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ORIGINAL SCIENTIFIC PAPER

The Effect of Fertilizer Subsidy, Food Credit, and Government Expenditure on Infrastructure towards Food Security: Demand and Supply Sides

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ABSTRACT
This research aims to examine how fertilizer subsidy, food credit, and government expenditure on infrastructure affect the food security in Aceh province (Indonesia) by using a dynamic model based on Error Correction Model method. This research classifies food security into supply side and demand side. The availability of energy and protein is the supply side and the consumption of energy and protein is demand side. Using time series data, the findings of this research is the majority of variables have a favorable effect on Aceh's food security both the supply and demand sides. As a result, short-term food security is more consistent than long-term food security.

Key words: *food security, fertilizer subsidy, food credit, government expenditure on infrastructure, Error Correction Model*

JEL Classification: B23, O31, Q18

INTRODUCTION

Food security remains a major burden that needs to be tackled to reach the Sustainable Development Goals. In recent years, food security has been widely considered to represent four critical pillars: availability, access, use, and stability. In addition, it should have three specific objectives namely guaranteeing adequate food supplies, maximizing supply flow stability, and ensuring that those in need have access to available resources (Clapp et al., 2021). Moreover, food security and environmental (ecological) sustainability are two challenges that must be tackled concurrently. The environment sustainability ensures sustained development, whereas food ensures life. Considering the people's health and purchasing capacity, the food supply becomes a critical issue that requires immediate attention. Food must be a priority, as it is the most fundamental necessity, aside from clothing and shelter (Darma et al., 2020). Given the current confluence of population growth, climate change, and shifting consumption patterns, future food and nutritional security also becomes a serious issue for both rich and poor people (Coles et al., 2016). Food insecurity was dramatically exacerbated by the 2007-2008 food price crisis, which continues to this day. As a result, it is viewed as a long-term failure of the global food system at the time, spurring the establishment of a global community to address agricultural and food security challenges.

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In the short term, Indonesia has three major challenges to food security: first, ensuring adequate food availability through trade and local production to meet national demands. Second, safeguarding the poor's food consumption. Third, alleviate family and national food insecurity (Vysochyna et al., 2020). Apart from a concern for the chronically disadvantaged groups left behind by market forces, food security requires little specific policy attention. Of course, some of these programs may be food-related, as food is the most basic requirement of the impoverished (Timmer, 2011).

Food insecurity frequently emerges as a result of a lack of food access, even when food supply is adequate. Reducing food insecurity is possible only if food security is established at the household level. Thus, the government places a high effort on meeting the needs of families when it comes to food. Agriculture policies for rice, maize, wheat, millet, and sorghum, as well as initiatives concentrating on input subsidies and credit facilities, attest an ineffectual in reaching out to poorer farmers; this will affect the accomplishment of food security stability (Sanga et al., 2021). Governments play a critical part in the phenomenon of food security; their contribution is meant to expedite the achievement of national development goals. The government's obligation to safeguard domestic producers and consumers is supposed to result in the stabilization of food prices, which may be accomplished through food pricing laws that alleviate farmer concern and ensure that consumer food costs remain consistent.

Food pricing policy is a critical component of agricultural growth. Food policy is separated into two components: input and output pricing. Input price policy refers to the distribution of subsidies to farmers to assist them in overcoming cost and capital constraints; output price policy refers to the government's procurement price policy (Arouna et al., 2020). Credit policy is the other component of agricultural development policy. Credit policy is also a component of the government's input price policy for farmers and agriculture business operators; in many countries, an appropriate supply of credit has a favorable effect on agricultural output and farm revenue (Bidisha et al., 2017). Other policies, particularly those relating to infrastructure development, must be incorporated to increase the effectiveness of agriculture policy. Proper infrastructure, such as roads and irrigation, will enable economic mobility in agriculture. Investing in road infrastructure reduces distribution costs and speeds up delivery, which benefits farmers. Additionally, improved irrigation systems might act as a stimulus for farmers to increase their yield (Bacior & Prus, 2018).

An investigation of how subsidies for fertilizer, food credit, and government spending on infrastructure contribute to Aceh's food security was the goal of this study. This research classified food security into supply side and demand side. The availability of energy and protein is the supply side and the consumption of energy and protein is demand side. Findings may be used to evaluate the impact of government expenditure, food credit, and fertilizer subsidies on Aceh's food security, as well as the ways in which these policies might be improved.

LITERATURE REVIEW

Food security is defined in Indonesia as "the availability of sufficient food, both in quantity and quality, that is safe, equitable, and affordable," as stated in Food Law No. 7 of 1996, which states that "food security is a necessary condition for meeting household food needs as reflected in the availability of sufficient food, both in quantity and quality, that is safe, equitable, and affordable." This notion implies that food security is ultimately aimed at the home level. Food security is composed of three major subsystems: availability, access, and absorption of food, whereas nutritional status is a byproduct of food security. Food consumption is one measure that may be used to analyze the performance of food security. Food consumption is divided into two, energy and protein consumption. Syahnur et al., (2014) examined the influence of energy consumption on Aceh's economic development in the long and short term using ECM (Error Correction Model) and discovered that energy consumption had a purely positive effect in both time periods. Another

indication is food quality, which may be quantified using food safety and nutritional content standards (Reincke et al., 2018). Appropriate inputs such as certified seeds, balanced fertilizer usage, automation, and agricultural loans all have a role. In Indonesia, the government places a premium on suitable inputs. As a result, appropriate inputs are incorporated in agricultural price policy to assist farmers. Agricultural pricing policy is a critical instrument for raising agricultural output, employment, and incomes in order to achieve food security. Farmers must be compensated fairly in order to ensure food security and increase their earnings (Dev & Rao, 2010). As a result, governments must establish more explicit policies that handle agricultural risk management successfully in order to achieve long-term growth. It is vital to have the tools and knowledge necessary to recognize and identify food security's determinants, as well as the capacity to intervene to protect persons from food poverty (Abdallah et al., 2021).

Numerous studies have been conducted on food security issues, including an in-depth analysis of the costs and returns associated with rice and wheat, the two most highly subsidized commodities that provide livelihoods for millions of farmers examine the effectiveness of agricultural pricing strategy in enabling farmers to earn a sufficient profit in order to enhance investment, technology, and productivity, and hence food security. A significant factor contributing to the rise in support prices is the rising cost of production as a result of an excessive concentration on getting input costs right. Governments might compensate farmers for productivity losses by establishing local fertilizer production and subsidizing important intermediate inputs such as high-quality seeds, fertilizers, and pesticides. Following that, because credit is the lifeblood of any business when it comes to increasing agricultural productivity and food security in developing countries, Bidisha et al., (2017), discovered that credit benefits households' primary and secondary income streams, both of which have been shown to improve household food security. Credit was associated with increased food supply, buying power, and food security, meaning that extending credit programs and making microcredit available to small and marginal farmers on a timely and nondiscriminatory basis might boost farm productivity and performance. Microcredit, the study found, has a tendency to alleviate poverty and promote food security.

To address agricultural productivity and food security concerns, numerous nations have enacted explicit policies for sustainable agricultural growth (Chen et al., 2017). Additionally, governments have devised subsidy programs to promote sustainable agriculture. As a result, the issue of food security is projected to be impacted. As a result, several research focus on agricultural subsidy programs, specifically their influence on productivity. Xu & Liao (2014), for example, built a risk insurance model to evaluate the impact of crop insurance subsidies on agricultural output and discovered that premium subsidies can continue to boost agricultural output. Faced with unexpected output, Peng & Pang (2019) Using a three-tier contract agricultural supply chain, we evaluated the effect of government subsidies on risk-averse farmers' output decisions. They emphasized that when subsidies grew, farmers' total goal production increased as well, and that subsidies favored risk-averse farmers. In addition, a few studies have looked at government expenditure in terms of food security impact. Nugroho (2017), Using panel data and the 3SLS approach, the study also concluded that in order to boost agricultural production, the Indonesian government should prioritize greater expenditure on agriculture and education. Additionally, it is believed that investments in roads, irrigation, and power have a limited influence on agricultural development and a low marginal return on poverty reduction. Abdul Manap (2020) found that road infrastructure has a positive significant impact on the food security. Households need a proper physical access to sell their products and to get food for their basic needs, and that will increase food security.

The research mentioned indicates that there is a correlation between policy inputs (subsidies, credit) and government spending on agriculture and food security. This study uses the same method as Syahnur et al.,(2014) Error Correction Model (ECM) and also using energy consumption as one of the variable but this research is classified the energy consumption into

demand side. This research also incorporate variables used in earlier research on the interplay between fertilizer subsidies, food credit, and government spending on infrastructure related to food security both in short-run and long-run.

THEORITICAL METHODOLOGY

This analysis utilized secondary time series data spanning the years 2013 to 2020. Due to the scarcity of data, preliminary data processing was performed prior to doing additional study. The data are provided as time series spanning eight years, although the minimum number of observations required for time series data is n=30. Due to these constraints, however, a linear interpolation of eight years of data into quarterly data was performed. Thus, the data collection period is from the first quarter of 2013 to the fourth quarter of 2020. Food security is the dependent variable in this study, whereas fertilizer subsidies, food credit, and government infrastructure investment are the independent variables. Food security is defined by the availability of energy and protein, as well as their consumption.

The selected variables are expected to have an effect on food security in the long and short term. Where the variables used have an important role in agricultural development from the demand and supply side. The independent variables used are also classified as subsystems to achieve food security stability. The estimating model employed in this investigation is the Error Correction Model (ECM) (OLS). The ECM was developed to account for disequilibrium and to examine the long and short term causal relationships between cointegrated variables (Syahnur et al., 2014). As a result, it is hoped that the short- and long-term behavior of the observed variables may be explained.

The dependent variables used in this research is food availability and consumption, those variables divided into energy and protein. This dependent variable is represented by the indicators of food security both in demand and supply side. Energy and protein availability is classified into supply side. The energy availability model is represented by equation 1 as follows.

$$\Delta eam_t = \gamma_0 + \gamma_1 \Delta sf_t + \gamma_2 \Delta ct_t + \gamma_3 \Delta gi_t + \gamma_4 sf_{t-1} + \gamma_5 ct_{t-1} + \gamma_6 gi_{t-1} + \gamma_7 (sf_{t-1} + ct_{t-1} + gi_{t-1} - fs_{t-1}) \quad (1)$$

Equation 2 refers to the protein availability model as follows.

$$\Delta pam_t = \gamma_0 + \gamma_1 \Delta sf_t + \gamma_2 \Delta ct_t + \gamma_3 \Delta gi_t + \gamma_4 sf_{t-1} + \gamma_5 ct_{t-1} + \gamma_6 gi_{t-1} + \gamma_7 (sf_{t-1} + ct_{t-1} + gi_{t-1} - fs_{t-1}) \quad (2)$$

Where eam refers to energy availability and pam is protein availability. sf, ct, and gi are fertilizer subsidy, food credit, and government expenditure on infrastructure, respectively.

Food consumption, which is the second indicators used, also divided into energy and protein consumption. This consumption classified into demand side. The energy consumption as follows.

$$\Delta ecm_t = \gamma_0 + \gamma_1 \Delta sf_t + \gamma_2 \Delta ct_t + \gamma_3 \Delta gi_t + \gamma_4 sf_{t-1} + \gamma_5 ct_{t-1} + \gamma_6 gi_{t-1} + \gamma_7 (sf_{t-1} + ct_{t-1} + gi_{t-1} - fs_{t-1})$$

The protein consumption as follows.

$$\Delta pcm_t = \gamma_0 + \gamma_1 \Delta sf_t + \gamma_2 \Delta ct_t + \gamma_3 \Delta gi_t + \gamma_4 sf_{t-1} + \gamma_5 ct_{t-1} + \gamma_6 gi_{t-1} + \gamma_7 (sf_{t-1} + ct_{t-1} + gi_{t-1} - fs_{t-1})$$

Where ecm and pcm are energy consumption and protein consumption, respectively. sf, ct, and gi are fertilizer subsidy, refers to food credit, government expenditure on infrastructure,

respectively. There is a technique that is followed in order to achieve the desired result: (1) the variables were converted into logarithmic forms, (2) stationary testing of all variables used to see whether the variables contained unit roots, (3) determination of the optimal lag, and (4) cointegration test to see if the variables used in the equation have a long-term relationship. In general, econometric approach, it is necessary to carry out the classical assumption test. The goal is to obtain an estimate that is Best Linear Unbiased Estimator (BLUE), then the estimation of the research model needs to be tested for classical assumptions consisting of normality test, multicollinearity test, heteroscedasticity test, and autocorrelation test.

RESULT

Prior to estimating time series data, a stationary test is undertaken. Estimation of non-stationary data would result in the appearance of super inconsistencies and false regression, preventing the application of conventional inference methods. This research used the unit roots test. This study used the Augmented Dickey Fuller test to find the unit root (ADF). The variable is stationary if the ADF t- statistic is greater than the probability value. The unit root test can be done on individual variables or on the entire study's variables (dependent and independent). The cointegration test employed in this study is the Johansen Test, which is designed to determine the long-run connection between two or more variables in a model. As stated in Table 1, unit root test and cointegration test results are accomplished.

Table 1. Unit Root Test and Cointegration Test Result

Unit Root Test Results (ADF Test)							Johansen Cointegration Test	
Variables	**Level**		**First Difference**		**Second Difference**		**Models**	**Conclusion**
	t-stat	Prob	t-stat	Prob	t-stat	Prob	kk	1 cointegration of eqn(s) at the 0.05 level
eam	-1.59	0.47	-2.08	0.06	-6.44	0.00	kg	1 cointegration of eqn(s) at the 0.05 level
pam	-0.88	0.77	-2.79	0.07	-6.57	0.00	ck	2 cointegration of eqn(s) at the 0.05 level
ecm	-1.99	0.28	-2.77	0.07	-3.53	0.01	cg	3 cointegration of eqn(s) at the 0.05 level
pcm	-3.14	0.03	-10.19	0.00	-6.58	0.00		
sf	-1.87	0.33	-1.65	0.44	-6.51	0.00		
ct	-0.19	0.92	-5.42	0.00	-8.46	0.00		
gi	-1.12	0.69	-4.78	0.00	-7.84	0.00		

Source: own presentation, 2021

Table 1 shows that all variables in this study are stationary using the second degree of integration test (second difference) and the cointegration test demonstrates that the variables are related in the long term which mean there is a link between food security and the independent variables. Numerous assumptions must be adequately justified for multiple linear regression models in order for the resultant estimate to fulfill the requirements for the Best Linear Unbiased Estimator (BLUE). A normality test, a multicollinearity test, an autocorrelation test, and a heteroscedasticity test are used to verify these assumptions. These tests are sometimes referred to as classic assumption tests, and the results are shown in Table 2.

Table 2. Classic Assumption Test

Normality Test			Heteroskedasticity Test		Autocorrelation Test	
Models	Jaque Berra	Prob	Obs*Squared	Prob	Initial probability	New probability
eam	3.989	0.13	5.924	0.11	0.0000	0.0003
pam	0.026	0.98	4.016	0.25	0.0000	0.0008
ecm	2.781	0.24	7.854	0.04	0.0000	0.0004
pcm	2.523	0.28	5.662	0.12	0.0000	0.0001

Source: own presentation, 2021

The Jarque-Bera test examines the normality of data by plotting the side. The estimated J-B probability value is larger than 0.05 in all models, indicating that u_t residual is normally distributed. The heteroscedasticity test checks if a regression model has a residual unequal variance for a known independent variable. Using the Breuschn Pagann Godfrey test, the three regression models utilized had no heteroscedasticity issues. However, the energy consumption model has a heteroscedasticity issue. So, using the Generalized Least Squares (GLS) approach, we discovered Obs*RSquared of 5.468656 with 0.1405. The chi-square probability is larger than 0.05, indicating no heteroscedasticity.

A multicollinearity test is used to examine if independent variables are related. This test uses the Variance Inflation Factor. The results of the multicollinearity test reveal that all independent variables in each model are not multicollinear. The Centered VIF value of each independent variable included in each model is less than 10. The Breusch-Godfrey Serial Correlation Model reveals that all models have autocorrelation difficulties with a chi-square probability value less than 0.05, which is 0.0000. The autocorrelation problem makes the OLS estimator inefficient, according to Gujarati (1995), (Has a minimum variance, both in small and large samples). So the OS estimators' variance estimate is skewed, and the OLS estimator's t-statistic is high. The General Least Square approach treats autocorrelation and generates a probability value that grows but stays below 0.05. As noted in the table, there is still autocorrelation when the chi-square probability value is examined. However, when additional autocorrelation indicators, such as the probability values of t-statistics, f-statistics, and Durbin Watson, are considered. If these signals are present, the restored model has avoided the autocorrelation problem.

According to the Food Security Agency, the condition of food security can be identified by one of the indicators, namely the availability of food for consumption. The availability of food is divided into two, namely the availability of energy and protein. Food availability comes from food production in the region concerned, in this study is Aceh. Figure 1 show the condition of energy and protein availability in Aceh from 2013 to 2020 by classifying energy and protein from vegetable and animal sources. According to (Antika Prycilla Veronika, Theresia Puspitawati, 2021), the recommended availability of energy and protein is 2550 kcal/capita/day for energy and 55 grams/capita/day for protein. Based on the two graphs above, the availability of energy and protein in Aceh has met the recommended criteria. The average availability of energy in Aceh each year is between 2550 to 2980 kcal/capita/day, while protein is between 71 to 89.6 grams/capita/day. Energy availability is also increasing almost every year, except in 2014-2016 which decreased by 7 to 9 percent and in 2018 it decreased by 1.9 percent. The average increase is between 1.2 to 7 percent. As for the availability of protein changes between -7 to 9 percent.

Another indication of food security that may be utilized is the level of food consumption. Food consumption indicators may be used to determine the quantity of food that families can get and eat. To evaluate the degree of nutritional absorption, food consumption is also separated into energy and protein consumption. According to the 2015 National Food and Nutrition Association (WKNPG), the recommended daily energy and protein intakes are 2200 kcal/capita/day and 57 grams/capita/day, respectively. By comparing the proposed requirements to the data in Figure 1, it is clear that energy use continues to fall well short of the adequacy level. The growth of protein intake in Aceh is seen in Figure 4. According to the WKNPG's guidelines and the statistics in Figure

4, protein consumption in Aceh is still well below the adequacy threshold. During the research period, the Acehnese population's protein consumption exceeded 50 grams/capita/day just once, in 2020, when it reached 53.75 grams/capita/day. Prior to 2020, it was about 40 grams per capita per day, and even in 2015, it was just 37.33 grams per capita per day, much below the required requirement of 57 grams per capita per day.

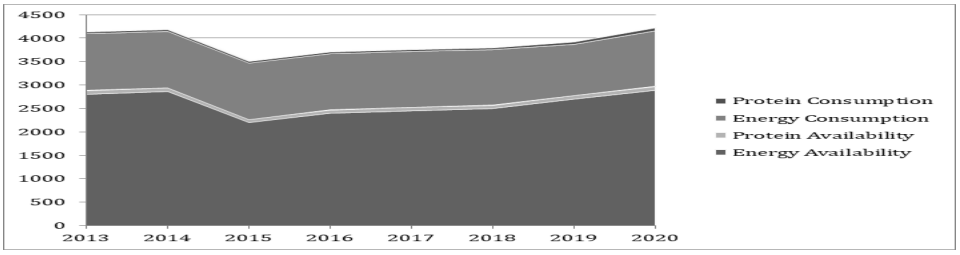

Figure 1. Development of Energy & Protein Availability and Energy & Protein Consumption per Capita per day in Aceh 2013-2020

Source: Aceh Provincial Agency

Most of the protein consumed is vegetable protein, if the average amount is 34.15 grams/capita/day, or 81 percent of the total protein consumed. Meanwhile, animal protein consumed annually is 8.26 grams/capita/day or 19 percent of the total protein consumed. The next stage is to make an estimate using a model that has already been created. Data processing is carried out by using the Error Correction Model to determine the short-term behavior and long-term behavior of the factors that affect Food Security in Aceh. In this study, food security is defined as the total of the values for energy availability, protein availability, energy consumption, and protein consumption. To examine the effect of the three independent variables utilized in this study on Aceh's food security, four models were used: **the energy availability model, protein availability model, energy consumption model, and protein consumption model**. Fertilizer subsidies, food credit, and government infrastructure spending are the independent factors. Table 1 present the summary result of long term behavior of all models, and table 1 present the summary result of short term behavior of all models.

Table 3. Summary of Estimated Result of Long-Term and Short –Term Models

	Variables	**Long Term**				**Short Term**			
		eam	**pam**	**ecm**	**pcm**	**eam**	**pam**	**ecm**	**pcm**
Coefficient	sf	-0.04	-0.008	-0.08	-0.12	0.14	0.03	-0.01	0.32
Prob		0.32	0	0.05	0.65	0.00	0.00	0.18	0.00
Coefficient	ct	0.007	0.005	0.001	0.28	-0.004	-0.001	-0.005	-0.01
Prob		-0.13	0	0.50	0.94	0.01	0.00	0.02	0.00
Coefficient	gi	-0.015	-0.01	-0.019	-0.03	0.013	0.002	-0.01	0.01
Prob		0.13	0	0.5	0.05	0	0.05	0.11	0.16
Coefficient	c	7.01	3.94	7.98	5.17	0.002	0.005	0.01	0.20
Prob		0.00	0.00	0.00	0.00	0.55	0.00	0.00	0.00
Coefficient	ect(-1)					-0.22	-0.60	-0.40	-0.27
Prob						0.02	0.04	0.03	0.00
	R-Squared	0.380	0.735	0.191	0.141	0.433	0.380	0.365	0.601
	DW	0.398	0.388	0.436	0.374	0.769	0.688	1.041	1.310
	F-stat	5.734	25.99	2.206	1.541	4.965	6.871	2.738	9.822
	Prob(F-Stat)	0.003	0.000	0.109	0.225	0.004	0.000	0.015	0.000

Source: own presentation, 2021

In the long run model, the variable with a positive and significant influence is food credit in terms of food availability (energy and protein availability), as shown by a coefficient probability of less than 5%. The coefficient of determination of the model indicates the extent to which the independent variable may explain the dependent variable. According to the estimation findings, the coefficient of determination is 0.380594. This suggests that variance in the three independent variables accounts for 38.05 percent of the variation in energy availability. The coefficient of determination for the protein availability model is 0.735809. This suggests that variance in the three independent variables may account for 73.58 percent of the variation in energy availability. While the remainder is explained by factors not included in the model.

In the short term model, major variables include fertilizer subsidies in the food availability (energy and protein) and protein consumption models, as well as government infrastructure spending in the energy availability model. The coefficient of determination in the energy availability model is 0.433067 for the short-term equation. This suggests that 43.30 percent of the variance in short-term energy availability in Aceh can be explained by the three independent factors. In terms of protein availability, this value is 0.380594. This suggests that 38.05 percent of the variance in short-term energy availability in Aceh can be explained by the three independent factors. The coefficient of determination for energy consumption is 0.365166. This suggests that 36.51 percent of the variance in short-term energy availability in Aceh can be described by change in the three independent variables, and the coefficient of determination for protein consumption is 0.601768. This suggests that 60.17 percent of the variance in short-term energy availability in Aceh can be explained by the three independent factors.

CONCLUSION

Several significant points may be deduced as a result of the topic that has been provided. In the long run, food credit has a considerable positive influence on food availability (energy and protein), implying that credit increases food availability. According to the law of supply, this results in a rightward shift of the supply curve. Subsidized fertilizers have a short-term positive and considerable influence on food availability; they cut farmers' production costs, hence shifting the supply curve to the right. Subsidized fertilizers also have a favorable and considerable influence on protein consumption. This is because they lower farmer prices, which lowers output costs. As a result, consumption increases, increasing the amount requested. Government investment in infrastructure also has a positive and considerable influence on energy availability. This is because government construction of irrigation and highways facilitates distribution for farmers, resulting in increased production and a shift to the right of the supply curve. These findings conclude that Aceh food security in the short term is more stable than the long-term food security.

Thus, all interest parties that in line with food security should pay attention to ensure the food security in Aceh run well in the long term. They have to guarantee the distribution of fertilizer subsidies are equitably and transparently, and to create irrigation and roads to improve food distribution, thereby increasing consumption in all regions. Credit should also be extended without imposing onerous terms and restrictions on disadvantaged farmers. So that food credit may continue to assist impoverished farmers in Aceh with capital challenges.

REFERENCES

Abdallah, M. Ben, Fekete-Farkas, M., & Lakner, Z. (2021). Exploring the link between food security and food price dynamics: A bibliometric analysis. *Agriculture (Switzerland)*, *11*(3), 1–19. https://doi.org/10.3390/agriculture11030263

Abdul Manap, N. M. (2020). the Effectiveness of Food Security Dimensions on Food Security in Landlocked Developing Countries. *International Journal of Modern Trends in Social Sciences*, *3*(14), 116–128. https://doi.org/10.35631/3140010

Antika Prycilla Veronika, Theresia Puspitawati, A. F. P. (2021). Associations between nutrition knowledge, protein-energy intake and nutritional status of adolescents. *Journal of Public Health Research*, *10:2239*(3), 5. https://doi.org/https://dx.doi.org/10.4081%2Fjphr.2021.2239

Arouna, A., Soullier, G., Mendez del Villar, P., & Demont, M. (2020). Policy options for mitigating impacts of COVID-19 on domestic rice value chains and food security in West Africa. *Global Food Security*, *26*(June), 100405. https://doi.org/10.1016/j.gfs.2020.100405

Bacior, S., & Prus, B. (2018). Infrastructure development and its influence on agricultural land and regional sustainable development. *Ecological Informatics*, *44*(February), 82–93. https://doi.org/10.1016/j.ecoinf.2018.02.001

Bidisha, S. H., Khan, A., Imran, K., Khondker, B. H., & Suhrawardy, G. M. (2017). Role of credit in food security and dietary diversity in Bangladesh. *Economic Analysis and Policy*, *53*, 33–45. https://doi.org/10.1016/j.eap.2016.10.004

Chen, Y. hua, Wen, X. wei, Wang, B., & Nie, P. yan. (2017). Agricultural pollution and regulation: How to subsidize agriculture? *Journal of Cleaner Production*, *164*, 258–264. https://doi.org/10.1016/j.jclepro.2017.06.216

Clapp, J., Moseley, W. G., Burlingame, B., & Termine, P. (2021). The case for a six-dimensional food security framework. *Food Policy*, *xxxx*, 102164. https://doi.org/10.1016/j.foodpol.2021.102164

Coles, G. D., Wratten, S. D., & Porter, J. R. (2016). Food and nutritional security requires adequate protein as well as energy, delivered from whole-year crop production. *PeerJ*, *2016*(7). https://doi.org/10.7717/peerj.2100

Darma, S., Pusriadi, T., Darma, D. C., Agroteknologi, P. S., Pertanian, F., Mulawarman, U., Manajemen, P. S., & Ekonomi, F. (2020). Indonesia Government's Strategy for Food Security: During the COVID-19 Period. *International Journal of Advanced Science and Technology*, *29*(4), 10338–10348.

Mahendra Dev, S., & Chandrasekhara Rao, N. (2010). Agricultural price policy, farm profitability and food security. *Economic and Political Weekly*, *45*(26–27), 174–182.

Nugroho, P. E. (2017). Government Expenditure, Agricultural Productivity, and Poverty Reduction in Indonesia: A Simultaneous Equations Approach. *Journal of the Graduate School of Asia-Pacific Studies*, *34*(34), 39–54.

Peng, H., & Pang, T. (2019). Optimal strategies for a three-level contract-farming supply chain with subsidy. *International Journal of Production Economics*, *216*(December 2018), 274–286. https://doi.org/10.1016/j.ijpe.2019.06.011

Reincke, K., Vilvert, E., Fasse, A., Graef, F., Sieber, S., & Lana, M. A. (2018). Key factors influencing food security of smallholder farmers in Tanzania and the role of cassava as a strategic crop. *Food Security*, *10*(4), 911–924. https://doi.org/10.1007/s12571-018-0814-3

Sanga, U., Sidibé, A., & Olabisi, L. S. (2021). Dynamic pathways of barriers and opportunities for food security and climate adaptation in Southern Mali. *World Development*, *148*, 105663. https://doi.org/10.1016/j.worlddev.2021.105663

Syahnur, S., Endra, E., & Muhammad, S. (2014). Short-Run and Long-Run Effect of Oil Consumption on Economic Growth: Ecm Model. *Economic Journal of Emerging Markets*, *6*(1), 38–49. https://doi.org/10.20885/ejem.vol6.iss1.art4

Timmer, P. (2011). Food Security in Indonesia: Current Challenges and the Long-Run Outlook. *SSRN Electronic Journal*, *May*. https://doi.org/10.2139/ssrn.1112807

Vysochyna, A., Stoyanets, N., Mentel, G., & Olejarz, T. (2020). Environmental determinants of a country's food security in short-term and long-term perspectives. *Sustainability (Switzerland)*, *12*(10), 1–15. https://doi.org/10.3390/su12104090

Xu, J. F., & Liao, P. (2014). Crop insurance, premium subsidy and agricultural output. *Journal of Integrative Agriculture*, *13*(11), 2537–2545. https://doi.org/10.1016/S2095-3119(13)60674-7

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