PalArch's Journal of Archaeology of Egypt / Egyptology

Impact of Export of Plantation Commodities and Energy Use on Indonesian Economic Growth: A Bound Test Co-Integration Approach

[1]Indra Wijaya, [2]Raja Masbar, [3]Aliasuddin, [4]Abd. Jamal

[1]E-Commerce, Lhokseumawe State Polytechnic, Aceh, Indonesia
[2]Fakulty of Economics and Business, Syiah Kuala University, Aceh, Indonesia
[3]Fakulty of Economics and Business, Syiah Kuala University, Aceh, Indonesia
[4]Fakulty of Economics and Business, Syiah Kuala University, Aceh, Indonesia

[1]wijaya_maniz@yahoo.com, [2]raja.masbar@unsyiah.ac.id, [3]aliasuddin@unsyiah.ac.id, [4]abdjamal@unsyiah.ac.id

Indra Wijaya, Raja Masbar, Aliasuddin, Abd. Jamal. Impact of Export of Plantation Commodities and Energy Use on Indonesian Economic Growth: A Bound Test Co-Integration Approach--Palarch's Journal of Archaeology of Egypt/Egyptology 18(1), 3438-3449. ISSN 1567-214x

Keywords: Plantation Commodities, Energy Usage, Economy Growth, ARDL.

Abstract

This research is conducted to analyze the impact of agricultural export commodities (plantation subsector) which is categorized into priority commodities consisted of rubber, rubber product, oil palm, cocoa, and coffee, and non-priority commodities consisted of cotton, tea, tobacco, sugar cane, cloves, and pepper as well as energy consumption (energy use) toward Indonesian economic growth. Using the ARDL approach (a Bound test) which is based on the time-series data in the period of 1981-2014, the result obtained is that stationary data on I(1) and the ECT value shows negative coefficient, F-Stat is 5 percent significant indicating that short run is co-integrated toward long run and the model used was stable (CUSUM and CUSUMSQ).

Introduction

The correlation between economic growth (GDP), energy consumption level (energy use), and trade (export) shows some implications, either short run or long run. Energy consumption has a direct impact on GDP and an indirect impact on export. In the short run, 2 (two) ways causalities occur on; energy consumption – GDP, export – GDP, and energy consumption – export. However, in the long run,

the two ways causalities relation only occurs in energy consumption – GDP. While export – energy consumption or export – GDP only occurs one-way feedback (Shakeel, Iqbal, & Majeed, 2014). Even though the intense energy consumption pattern has a direct, positive, and significant relation toward economic growth, but indirectly it negatively impacts economic growth by the higher carbon dioxide emission (Sek, 2017). Specifically, energy consumption (either kerosene or LPG) also shows an influence on economic growth in the long run. However, the influence of LPG consumption is better compared to kerosene consumption. (Sapnken, Tamba, Ndjakomo, & Kof, 2020).

In line with the above description, one of the economic sectors in the export component in agriculture. The role of the agricultural sector on economic growth has become a controversial issue in various developing countries. On one side, the discourse of the importance to create a modern industry has made the agriculture sector is marginalized in the economy. However, on the other hand, the discourse of the agriculture role in GDP development by enhancing agricultural technology will give a significant impact on long-run economic growth (Self & Grabowski, 2006). The development of the agricultural sector as a precondition is regarded as an engine of growth toward industrialization, even if the country applies trade openness, the positive impact will influence GDP (Awokuse, 2009). The contribution of the agricultural sector to GDP is also determined by the competitiveness of agricultural products (Sormeaux & Pemberton, 2010). Besides, agricultural productivity also influences GDP which is suspected by improving manpower quality especially in the agricultural sector or agricultural-based industry sector (Awan & Alam, 2015). The agricultural sector is considered a panacea for economic growth (Myrdal, 1897).

The contribution of the agricultural sector in Indonesia that is known as an agricultural country, shows that farming's role is greater than non-farming and creates a better impact on the Indonesian economy (Amir, 2004). This indicates that the Indonesian farming sector has a strategic role and position, determining and fundamental, include in the initial stage time, high economic growth, crisis, recovery, and has high economic growth recovery (rebound) (Saragih, 2010). However, currently, the farming sector contribution toward Indonesian GDP shows a decreasing trend, this is caused by the role of the food crop sub-sector is declining. On the other hand, the role of the plantation sub-sector is stable and gives hope for farming sustainability because Indonesia has many potentials as an archipelago state.

Currently, Indonesian Farming Commodity has been accepted by the international market. The Indonesian government has established some farming commodities into the 10 (ten) main Indonesian export priority commodities, such as Rubber, and Rubber product, Oil Palm, Cacao, and Coffee. Some conditions covering Indonesia are the growth in acreage for various commodities has increased by 3 (three) times and production increases as much as 10 (ten) times. The further observation for the land ownership, it is derived information that there is a fundamental difference based on commodities planted. Smallholder Plantation (PR) dominates in pepper, cotton, tobacco, cloves, cacao, and coffee. While in the Large State Plantation (PBN) and Large Private Plantation (PBS) generally

manages commodities such as Tea, Sugar Cane, and Oil Palm. Through the above brief description, it can be concluded that there are 3 (three) out of 4 (four) plantation commodities that are incorporated in Indonesian main export priority commodities which are from the acreage dominated by smallholder plantation (PR).

The scope of plantation sub-sector commodities used in this research consists of priority and non-priority commodities. The number of commodities observed in this study is 10 (ten), which are: Cacao, Coffee, Rubber, Oil Palm, Tea, Tobacco, Sugar Cane, Cloves, and Pepper. The contribution of the 10 (ten) plantation commodities are very different from Indonesian export value, 6 (six) commodities make a positive outcome on the net export, which are Pepper, Cacao, Rubber, Oil Palm, Coffee, and Tea. While 4 (four) other commodities give a negative impact, they are; Clove, Cotton, Sugar Cane, and Tobacco.

Through the above description, the research focuses on how the role of Indonesian main export commodities especially in the plantation sub-sector both in priority and non-priority commodities as well as energy consumption toward Indonesian GDP.

Literature Review

Stern (2004) mentions that the factor identified in the role of economic growth (development), especially in a production process that involves transformation or material movement, is energy. Substituting the means of production and various forms of goods in economic growth which requires energy input can be regarded as the cause of economic growth. The energy request on the farming sector and other sectors make the energy role on economic growth are very huge. On the other hand, final energy consumption covers all energy used by the last consumer in the industry sector, transportation, household, farming, and others. (Dewan Energi Nasional, 2014). Alp (2016) also adds by stating that economic growth is reflected by the increasing energy consumption.

Based on the Regulation of Ministry of the Agriculture Republic of Indonesia Number *56/Permentan/RC.040/11/2016* on the Guidelines in the Developing Agricultural Area where the strategic explanation objective is to achieve national development by improving productivity and competitiveness of the people in the International market as well as by moving domestic economic strategic sectors. The goals of priority commodities production are agriculture and horticulture. It is comprehensively integrated starting from upstream, on-farm, downstream or its supporting aspect either regional or national priority.

Export activity in globalization is one of the contributors to the economy of a nation. Globalization and free trade have encouraged inter-nation competition to become tighter. Every nation, including Indonesia, tries continuously improving its export quantity and quality, so that, it increases the product competitiveness to be more efficient and sold in the international market. The structure of Indonesian export development has shifted from oil and gas to non-oil and gas. And currently, the non-oil and gas sector has dominated Indonesian export values. The non-oil and gas sector contribution in the period of 2012-2019 is on the

approximate level of 81-93 percentage. This implies that the Indonesian government must immediately take action and policy to increase non-oil and gas export (BPS, 2019).

Export in the plantation priority commodity (rubber, coffee, oil palm, cacao, and coconut) shows an increasing trend in the period of 2015-2019. However, export is still dominated by raw material, so that, it is required some policies, either in limiting the export of raw material, diversification of export products, and downstream industries must be carried out immediately to increase added value (Kementan & Kemenperin, 2019).

Data Sources, Model, and Methodology

The research uses data from 1990-2014, it is because of the availability of the data. As for the source of data used, it can be grouped as follows: Gross Domestic Product or GDP (2010 constant price in US$) and Energy Use or EU (kg of oil equivalent per capita) that was obtained from the World Development Indicator (WDI). Meanwhile, the total value of plantation sub-sector priority commodities or TVU (US $) and total value plantation sub-sector non-priority commodity or TVNU was obtained from various publication sources which come from the Ministry of Agriculture Republic of Indonesia (Statistik Pertanian, 1990-2014).

The research uses Autoregressive Distributed Lag (ARDL) with a wide range of flexibility to use lag either dependent or supporting variable. Fundamentally, ARDL is a linear regression model by estimating the short run and long run as the cause of regression changes (Pesaran et al., 2001). Besides that, ARDL has some benefits, such as it can be used with a few sample amount (limited data availability), the variable used can come from different stationaries either on the level or I(0) or the first level I(1), Lag used is very different, and it has been used in some researches (Asteriou & Hall, 2011; Kustina et al., 2019). The ARDL model commonly uses natural logarithm transformation (ln). Parallel with the case, some studies that have been conducted by Odhiambo (2009), Ozturk & Acaravci (2010), Aliasuddin and Ramadhana (2019) states that it becomes the footstep to formulate the equation model in this research:

$$\ln GDP_t = \alpha_0 + \alpha_1 \ln TVU_t + \alpha_2 \ln TVNU_t + \alpha_3 \ln EU_t + \varepsilon_t \quad (1)$$

Based on the equation model (1) above, ARDL co-integration of this research is:

$$\Delta lnGDP_t = \alpha_0 + \sum_{i=1}^{n} \alpha_1 \Delta lnGDP_{t-i} + \sum_{i=1}^{n} \alpha_2 \Delta lnTVU_{t-i} + \sum_{i=1}^{n} \alpha_3 \Delta lnTVNU_{t-i} + \sum_{i=1}^{n} \alpha_4 \Delta lnE + \beta_1 lnGDP_{t-1} + \beta_2 lnTVU_{t-1} + \beta_3 lnTVNU_{t-1} + \beta_4 lnEU_{t-1} + \varepsilon_t \quad (2)$$

Data Stationaries Test

The first step in analyzing the ARDL model is that it is required stationaries on every variable observed. The data which is not stationary causes the false

regression result. The stationary test approach uses the Augmented Dicky-Fuller (ADF) test. The data is stationary if the average value and the variant do not change or approaching zero (0) point, however, conversely if occurs variant changes in every moment, the data is stated not stationary (Unit Root). The ADF test will generate 2 (two) hypotheses. i.e.: H0 = not stationary / Unit Root (Prob > 0.05) and H1= stationary (Prob < 0.05). The decision to accept H0 if the probability value of a data is greater than the 5 percent significance level. Conversely, it rejects H0, if the probability value is smaller than the 5 percent significance level. This hypothesis can be applied to the level of at-level or first-difference.

Lag Length Test

The ARDL method test is determined on the lag variable to generate the best estimation. The lag which is too long will decrease its degree of freedom (df) amount, while the lag that is too short will lead to specification error (Gujarati & Porter, 2009).

Co-integration Test

Bound F-test is one of the ways to test co-integration on the ARDL model. Co-integration aims to see short-run and long-run existence (Makun, 2018). The procedure of F-test Bound co-integration uses Wald restriction or F-statistic and compared to the upper band and lower band critical value. Pesaran et al. (2001) explained that there are three results of F-test Bound, they are as follows:

1. F-stat is greater than the upper band and lower band critical value, it is occurred co-integration or rejects H0 (not co-integrated).
2. F-stat is below the upper band and lower band critical value, it receives H0.
3. F-stat is between the upper band and lower band critical value, there is no decision.

The short-run error correction model is also used for identifying short-run dynamic estimation purposes. Correction requirement (ECT) is expected to have a negative sign and significant toward the dependent variable (Makun, 2018). The short-run correction model specification in this research is as follows:

$$\Delta lnGDP_t = \alpha_{0i} + \sum_{i=1}^{n} \alpha_5 \Delta lnGDP_{t-i} + \sum_{i=1}^{n} \alpha_6 \Delta lnTVU_{t-i} + \sum_{i=1}^{n} \alpha_7 \Delta lnTVNU_{t-i} + + ECT_{t-1} + \varepsilon_t$$

Model Stability Test

The model stability test is based on recursive residual, which is divided into cumulative sum *(*CUSUM*)* and cumulative sum of squares *(*CUSUMSQ*)*. Recursive residual is the residual from the regression group where the sample amount increases from the smallest to the whole sample (Brown et al, 1975). The CUSUM test is based on the test toward *Wr* plot quantity.

$$Wr = \left(\frac{1}{v}\right) \sum_{t=k+1}^{r} wt \, , r = k+1 \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

Where *v* is the deviation standard estimation on T and *Wr* is recursive residual. The CUSUM test can be seen if the *Wr* quantity plot exceeds the limit set by (5 percent) significance level from the test for *R*-values, zero hypotheses toward parameter stability are rejected (Dritsaki & Stiakakis, 2014). The purpose of this test is to detect systematic changes in the regression coefficient. The plot forms a linear line. The *Wr* distribution is considered to meet the requirement of the significance if it does not exceed its significance degree plot. While the CUSUMSQ test uses square recursive residual (Wt^2) and is based on the test toward Sr quantity plot as follows:

$$Wr = \left(\frac{\sum_{t=k+1}^{r} wt^2}{\sum_{t=k+1}^{T} wt^2}\right), r = k+1 \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (7)$$

The CUSUMSQ test can be examined by seeing the *Sr* quantity plot. If it exceeds the set limit by the significance level of the test, so zero hypotheses (H0) are rejected. The test is a supplement to the CUSUM test, especially if the regression coefficient accuracy is not systematic.

Results and Discussion

The following table 1 below explains the average economic growth (GDP) as much as 26.78 with a deviation standard of 0.46. Meanwhile, energy consumption (EU) has a smaller mean compared to the other variable, as much as 6.44 with a deviation standard of 0.28. On the other hand, the highest standard deviation occurs on the priority commodities (TVU) total value as much as 1.06. This shows that TVU has relatively high distribution data compared to the other variable. Table 1 also explains that the highest matrix correlation occurs on the EU variable with GDP as much as 0.968, while the lowest matrix correlation occurs on the EU variable with TVU.

Table 1. Statistic Descriptive and Matrix Correlation

Variables	Mean	Maximum	Minimum	Std. Dev.	GDP	TVU	TVNU	EU
GDP	26.78	27.57	26.00	0.46	1			
TVU	15.31	17.33	13.86	1.06	0.819	1		
TVNU	12.87	13.65	12.13	0.36	0.940	0.852	1	
EU	6.44	6.78	5.95	0.28	0.968	0.701	0.848	1

Afterward, it is conducted root test to examine the data stationery which is based on the time-series model corresponding to the average value and variants do not change systematically in the whole time sequence, or in other words, its average and variants are constant. If the condition of not stationary occurs, the data contains autocorrelation. Based on Table 2 below, the fourth research variables (GDP, TVU, TVNU, and EU) shows: not stationary on the I(0) level, however, after conducted transformation on the first level I(1) for the fourth variable, it is

derived that GDP stationery has high stationary score compared to the other three variables as much as -7.616827 with the probability of 0.0131, however, it remains integrated on I(1). Based on the stationary level of I(1), it is obtained in the fourth variable, the ARDL model usage can be applied in this research because it is derived from the different integration between I(0) and I (1).

Table 2. Unit Root Test

Variables	ADF at level	Prob.	ADF at first level	Prob.	Integration
LNEU	-1.086785	0.9162	-6.070045	0.0001	I(1)
LNGDP	-2.231001	0.4574	-4.158853	0.0131	I(1)
LNTVNU	-2.451967	0.3476	-7.616827	0.0000	I(1)
LNTVU	-1.986694	0.5869	-5.625638	0.0003	I(1)

Based on the research processing data conducted using Akaike Information Criteria (AIC) approach, it is derived from the different optimum lag amounts. This is in line with the advantage of the ADRL model where the lag usage may not always be the same or can use the different lag (Ozturk & Acaravci, 2010). Lag optimal derived in each variable shows that the GDP variable is derived in the 2nd lag, the TVU variable does not have lag (0), the TVNU variable on the 2nd lag, and the EU variable on the 1st lag.

Afterward, discussion on the ARDL model also estimates the long-run. The research result on the long-run estimation is shown in the following Table 3. It can be concluded that the three independent variables positively influence, but one of the TVNU variables shows no significance on the probability level of 0.7913 with a coefficient score of 0.042661. Meanwhile, the highest significance on the EU variable with a probability score of 0.0000 and coefficient of 0.775531. This result confirms with Faisal et al. (2017) research who explains the bigger energy consumption; hence the energy availability will influence economic growth.

Table 3. Long-Run Estimation

Variable	Coefficient	Std. Error	t-Statistic	Prob
LNTVU	0.227445	0.091582	2.483513	0.0207
LNTVNU	0.042661	0.159337	0.267739	0.7913
LNEU	0.775531	0.205363	3.776392	0.0010
C	17.81638	1.773680	10.04487	0.0000

Next, observing the ARDL model, this research also estimates on ECM long-run which is conducted to find the influence of lag variable and balance. The ECM provision or requirement is that the coefficient must have a negative slope which indicates the occurrence of convergence. If it is derived positive value, so the pattern will keep away from the balance point or divergent. The estimation result shows that the ECT score shows a negative coefficient as much as -0.321020

which indicates a 32 percent imbalance from the previous period (interference) which will come back again toward the long-run point in 3.84 months period.

The influence of the $TVNU_t$ variable and $TVNU_{t-1}$ also shows a negative coefficient, respectively as much as -0.036496 and -0.051753. On the other hand, the influence of GDP_{t-1} and EU_t shows a positive coefficient respectively as much as 0.262151 and 0.471472. Meanwhile, TVU is not estimated because the optimum lag occurs on the 0 lag. Table 4 also shows that the DW value is as much as 2.170828 which indicated that it does not occur autocorrelation in this research.

Table 4. Short Run Estimation

Variable	Coefficient	Std. Error	t-Statistic	Prob
$\Delta(LNGDP_{t-1})$	0.262151	0.115816	2.263525	0.0333
Δ(LNTVNU)	-0.036496	0.030541	-1.194981	0.2443
$\Delta(LNTVNU_{t-1})$	-0.051753	0.029332	-1.7643090	0.0909
Δ(LNEU)	0.471472	0.114135	4.130839	0.0004
ECT_{t-1}	-0.321020	0.059033	-5.437933	0.0000
R-squared	0.515372			
Adjusted R-squared	0.443576			
Durbin-Watson stat	2.170828			

Afterward, a co-integration test is required in this research to find out whether there is a long-run balance between the independent variable and dependent variable. The co-integration test uses the bound test that has some advantages, which are it can be integrated into the different order I(0) or I(1), or the sample amount used is less. Based on Table 5 below, the F-Statistic value derived is as much as 5.038, which indicates above the critical value of 5 percent either on the lower or upper bound. Hence, it can be concluded that it occurs short-run co-integrated toward the long run.

Table 5.The Result of ARDL co-integration

Variables	F-Statistic	Cointegration	Lag.Optimal
	5.038*	Cointegration	2,0,2,1
F (GDP/ EU, TVNU , TVU)	Critical Value	Lower Bound	Upper Bound
	1%	4.428	5.816
	5%	3.164	4.194
	10%	4.428	3.532

The next estimation is the stability test model using CUSUM and CUSUMSQ which is needed to observe estimates consistency on the usage of the ARDL model. The estimation result shows that the stability test model is on the above 5 percent significance range line or accept H0, so the estimation model derived is quite good and feasible to be used. The following chart presents figures 1 and 2 for CUSUM and CUSUMSQ.

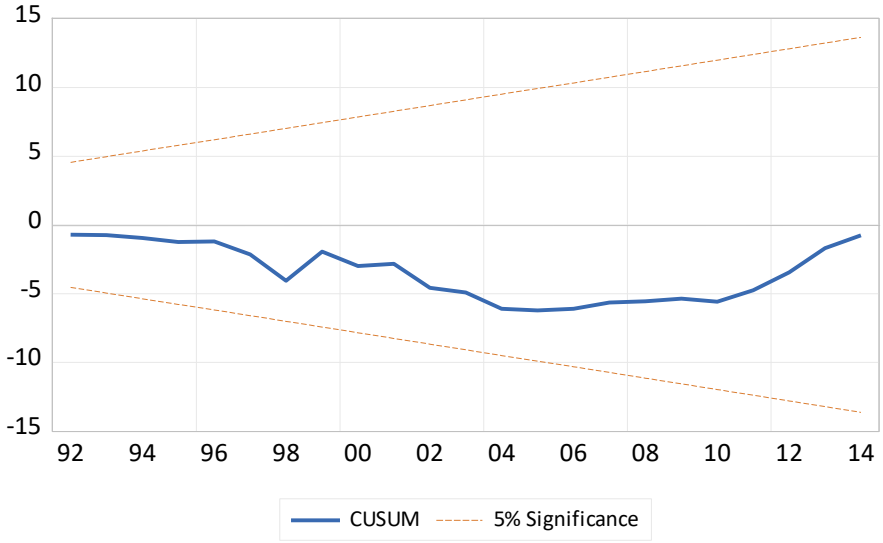

Figure 1. Cumulative sum (CUSUM) tests

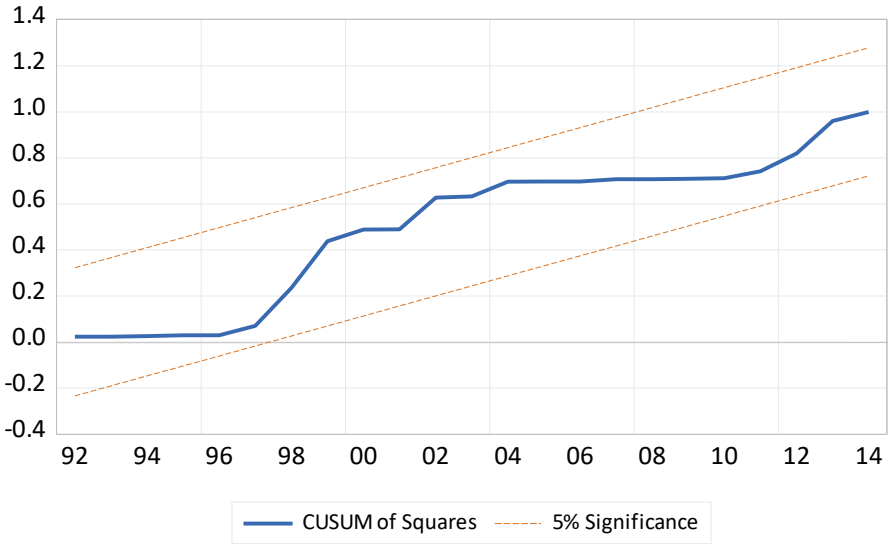

Figure 2. Cumulative sum squares (CUSUMSQ) test

Conclusion and Implication of Policy

This study aims to analyze the role of the main export commodity especially the plantation subsector which covers priority commodities (TVU) and non-priority

commodities as well as energy consumption (EU) toward the economic growth (GDP) during the period of 1981-2014 using Bound Test ADRL model and (CUSUM and CUSUMSQ) stability test, so that, it is found co-integration result between the dependent variable and independent variable in the long run stably. The other finding from the estimates model is that the EU variable has a better coefficient compared to both TVU and TVNU variables as much as 0.77. Meanwhile, if it is compared to the role of TVU and TVNU variables, so the TVU coefficient is greater than TVNU. The TVNU variable does not show its significance.

Implications from the estimation identification result in this research can be explained as follows:

1. Considering plantation sub-sector (TVU and TVNU) contribution toward economic growth (GDP) is lower compared to the contribution of EU variable, so Indonesian government must be able to anticipate the energy needs in the future by conducting energy source diversification activities especially on the sustainable energy (EBT). Indonesian energy supply Porto folio can be developed corresponding to the geographical condition of an archipelago country.
2. Even though the TVU coefficient is greater than GDP, but it is still dominated by raw material export, therefore, it is required firmness of the Indonesian Government in implementing the limitation of raw material export policy.
3. Regarding the low level of TVNU coefficient, the Indonesian government can implement an industrial downstream policy based on non-priority commodities to stimulate the society's activities in increasing productivity and their added value. This is based on the acreage dominated by the smallholder plantations.

References

Aliasuddin & Ramadhana, R. (2019). Dynamic hydroelectricity consumption and economic growth in APEC countries and India. *Regional Science Inquiry, 11*(3), 111-117.

Alp, E.A. (2016). *Energy Consumption and Economic Growth in 12 Asian Countries: panel data analysis. Applied Economics Letter, 282-287.*

Amir, H. (2004). Pengaruh Ekspor Pertanian dan Non Pertanian Terhadap Pendapatan Nasional: Studi Kasus Indonesia Tahun 1981-2003. *Kajian Ekonomi dan Keuangan, Volume 8, Nomor 4*.

Awan, A. G., & Alam, A. (2015). Impact of Agriculture Productivity on Economic Growth: A Case Study of Pakistan. *Industrial Engineering Letters Vol.5, No.7*, 27-31.

Awokuse, T. O. (2009). Does Agriculture Really Matter for Economic Growth in Developing Countries? *American Agricultural Economics Association Annual Meeting.* Milwaukee.

BPS. (2019). *Analisis Komoditas Ekspor 2012-2019.* Jakarta: Badan Pusat Statistik.

Brown, R. L., Durbin, J. & Ewans, J. M. (1975). Techniques for testing the Constance of regression relations over time. *Journal of the Royal Society*. 37, 149-172

Dewan Energi Nasional. (2014, Juni 26). *Paradigma Baru Kebijakan Energi Nasional Menuju Ketahanan dan Kemandirian Energi. Diambil dari Dewan Energi Nasional Republik Indonesia: den.go.id/index.php/dinamispage/index/471-html*

Gujarati, D & Porter, D. C. (2009). *Basic Econometrics, fifth edition*. New York: McGraw-Hill.

Kementan, & Kemenperin. (2019). *Bahan Baku Dominasi Ekspor Komoditas Unggulan Perkebunan.* Jakarta: Kementerian Pertanian dan Kementerian Perindustrian Republik Indonesia.

Kustina, K.T., Dewi, G.A.A.O., Prena, G.D., Suryasa, W. (2019). Branchless banking, third-party funds, and profitability evidence reference to banking sector in indonesia. Journal of Advanced Research in Dynamical and Control Systems, 11(2), 290-299.

Makun, K. K. (2018). Imports, remittances, direct foreign investment, and economic growth in the Republic of the Fiji Islands: An empirical analysis using ARDL approach. *Kasetsart Journal of Social Sciences*, *39*(3), 439–447

Odhiambo, N. M. (2009). Energy consumption and economic growth nexus in Tanzania: An ARDL bounds testing approach. *Energy Policy*, 37, 617-622.

Ozturk, I. & Acaravci, A. (2010). The causal relationship between energy consumption and GDP in Albania, Bulgaria, Hungary, and Romania: Evidence from ARDL bound testing approach. *Applied Energy*, 87, 1938-1943

Peraturan Menteri Pertanian Republik Indonesia Nomor 56/Permentan/RC.040/11/2016 Tentang Pedoman Pengembangan Kawasan Pertanian.

Pesaran, M. H, Shin, Y., & Smith, R. J (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, *16*(3), 289-326.

Sapnken, F. E., Tamba, J. G., Ndjakomo, S. E., & Kof, F. D. (2020). Oil Products Consumption and Economic Growth in Cameroon Households: An Assessment Using ARDL Cointegration and Granger Causality Analysis. *International Journal of Energy Economics and Policy, 10(6)*, 510-523.

Saragih, B. (2010). *Agribisnis: Paradigma Baru Pembangunan Ekonomi Berbasis Pertanian* . Bogor: PT Pernerbit IPB Press.

Sek, S. K. (2017). The impact of energy consumption on economic growth: The case of China. *Applied Ecology and Environmental Research 15(3)*, 1243-1254.

Self, S., & Grabowski, R. (2006). *Economic Development and the Role of Agricultural Technology.* Southern Illinois: University Carbondale.

Shakeel, M., Iqbal, M. M., & Majeed, M. T. (2014). Energy Consumption, Trade, and GDP: A Case Study of South Asian Countries. *The Pakistan Development Review*, 461- 476.

Sormeaux, A. D., & Pemberton, C. (2010). *Factors Influencing Agriculture's Contribution to GDP: Latin America and the Caribbean.* Trinidad and Tobago: The University of the West Indies, St. Augustine Campus.

Stern, D. (2004). *The Rise and Fall of The Environmental Kuznetcurve.* 32(8), 1419-1439