income elasticity is derived from equation (8). The result of income elasticity calculation using equation (8) can be seen in Table 4.

The economic theory of income elasticity described by Nicholson (1994) states that when a good has less than one income elasticity, it is a basic necessity. Conversely, if the value of elasticity is above one, then the goods are said to be luxury goods. The magnitude of elasticity as listed in Table 4 above has a positive value. This means that all commodity groups in this study classified as normal goods. In 2015, all categories of goods are basic goods except for commodity group 6. In 2017, goods classified as luxury goods are in group 6 (ingredients of beverages, cigarettes, and other consumption) and group 5 (processed food and beverages).

The magnitude of elasticity as listed in Table 4 above has a positive value. This means that all commodity groups in this study classified as normal goods. In 2015, all categories of goods are basic goods except for commodity group 6. In 2017, goods classified as luxury goods are in group 6 (ingredients of beverages, cigarettes, and other consumption) and group 5 (processed food and beverages).

Table 4. Income elasticity in 2015 and 2017

Year	2015	2017
Group 1	0.4721	0.8538
Group 2	0.5898	0.8611
Group 3	0.6814	0.8197
Group 4	0.5489	0.8279
Group 5	0.8475	1.0005
Group 6	1.5518	1.1004

Source: Data processed (2018)

The group of finished food and beverage commodities in 2017 earns the elasticity of income above 1, but the value is not too far from the number one. Nevertheless still categorized as luxury goods. The changing status of finished food and beverage goods from basic necessities to luxury goods indirectly has to do with the increasing number of South Kalimantan residents working with relatively high education status. By 2015, the percentage of working population with senior high school education is 33.99%. This number rises again in 2017 to 35.08%. In addition, the average number of working hours per week of working people also increased during the period 2015-2017. The longer working hours cause the community to prefer things that are practical such as food and beverages.

Compensating Variation (CV)

Based on the AIDS model obtained and the elasticity derived from the model, it can be derived again the amount of Compensating Variation (CV) which can be considered a representation of welfare. The CV quantity obtained from the formula in equation (9) by applying it to the data of Susenas 2015 and Susenas 2017 South Kalimantan gives a yield of 17.73% or if nominated in rupiah to Rp169,539. A positive CV indicates a decrease in welfare after volatile foods deflation in 2016. A compensation of Rp169,539 is needed to bring consumers to utility or satisfaction in 2015.

Important information from the findings of this research is that there is another side to note by the government when its policy is pro-consumer (keeping inflation as low as possible), in this case keeping volatile foods prices very low. The other side is that consumers who are also volatile foods producers become trapped as net consumers, when they have to buy an item at a low price at the same time they earn very low income. Volatile foods are mostly agricultural commodities. One of the government policies that have been implemented to intervene in one of the volatile foods of rice is to apply the policy of Highest Retail Price of rice. This policy on the one hand benefits the consumer, but on the other hand leaves the follow-up problem. Until 2017, the exchange rate of farmers (NTP) of South Kalimantan is still below 100.

IV. Conclusion

1. The largest portion of food expenditure on the people of South Kalimantan is in the finished food and beverage group.
2. Decrease in the proportion of expenditure (budget share) occurs in 2017 for the group of grain commodities, egg and milk commodity groups, commodity groups of fruits, vegetables, nuts, fats and oils, fish and meat commodity groups.
3. Increasing the proportion of expenditure in 2017 occurs in the group of finished food and beverage commodities.
4. The phenomenon as mentioned in points 2 and 3 indicates that there is shifting pattern of food consumption of the people of South Kalimantan from raw food to finished food.
5. Based on the income elasticity scale, all food commodity groups in South Kalimantan except commodity group 6 are basic goods in 2015. In 2017 the group of beverages, cigarettes and other foods also have more than one elasticity value that is included in the category of luxury goods. The commodity of processed food and beverage also in 2017 categorized as luxury goods.
6. Welfare decline in 2017 after the deflation of volatile foods in 2016. The amount of rupiah to be compensated to consumers to reach the level of satisfaction (utility) as they feel in 2015 is Rp169,539. This is presumably because most of the volatile foods are agricultural goods, which are both producers and consumers. The low selling price leads to low income so that their welfare decreases.

V. References

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Note

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Tita Rosy. " Effect of Volatile Foods Deflation on Foods Consumption Patterns and Welfare in South Kalimantan: LA / AIDS application on SUSENAS-based data March 2015 and March 2017." *IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)* 11.9 (2018): 34-40.