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Bioscience Research

Print ISSN: 1811-9506 Online ISSN: 2218-3973

Journal by Innovative Scientific Information & Services Network



RESEARCH ARTICLE

BIOSCIENCE RESEARCH, 2019 16(3): 3037-3046.

OPEN ACCESS

Analysis of local food availability in supporting food diversification in central - Kalimantan Province, Indonesia

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Local food production in Central Kalimantan Province during 1996-2016 showed an uptrend and a down-trend. Corn production shows an uptrend, while soybean, cassava, sweet potato and peanut production shows a down-trend. Estimates of local food production in Central Kalimantan Province during 2017-2021 show the increases and decreases. The estimated corn production shows an increase, while the estimation production of soybeans, sweet potato, cassava and peanuts showed a decrease. Low productivity is one of the factors causing a decline in food production, so local food crop farmers must know the importance of land care and agricultural intensification. The estimated local food availability during 2017-2021 in Central Kalimantan Province show the increases and decreases. The estimated availability of corn and cassava for the next five years showed a significant increase, while the estimated availability of soybeans and sweet potato showed a decline, estimation of the availability of peanuts showed a very drastic decline to reach a negative point. The main factors affecting local food availability in Central Kalimantan Province are local production, import-export and stocks.

Keywords: food availability, local food, diversification, trend

INTRODUCTION

Food is an important and strategic commodity for people's lives, because food is a basic human need that must be met by the government and society together. Law Number 7 of 1996 concerning food mandates that the government carries out regulation, guidance, control and supervision of food; while the community organizes the processes of production and supply, trade, food distribution. People as food consumers have the right to obtain food that is sufficient in number, quality, safe, nutritious, diverse, even and affordable by purchasing power (Anonim, 1996).

Lack of food can lead to various economic, socio-cultural and security problems. The average expenditure per capita for food and non-food ingredients is still a very important problem affecting food availability and development in Central Kalimantan Province. Table 1 presents the percentage of average per capita expenditure per month for food and non-food ingredients in Central Kalimantan Province 2007-2016.

In the framework of food development, data and information about food availability can be taken into consideration in conducting food evaluation and planning.

Table 1; Percentage of Average Monthly Expenditures for Food and Non-Food Consumption in Central Kalimantan Province 2006-2015

Year	Food Consumption (%)	Non-food Consumption (%)
2006	64.80	35.20
2007	65.94	34.06
2008	58.98	41.02
2009	63.25	36.75
2010	60.92	39.08
2011	56.55	43.45
2012	55.81	44.19
2013	55.20	44.80
2014	54.79	45.21
2015	53.74	46.26

Source: Central Kalimantan Bureau of Statistics 2016.

Table 2; Availability, Production, Needs and Consumption of Local Food in Central Kalimantan Province, 2016

Type of Foods	Needs (ton)	Production (ton)	Availability (ton)	Consumption (capita kg-1 y-1)
Corn	12,200	8,189	13,702	4.89
Soybeans	28,617	1,262	30,266	11.47
Sweetpotatoes	8,483	9,640	9,640	3.40
Cassava	11,052	45,712	45,712	4.43
Peanuts	2,345	523	2,943	0.94

Source: Central-Kalimantan Food Security and Extension Coordination Agency 2017

Table 3 ; Factors Affecting the Availability of Local Food in Central Kalimantan, 2016

Type of foods	Availability (ton)				
	Local Production	Stock	Import	Export	Total
Corn	88,189	0	5,513	0	13,702
Soybeans	1,262	0	29,004	0	30,266
Sweetpotatoes	9,640	0	0	0	9,640
Cassava	45,712	0	0	0	45,712
Peanuts	523	0	2,420	0	2,943

Source: Central-Kalimantan Food Security and Extension Coordination Agency 2017.

One method and approach that can be used to obtain production data and information, utilization of food availability for consumption in an area during a certain period is through the Food Balance Sheet (NBM). This table of NBM presents a comprehensive picture of the pattern of food supply in a region within a certain period. The NBM of Central Kalimantan Province is prepared every year with reference to the method of the Food and Agriculture Organization (FAO) by considering the conditions and availability of existing data. Table 2 presents the availability and consumption of local food in Central Kalimantan Province in 2016.

Based on Table 2, Food availability, Local Food Production and Consumption in Central Kalimantan Province in 2016, corn food

production was 8.189 tons, consumption was 4.89 per capita per year and corn availability was 13,702 tons. While the need for corn food is 12.200 tons. This shows that the diversity of corn is greater than the need, there is a surplus of 1,502 tons. The type of soybean food production is 1.262 tons, per capita consumption per year is 11.47, and soybean food availability is 30,266 tons; while soybean needs amounted to 28,617 tons. This means that the availability of soybeans is greater than its needs, a surplus of 1.649 tons. Central Kalimantan Province still needs imports of soybeans from outside the region to meet soybean needs for the community. The type of sweet potato production is 9,640 tons with consumption of 3.40 per capita per year, while the availability of sweet potatoes is 9,640 tons and the

need is 8,483 tons, so availability is greater than the need and a surplus of 1,157 tons.

The cassava food has a production of 45.712 tons with food consumption of 4.43 per capita per year, while the availability of cassava is 45.712 tons and the community needs are 11.052 tons. The availability of cassava foods is larger than its needs, and has a surplus of 34.660 tons. The peanuts food has a production of 523 tons and consumption of 0.94 per capita per year, while the availability of peanuts food amounted to 3.220 tons and its needs of 2.345 tons. The low consumption of peanuts results in small production so the role of the government is very much needed in an effort to increase consumption of peanut food and provide counseling on how to grow good crops for peanut farmers in Central Kalimantan Province.

Based on Table 3, the factors that influence local food availability in Central Kalimantan Province in 2016 are regional production, stock and import export. Availability of maize in Central Kalimantan was 13,702 tons with regional production of 8,189 tons and imports of 5,513 tons. Availability of soybeans in Central Kalimantan amounted to 30,266 tons with regional production of 1,262 tons, to meet the food needs of soybeans, imports of 29,004 tons were needed. The availability of sweet potatoes in Central Kalimantan is 9,640 and the availability of cassava is 45,712 tons, the availability of sweet potatoes and cassava has fulfilled the need so that it does not import from outside. The availability of peanuts is 2,943 tons with regional production of 523 tons, to meet the availability of peanuts, the policy to import peanuts is 2,420 tons.

Problem formulation how is the trend of local food production in 1997-2017, What is the estimation of local food production from 2018-2022, What is the development of estimation of local food availability for 2017-2021? The research objectives are: Analyzing the trend of local food production in 1997-2017. estimation of local food production Year 2017-2021. Analyze estimates of local food availability for 2017-2021.

MATERIALS AND METHODS

This research was carried out in Central Kalimantan Province which consisted of thirteen districts and one city, covering Kotawaringin Barat, Kotawaringin Timur, Kapuas, Barito Utara, South Barito, Sukamara, Katingan, Pulang Pisau, Lamandau, Seruyan, Gunung Mas, East Barito, Murung Raya, Palangka Raya. The data used

secondary data are times series of local food production in Central Kalimantan Province for 20 years from 1996 to 2016.

To answer the purpose of this study simple regression analysis for linear equations (Firdaus, 2004) is used, namely by providing a detailed description with reference to predetermined data and relating trends and estimates of local food production (corn, soybeans, cassava, sweet potatoes jalar and peanuts) in Central Kalimantan Province from 1996-2016, The formula for calculating straight-line equations is as follows:

$$Y = a + bx;$$

$$a = \Sigma Y/N; b = (\Sigma XY) / (\Sigma X)^2$$

Where:

Y = Trend of local food production 1996-2016, or estimation of local food production 2017-2021.

a = constant value

b = parameter value.

x = Tahun trend (Tahun 1996-2016) atau tahun estimasi produksi (Tahun 2017-2021)

n = Jumlah rangkaian data (21 tahun)

Analysis of the development of estimates of local food availability in 2017 up to 2021 using the formula:

$$Ps = Pr - \Delta St + Im - Ek$$

where:

Ps : Total food availability

Pr : Local Production

ΔSt : (Final Stock–Initial stock)

Im : Import

Ek : Export.

RESULTS AND DISCUSSION

Trend of Local Foods Production in Central Kalimantan Province

Local food production in Central Kalimantan has experienced a downward trend and an upward trend. The downward trend is technically a down-trend that can be identified from a graph with a downward direction, and a series of peaks (P) and valleys (L) that are lower than the peak.

Trend of Corn Production

The corn production trend in Central Kalimantan from 1996-2016 is presented in Figure 1

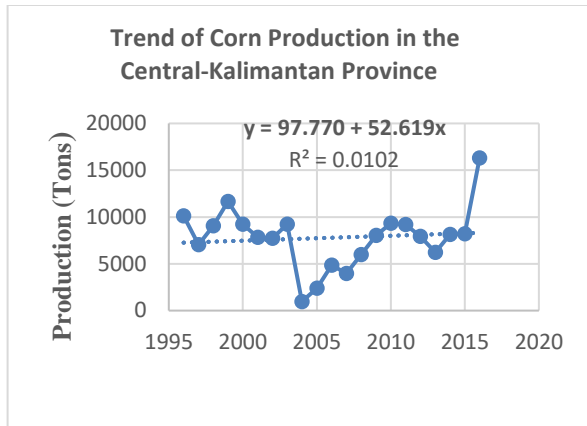


Figure 1; Trend of Corn Production in the Central-Kalimantan Province 1995-2016

The trend of corn production in Central Kalimantan Province experienced an uptrend (trend) as evidenced by Peak (Peak) and Through (carbon copy) which tends to increase. With a linear equation $y = 97,770 + 52,619x$ which means that if the corn production trend increases then the increase in production every year is 52,619 tons, and the R square value is 0,0102 which means that the value of 1% corn production trend is influenced by time period the rest is influenced by several factors such as land area, seeds, urea fertilizer and labor.

Trend of Soybeans Production

The soybean production trend in Central Kalimantan in 1996-2016 is presented in Figure 2.

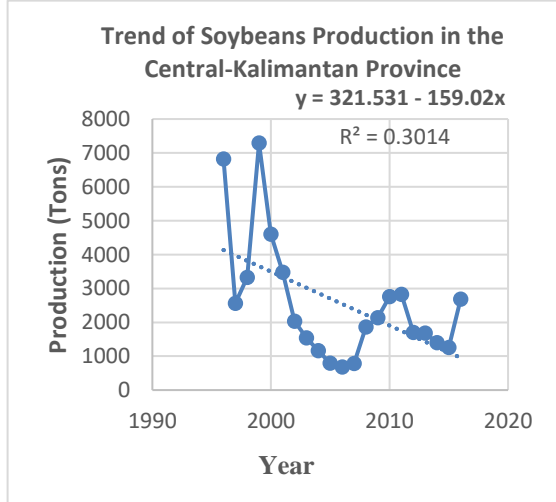


Figure 2; Trend of Soybeans Production in the Central Kalimantan Province 1995-2016.

The trend of soybean production in Central Kalimantan Province experienced a declining

trend as evidenced by Peak (Peak) and Through (carbon copy) which tended to decline. With a linear equation $y = 321,531 - 159.02x$ which means that if the soybean production trend decreases then the annual decline is 159.02 tons and the Squire R value is 0.314 which means that the value of 30% of the corn production trend is influenced by the time period (70 years) while 70 % is influenced by several other factors such as land area, seeds, urea fertilizer and labor.

Trend of Sweetpotato Production

Sweet potato production trends in Central Kalimantan in 1996-2016 are presented in Figure 3.

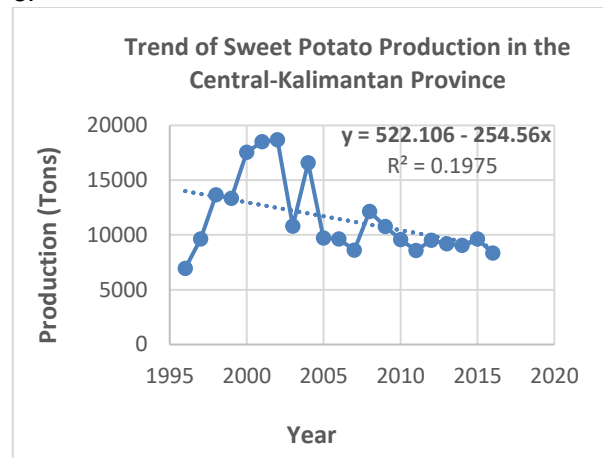


Figure 3; Sweetpotato Production Trend in Central Kalimantan Province 1995-2016

The trend of sweet potato production in Central Kalimantan Province experienced a downward trend (double-trend) as evidenced by decreasing Peak (Peak) and Through (carbon copy). With a linear equation $y = 522.106 - 254.56x$ which means that if the sweet potato production trend decreases then the annual decline of 254.56 tons and the R value of Squire 0.1975 which means that the value of 19% sweet potato production trend is affected by time period (year) while 81% is influenced by several other factors such as land area, seeds, urea fertilizer and labor.

Trend of Cassava Production

The cassava production trend in Central Kalimantan in 1996-2016 is presented in Figure 4.

Kalimantan Province 1995-2016

The trend of cassava production in Central Kalimantan Province experienced a downward trend (dwondtrend) as evidenced by decreasing Peak (Peak) and Through (carbon copy). With a linear equation $y = 92693 - 2179.2x$ which means

that if the cassava production trend decreases, the annual decline is 2179.2 tons and the Square R value is 0.3317, which means that the value of 33% of the sweet potato production trend is affected by time periods (year) while 77% is influenced by several other factors such as land area, seeds, urea fertilizer and labor.

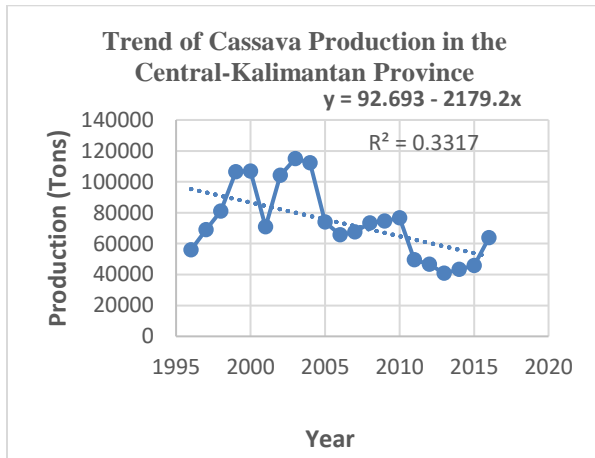


Figure 4; Cassava Production Trend in Central

Trend of Peanut Production

The trend of peanut production in Central Kalimantan in 1996-2016 is presented in Figure 5.

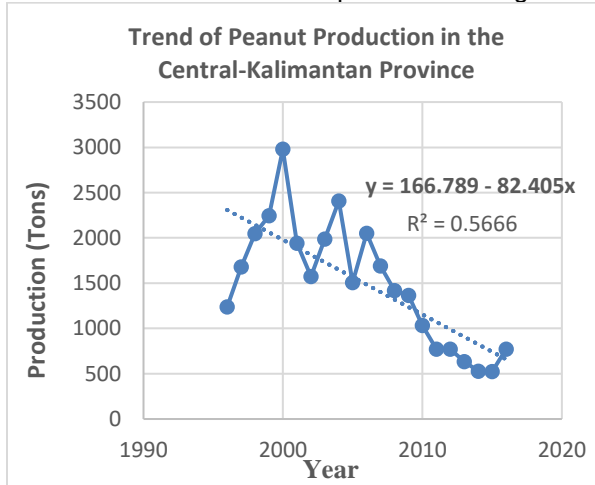


Figure 5; Peanut Production Trend in Central Kalimantan Province 1995-2016

The trend of peanut production in Central Kalimantan Province experienced a declining trend as evidenced by Peak (Peak) and Through (carbon copy) which tends to decline. With a linear equation $y = 166.789 - 82.405x$ which means that if the peanut production trend decreases, the annual decline is 82.405 tons and the R value is Square 0.5666, which means that the value of 56%

of sweet potato production trend is affected by the period of time (year) 64% is influenced by several other factors such as land area, seeds, urea fertilizer and labor.

Estimation of Food Production in Central Kalimantan

Estimates of local food production in Central Kalimantan are carried out for the next five years (2017-2021).

Estimation of Corn Production

The estimated corn production in 2017-2021 in Central Kalimantan is presented in Figure 6.

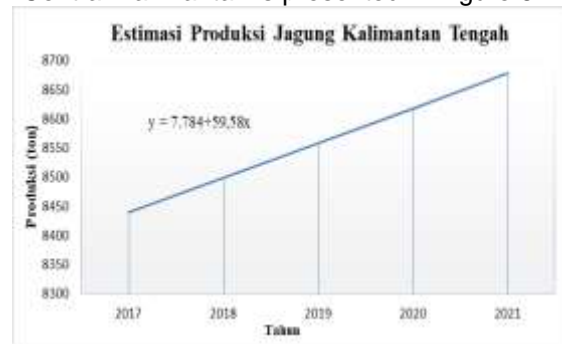


Figure 6; Estimation of Corn Production in Central Kalimantan 2017-2021

Based on the analysis of the corn production trend in Central Kalimantan in 1995-2016, it can be obtained an increase in corn production for the next 5 years, with a linear equation is $y = 7.784 + 59.58x$ which means that if the estimated corn production increases then the increase in annually amounting to 59.58 tons with a constant value of 7,784 tons. The lowest amount of maize production occurred in 2017 at 8.439 tons / year, and it was estimated that in the following year there was an increase and in 2021 the estimated production was 8,678 tons / year, estimated corn production based on actual conditions for the past 21 years.

Estimation of Soybeans Production 2017-2021

Estimates of soybean production in 2017-2021 in Central Kalimantan can be seen in Figure 7.

Based on the results of the analysis of soybean production trends in Central Kalimantan from 1995 to 2016, it can be estimated that soybean production in Central Kalimantan in the next 5 years has decreased based on actual conditions for the past 21 years.

With a linear equation is $y = 2.542 - 180.1x$ if the estimation of soybean production has decreased then the decrease in each year is

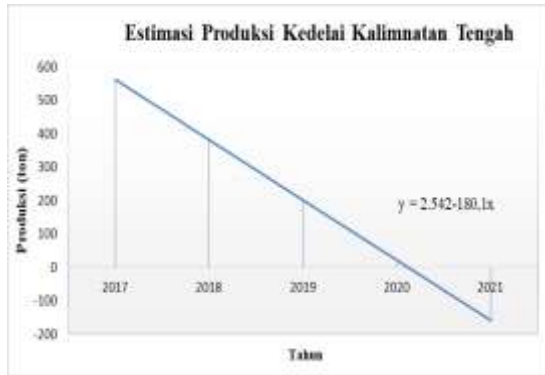


Figure 7; Estimation of Soybeans Production in Central Kalimantan 2017-2021.

180.1 tons with a constant value of 2,542 tons. The amount of production in 2017 is 562 tons / year while in 2021 the production estimate has decreased and reached a negative point of -158 tons / year. It was concluded that regional soybean production in Central Kalimantan had decreased every year. The high consumption level for processed soybean diversification, such as tofu, tempeh and soy milk, results in increased demand for sugar in each year. To meet soybean needs, the government issued a policy by importing soybeans.

Estimation of Sweetpotato Production 2017-2021

The estimation of sweetpotato production in 2017-2021 can be seen in Figure 8.

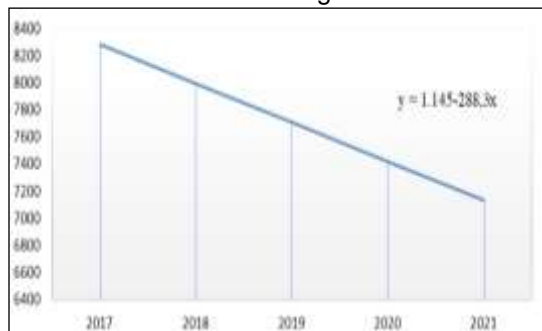


Figure 8; Estimation of Sweetpotato

Production in Central Kalimantan 2017-2021

Based on the analysis of the sweet potato production trend in Central Kalimantan from 1995 to 2016, the estimated sweet potato production in Central Kalimantan in the next 5 years will decrease every year based on the actual situation for the past 21 years. with a linear equation is $y = 1.145 - 288.3x$ if the estimation of sweet potato production decreases then the annual decline is 288.3 tons with a constant value of 1145.4 tons. In 2017 the amount of production estimated at 8,283

tons / year, in 2018 the estimated production amounted to 7,995 tons / year, in 2019 the production estimate decreased by 7,706 tons / year and 2021 which estimated the production amounted to 7,130 tons / year. The decline in production is caused by several factors such as land area, soybean prices, climate, labor and consumption levels.

Estimation of Cassava Production 2017-2021

The estimated production of cassava for the next 5 years, in 2017-2021 can be seen in Figure 9.

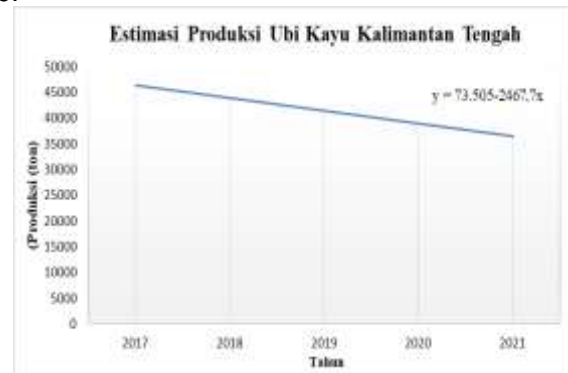


Figure 9; Estimation of Cassava Production in Central Kalimantan 2017-2021

Based on the analysis of the cassava production trend in Central Kalimantan from 1995 to 2016, an estimate of cassava production in Central Kalimantan for 2017-2021 has decreased based on the actual condition for the past 21 years. With a linear equation that is $y = 73,505 - 2467.7x$ if the estimated cassava production decreases, the decrease in each year is 2,467.7 tons while the constant value is 73,505 tons. With the amount of production estimated in 2017 amounting to 46,361 tons / year there is an increase in the number of production compared to 2016 with a total production of 63,862 tons / year. In 2020 the estimated cassava production decreased with a total production of 44,701 tons / year and in 2021 the total production was 38,958 tons / year. To overcome the decline in cassava production intensification of agriculture, especially local cassava food is very necessary because the best land use can produce maximum production.

Estimation of Peanut Production 2017-2021

The estimation of peanut production in Central Kalimantan in 2017-2021 is presented in Figure 10.

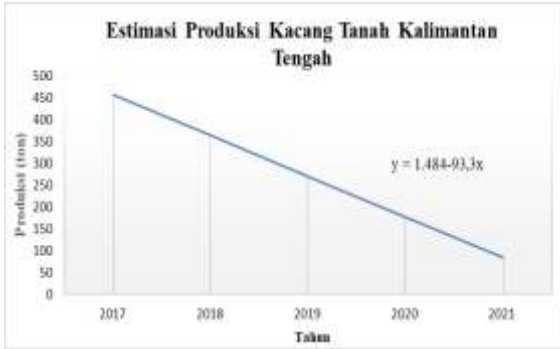


Figure 10; Estimation of Peanut Production in Central Kalimantan 2017-2021

Based on the analysis of peanut production trends in Central Kalimantan from 1995 to 2016, estimates of peanut production in Central Kalimantan can be obtained in 2017-2021 which have decreased, with a linear equation that is $y = 1.484 - 93.3x$ if estimates of peanut production decline then the decline occurs every year at 93.3 tons with a constant value of 1,484 tons. Estimated peanut production in 2017 has decreased with the amount of production of 457 tons / year, compared to the previous year, namely in 2016 with a total production of 772 tons / year. While the following year there was a decline in production, it can be seen the estimation of peanut production in 2018 amounted to 364 tons / year and estimated peanut production in 2019 amounted to 270 tons / year, estimated production of peanuts in 2020 of 177 tons / year and estimated production peanuts in 2021 amounting to 84 tons / year.

Estimation of Local Food Availability in Central Kalimantan

Estimates of local food availability can support food diversification, if food availability meets needs and consumption.

Estimation of Corn Availability 2017-2021

Estimation of Availability of Corn in Central Kalimantan in 2017-2021 is presented in Figure 11.

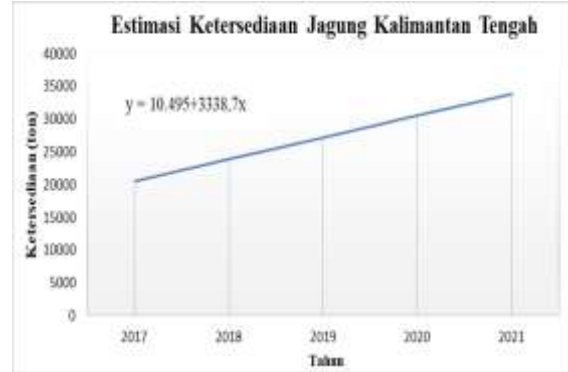


Figure 11; Availability of Corn in Central Kalimantan 2017-2021

Estimation of Soybeans Availability 2017-2021

The estimated availability of soybeans in Central Kalimantan in 2017-2021 is presented in Figure 12

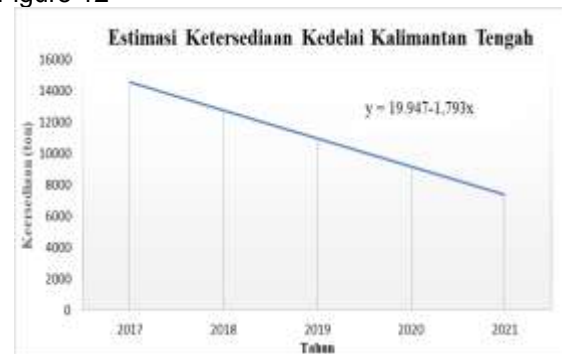


Figure 12; Availability of Soybeans in Central Kalimantan 2017-2021

Based on the analysis of the soybean production trend in Central Kalimantan from 1995 to 2016, it can be estimated that the availability of soybeans in Central Kalimantan in 2017-2021 has decreased. With a linear equation $y = 19,947 - 1,793x$ if the estimation of soybean availability decreases, the decrease in each year is 1,793 tons, with a constant value of 19,947 tons. The highest estimated soybean availability in 2017 is 14,458 tons / year. In 2019 the estimated availability of soybeans is 10,982 tons / year and in 2020 the estimated availability of soybeans is 9,189 tons / year. While the lowest availability estimate is in 2021 with a total availability of 7,396 tons / year. Decrease in soybean availability due to imports in 2016 amounted to 6,643 tons / year, which greatly affected availability in 2016. The role of the government is very necessary to meet soybean needs in Central Kalimantan with a policy of increasing regional production and imports of soybeans from outside the region.

Estimation of Sweetpotato Availability Tahun 2017-2021

The estimated availability of sweet potatoes in Central Kalimantan in 2017-2021 is presented in Figure 13.



Figure 13; Availability of Sweetpotato in Central Kalimantan 2017-2021

Based on the analysis of sweet potato production trends in Central Kalimantan in 1995-2016, we can estimate the availability of sweet potatoes in Central Kalimantan in 2017-2021 experiencing a downward trend. With a linear equation $y = 9.175 - 190.6x$ if the estimated availability of sweet potatoes decreases, the annual decline is 190 tons, with a constant value of 9,175 tons. If seen from the development of the graph above it does not show a significant change. Estimates of sweet potato availability in 2017 amounted to 8,603 tons / year in 2020, estimated sweet potato availability was 8.031 tons / year and in 2021 estimated sweet potato availability was 7.840 tons / year. The role of the government (agricultural extension) is very necessary to increase sweet potato production so that the availability of sweet potato can be fulfilled, by increasing the intensification of sweet potato farming and the importance of diversification in increasing the availability of sweet potatoes in Central Kalimantan.

Estimation of Cassava Availability 2017-2021

The estimated availability of cassava in Central Kalimantan in 2017-2021 is presented in Figure 14.

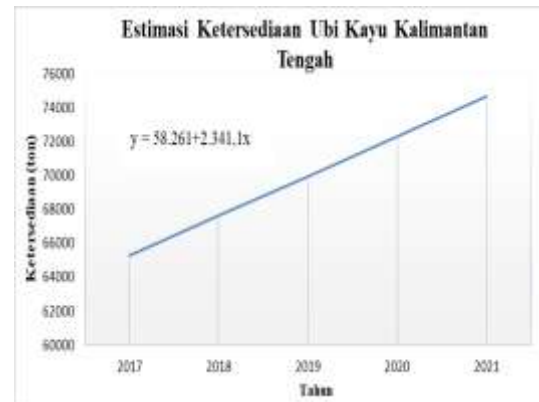


Figure 14; Availability of Cassava in Central Kalimantan 2017-2021

Based on the analysis of cassava production trend in Central Kalimantan in 1995-2016, we can estimate the availability of cassava in Central Kalimantan in 2017-2021 has increased. With a linear equation $y = 58,261 + 2,341.1x$ if the estimated availability of cassava increases, the increase in each year is 2,341.1 tons, with a constant value of 58,261 tons. If seen in the graph above, the estimated availability of cassava in 2017 is 65,284 tons / year, in 2019 the estimated availability of cassava is 69,966 tons / year, in 2020 the estimated availability of cassava is 73,307 tons / year, and the availability of cassava in 2021 that is equal to 74,648 tons / year. It can be concluded that the estimated availability of cassava in the next 5 years is experiencing an increasing trend, and the policy to import cassava from the outside is not necessary because the availability of cassava has met the needs in Central Kalimantan. The government's role in supporting the diversification of cassava processing is by promoting such processed products such as tapioca flour and cassava chips at the exhibition, the introduction of processed cassava is needed especially to increase the income of cassava farmers.

Estimation of Peanuts Availability 2017-2021

The estimated availability of peanut in Central Kalimantan in 2017-2021 is presented in Figure 15.



Figure 15; Availability of Peanuts in Central Kalimantan 2017-2021

Based on the analysis of the cassava production trend in Central Kalimantan in 1995-2016, it can be obtained estimating availability of peanuts in Central Kalimantan in 2017-2021 has decreased. The decrease in the availability of peanuts occurs because the amount of public consumption is lacking. In 2017 the estimated availability of peanuts was -282 tons / year and in 2021 estimated the availability of peanuts amounted to -13,898 tons / year. The estimated availability of peanuts over the next 5 years has experienced a downward trend until it reaches a negative point. The role of the government is very necessary to overcome the availability of peanuts, namely by intensifying agriculture to increase the production of peanuts.

CONCLUSION

The trend of local food production in 1996-2016 in Central Kalimantan Province shows an upward trend and a downward trend. Corn production experienced an uptrend ($Y = 97770 + 52,619x$; $R^2 = 0.0102$) While the production of soybeans, sweet potatoes, cassava and peanuts showed a declining trend.

The estimation of local food production in Central Kalimantan Province in 2017 up to 2021 shows an increase and decrease in production. The estimated corn production shows a significant increase ($Y = 7784 + 59.58x$). Estimates of soybean production over the next 5 years show a significant decrease ($Y = 2542-180,1x$). The estimated sweet potato production for the next 5 years shows a decrease ($Y = 1145.4-288.3x$). The estimation of cassava production for the next 5 years has decreased insignificantly with the equation, $y = 73505-2467.7x$). While the estimation of peanut production over the next 5 years shows a decrease with a linear equation is $y = 1484-93,3x$). Low production is one of the

decreasing factors, there are 4 local food plants which show a decline and to get a production increase in the following year. So local food crop farmers must know the importance of land use or agricultural intensification.

Estimates of local food availability in 2017-2021 in Central Kalimantan Province show increases and decreases. The estimated availability of corn and cassava for the next 5 years shows a significant increase; if it is associated with food diversification, it has fulfilled the requirements because estimation of food availability in 2017-2021 is higher compared to food needs. While estimates of the availability of soybeans and sweet potatoes showed a decline, and estimates of the availability of peanuts decreased very drastically to reach a negative point. The main factors affecting availability are low consumption, low regional production, import-export and stock.

CONFLICT OF INTEREST

The authors declared that present study was performed in absence of any conflict of interest.

ACKNOWLEDGEMENT

Thanks to the friends of the researchers whose names are listed in this article. The results of this study are dedicated to the development of science.

AUTHOR CONTRIBUTIONS

AE, M, M, S and HU design and conduct research, data collection, data analysis and also manuscript writing. S and LL designs and conducts research, reviewing manuscripts and sending manuscripts.

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