Asian Journal of Agriculture and Rural Development
Volume 15, Issue 1 (2025): 39-49

The dynamic impact of government agricultural expenditure on the agricultural value added in ASEAN-5 countries

Jirawat Jaroensathapornkul

Faculty of Economics, Srinakharinwirot University, Thailand.

jirawatj@m.swu.ac.th

Article History
Received: 26 November 2024
Revised: 23 January 2025
Accepted: 4 February 2025
Published: 19 February 2025

Keywords
Agricultural value added
ASEAN
Cointegration
Dynamic impact
Error correction model
Government agricultural expenditure
Indonesia
Malaysia
Thailand
The Philippines
Vietnam.

ABSTRACT
This study aims to investigate the long-run and short-run impacts of government agricultural expenditure on agricultural value added in ASEAN-5 countries. It employs the Augmented Dickey–Fuller (ADF) unit root test to ensure data stationarity and the Johansen cointegration and Error Correction Model (ECM) to determine the long-run and short-run relationships, respectively. The findings indicate that, after adjusting the data to first or second differences, they are stationary with statistical significance. Based on the Johansen cointegration test, the trace test indicates that government agricultural expenditures have a long-run impact on agricultural value added in ASEAN-5 countries. Additionally, the estimated parameters of the error correction terms suggest that we can correct the disequilibrium in the short-run impacts. The estimation results of the ECM also show that government agricultural expenditure positively affects agricultural value added under different time-lag conditions. The study concludes that the government has played a significant role in enhancing agricultural value added in ASEAN-5 countries up to the present. As government spending is a part of fiscal policy, it is suggested that the government's agricultural budget be used more efficiently. This will help implement fiscal policy and boost economic growth in the short term.

Contribution/Originality: This research provides a novel analysis of the impacts of government agricultural expenditure on agricultural value added in ASEAN-5 countries using dynamic econometric models. It highlights the significant role of efficient budget allocation in enhancing agricultural value added and offers valuable insights for policymakers in developing economies.

DOI: 10.55493/5005.v15i1.5305
ISSN(P): 2304-1455/ ISSN(E): 2224-4433

How to cite: Jaroensathapornkul, J. (2025). The dynamic impact of government agricultural expenditure on the agricultural value added in ASEAN-5 countries. *Asian Journal of Agriculture and Rural Development, 15*(1), 39–49. 10.55493/5005.v15i1.5305

1. INTRODUCTION

Government support mechanisms for sustainable agriculture, highlighting that subsidies, programs, regulations, and financial assistance are the primary tools funded through government budgets (Barbosa, 2024). Regarding the functional classification of government budget expenditures, one important category is that of economic affairs.

Moreover, the classification of government agricultural expenditure as economic affairs primarily focuses on providing public services for agricultural development (Budget, 2022). Between 1980 and 1998, the ratio of government spending on the agricultural sector to total spending declined in Asia, Latin America, and Africa (Fan & Rao, 2003). Within Asian countries, namely, South Korea, Thailand, Malaysia, and Indonesia, this ratio was rather constant from 1972 to 1993 (Fan & Pardey, 1998). Moreover, from 1961 to 1992, this ratio in Thailand ranged from 7.4% to 10.4% (Yamada, 1998) while the government paid more attention to road system development (Fan, Jitsuchon, & Methakunnavut, 2004). Apart from this, the government spending on agriculture significantly boosts sustainable agricultural economic growth in China. This positive impact is especially strong in central regions and areas with a high proportion of primary industry, with agricultural industry integration playing a crucial role in enhancing this effect (Zhang & Zhang, 2024).

Currently, based on data from the Food and Agriculture Organization (FAO) in ASEAN-5 countries: Indonesia, Malaysia, the Philippines, Thailand, and Vietnam, the average values of central government spending on agriculture, forestry, and fishery from 2001 to 2021 in Thailand, Indonesia, Malaysia, and the Philippines were 4,098.58, 2,244.13, 1,692.05, and 1,591.39 million USD, respectively, while the corresponding average value in Vietnam from 2006 to 2013 was 573.75 million USD (Table 1). Furthermore, the ratio of central government spending on agriculture, forestry, and fishery to total central government spending in Thailand, which was about 5.99%, was ranked the highest. Although the average value of central government spending on agriculture, forestry, and fishery in Indonesia was obviously greater than that of Vietnam, the ratio of this value to total central government spending was not much different (Table 1).

Theoretically, government agricultural expenditure has played a role in driving real agricultural gross domestic product (GDP) expansion in the short run and long run. Based on the findings of Benin and Mogues (2012) government spending on rural areas supports economic growth in the agricultural sector and poverty reduction in various countries of the African region, while the extents of its impact were different in each country. Moreover, Ngobeni and Muchopa (2022) revealed that an increase in government agricultural expenditure in South Africa, average annual rainfall, and population was shown to ultimately increase the value of agricultural production. On the other hand, research findings in the case of Nigeria show both positive and negative impacts on the agricultural sector. Tijani, Oluwasola, and Baruwa (2015) found that public spending positively affected long-run growth in the agricultural sector with statistical significance. Abdullahi (2021) also succinctly stated that public spending on agriculture encouraged productivity. Ogah, Bartholomew, and Ezihe (2023) specifically revealed that the public spending on agriculture between 1999 and 2020 (a period when Nigeria had a democratic system) positively affected short-run and long-run growth in the agricultural sector with statistical significance. Nevertheless, Oyinbo, Zakari, and Rekwot (2013); Akinjare, Adetiloye, and Oladeji (2014); Ani, Biam, and Kantiok (2014); Lawal et al. (2019) and Omodero (2019) criticized the fact that government agricultural expenditure had no power to drive the engine of the agricultural sector and eradicate poverty with statistical significance. It is also consistent with the main empirical findings in Malawi (Musaba, Chilonda, & Matchaya, 2013) Lesotho (Megbowon, Mothae, & Relebohile, 2022) and Ethiopia (Mulugeta Emeru, 2023).

Table 1. Central government spending on agriculture, forestry, and fishing in ASEAN-5 countries.

Year	Central government spending on agriculture, forestry, and fishing (Unit: Millions USD)	Percentage of total central government spending
Indonesia		
2001 - 2009	874.10	1.77%
2010 - 2019	3,753.27	2.48%
Average	2,244.13	2.06%
Malaysia		
2005 - 2014	1,597.33	3.75%
2015 - 2021	1,778.16	2.46%
Average	1,692.05	3.07%
The Philippines		
2001 - 2009	984.09	4.58%
2010 - 2021	2,046.86	3.80%
Average	1,591.39	4.14%
Thailand		
2001 - 2009	2,029.24	5.75%
2010 - 2021	5,650.59	6.18%
Average	4,098.58	5.99%
Vietnam		
2006 - 2013	573.75	2.39%

Source: Food and agriculture organization (FAO).

As for the empirical evidence of Asian countries, government agricultural expenditure on research and development (R&D) as well as agricultural extension service has had a positive impact on agricultural productivity in India (Fan, Hazell, & Thorat, 1999). This is especially evident in the case study of Meghalaya, located in northeastern India, which found that government agricultural expenditure positively affected economic growth in the agricultural sector (De, 2018). Meanwhile, the empirical evidence from China revealed that public spending played a significant role in agricultural green total factor productivity (AGTFP) (Wang, Zhu, Wang, & Zhong, 2022). Moreover, the public budget allocated to reduce poverty in China was reserved for a project that encouraged agricultural productivity and allowed the rural economy to recover and develop sustainably (Zeng, Zhang, Li, & Sun, 2021).

Research in ASEAN countries shows that public spending positively impacts agricultural GDP per capita growth in Indonesia (Armas, Osorio, Moreno-Dodson, & Abriningrum, 2012; Nugroho, 2017). Agricultural function expenditure has also boosted provincial economic growth in Indonesia (Rajagukguk, 2021). In Malaysia, government expenditure significantly influences agricultural production (Zhi & Wong, 2020). Increasing government expenditure is more effective than reducing taxes for economic relief during recessions, as it positively affects most sectoral outputs (Hong, 2016). In the ASEAN region, government agricultural expenditure has significant long-term positive effects on real GDP, though short-term effects are not statistically significant (Saengchai, Sriyakul, & Jermsittiparsert, 2019). According to the above research findings, the empirical study of ASEAN-5 countries, i.e., Indonesia, Malaysia, the Philippines, Thailand, and Vietnam, which are important countries in terms of agriculture, has been limited up to the present. This leads to the main objective of the paper, which is to look into the short- and long-term effects of ASEAN-5 governments' spending on agriculture on the value added by agriculture. The expected benefit of the paper is to affirm the role of government in the achievement of value-added agricultural expansion.

2. MATERIALS AND METHODS

Based on the measurements and sources of data in Table 2, the annual frequency of the data and the limited number of observations were considered inappropriate for time series analysis. Therefore, quarterly data was extrapolated by using the Denton method. Apart from this, the econometric models were based on Musaba et al. (2013); Oyinbo et al. (2013) and Ngobeni and Muchopa (2022). Basically, the procedure began with a hypothesis test for stationary time series data on agricultural value added and government agricultural expenditure in ASEAN-5 countries. The augmented Dicky-Fuller test (ADF Test) was utilized for stationary tests. Here is an illustration of the regression:

$$\Delta y_{jst} = \alpha_{js} + \beta_{js} Trend_{jst} + \vartheta_{js} y_{jst-1} + \varphi_{1js} \Delta y_{jst-1} + \cdots + \varphi_{p-1js} \Delta y_{jst-p+1} + e_{jst} \quad (1)$$

Where $\alpha, \beta,$ and p represent constant, coefficient of the time trend variable, and the lag order of the autoregressive process, respectively. Δy_t is the difference between the value in the current period and that of one lag period, namely, $\Delta y_{t-1} = y_{t-1} - y_{t-2}$. e represents the error terms, which are the i.i.d. variables $j = 1,2$, where 1 and 2 are the variable of agricultural value added and the variable of the government agricultural expenditure, respectively. On the other hand, $s = 1,2,3,4,5$, where $1,2,3,4$ and 5 represent Indonesia, Malaysia, the Philippines, Thailand, and Vietnam, respectively. In a practical way, the ADF test was used for data in the form of level, first difference (Δ), and second difference (Δ^2). The Equation 1 was also separated into three types of tests: model with intercept, model with trend and intercept, and model without trend and intercept, which are hence referred to as "intercept," "trend and intercept," and "none," respectively. In the next step, those stationary data were analyzed for the long-run relationship, which is the so-called "cointegration." The Johansen cointegration test was utilized for the cointegration tests. The equations of two likelihood ratio tests, namely, the trace test and the maximum eigenvalue test, are expressed as follows.

$$J_{trace,s} = -T_s \sum_{i=r+1}^{n} Ln(1 - \lambda_{i,s}) \quad (2)$$

$$zJ_{max,s} = -T_s Ln(1 - \lambda_{r+1,s}) \quad (3)$$

Where T the number of observations is, λ_i is the ith largest canonical correlation, and r is the number of cointegrating vectors. The null hypothesis shows that there is no long-run relationship between the variable of agricultural value added and the variable of government agricultural expenditure. If either the trace statistic or the maximum eigenvalue statistic is greater than its critical values, the null hypothesis will be rejected. Similarly, if the MacKinnon-Haug-Michelis *p*-value is less than the level of significance, the null hypothesis will be rejected. It also shows whether the null hypothesis is rejected or not when the trend assumption is met (quadratic deterministic trend and no deterministic trend) and when lag intervals are used in the first differences. After the cointegration between those variables was assessed, the short-run relationship between the variable of agricultural value added and the variable of the government agricultural expenditure in ASEAN-5 countries was analyzed by using an error correction model. The model is described as follows:

$$\Delta y_{1st} = \gamma_{0s} + \sum_{i=1}^{p} \omega_{js} \Delta y_{jst-i} + \gamma_s ECM_{st-1} + \varepsilon_{st} \quad (4)$$

Where γ_0 represents the constant terms, ECM represents the error correction terms, and ε represents the error terms, which are i.i.d. Theoretically, the sign of ECM is expected to be negative. On the other hand, the parameters ω_{2s} can be positive or negative, according to the main findings of various empirical studies in the previous literature, under a null hypothesis of $\omega_{2s} = 0$. On the top of that, Lagrange multiplier (LM) test for residual serial correlation in a vector error correction model (VECM) was used to see if there was evidence of autocorrelation in the residuals. The White test was also utilized for VEC residual heteroskedasticity tests (levels and squares).

Table 2. Variables, descriptions, measurement, and sources.

Variable	Description	Measurement	Source
y_{1s}	Value added in agriculture, forestry and fishing in country s, where s = 1,2,3,4, and 5.	Item code: 22016, value added in 2015 US$ prices.	FAOSTAT (2023)
y_{2s}	Central government spending on agriculture, forestry, and fishing in country s, where s = 1,2,3,4, and 5.	Item code: 23161, value added in 2015 US$ prices. FAOSTAT government expenditure statistics pertain to the central government subsector. The central government subsector consists of the institutional unit(s) of the central government plus those nonmarket non-profit institutions (NPIs) that are controlled by the central government. The political authority of central government extends over the entire territory of the country. It is generally composed of a budgetary central government, extrabudgetary units, and social security funds (Unless a separate subsector is used for social security funds).	FAOSTAT (2023)

Note: 1 = Indonesia. 2 = Malaysia, 3 = The Philippines, 4 = Thailand, and 5 = Vietnam.

3. RESULTS AND DISCUSSION

According to the ADF test results from three types of tests: "intercept," "trend and intercept," and "none," MacKinnon one-sided *p*-values indicated that almost all time series data in the form of levels of agricultural value added $(y_{11}, y_{14}, y_{15})$and government agricultural expenditure in ASEAN-5 countries $(y_{21}, \ldots, y_{25})$were not stationary with statistical significance at the 0.05 level, except those of Malaysia $(y_{12})$and the Philippines (y_{13}), in the test of the "intercept" model. Nevertheless, after all data were adjusted to be in the form of the first or second difference $(\Delta y, \Delta^2 y)$, they were found to be stationary with statistical significance at the 0.05 level (Table 3). Since the second difference data sets were employed for the error correction model of each country, the cointegration test was basically run by using the first difference data sets (Δy_{1s} and Δy_{2s}). The trace test and the MacKinnon-Haug-Michelis *p*-values show that government spending agricultural has an long-term effect on the value added to agriculture in ASEAN-5 countries. This effect is statistically significant at the 0.05 level. These results are presented under the conditions of trend assumption (quadratic deterministic trend and no deterministic trend) and lag intervals (1 to 5, 7, 9, 13, and 17) in first differences (Table 4). It corresponds with the empirical evidence of Saengchai, Sriyakul, & Jermsittiparsert (2019) which presented the results of the ASEAN region.

As for the short-run impact, the estimation results of the error correction model for all countries are statistically credible. The reason for this is that the LM test for residual serial correlation in a VECM residual heteroskedasticity test did not show any signs of autocorrelation or heteroskedasticity in the residuals. Furthermore, the sign of the estimated parameter of error correction terms $(\gamma_1, \ldots, \gamma_5)$ implies that disequilibrium in the short-run impacts can be corrected with statistical significance at the 0.05 level. As for the estimation results of ω_{2s}, the government agricultural expenditure positively affects the agricultural value added in ASEAN-5 countries with statistical significance at the 0.05 level (Table 5). This is consistent with the research findings in Indonesia of the World Bank (2010); Armas et al. (2012); Nugroho (2017) and Rajagukguk (2021) as well as the research findings in Malaysia of Zhi and Wong (2020) and Hong (2016). Apart from this, the estimation results of $\omega_{21}, \omega_{22}, \omega_{23}, \omega_{25}$imply that the time lag of government agricultural expenditure impact on the agricultural sectors of Indonesia and Vietnam is just 1 quarter, while the time lags of such an impact in Malaysia and Thailand are 2 and 4 quarters, respectively, with statistical significance at the 0.05 level. Unfortunately, the estimation results of ω_{24} (the Philippines) failed to reject the null hypothesis from 1 to 4 quarters of time lag with statistical significance at the 0.05 level (Table 5).

Table 3. Results of augmented Dickey–Fuller (ADF) unit root test (In levels, 1st difference, and 2nd difference).

Variables	Model	Augmented Dickey-Fuller test statistics					
		Levels	MacKinnon one-sided *p*-values	1st difference (Δ)	MacKinnon one-sided *p*-values	2nd difference (Δ^2)	MacKinnon one-sided *p*-values
Indonesia							
y_{11}	Intercept	1.5337	0.9992	-1.3279	0.6114	-4.8389	0.0002**
	Trend and intercept	-2.4623	0.3452	-2.4232	0.3644	-4.8125	0.0013**
	None	2.2731	0.9941	1.1339	0.9320	-4.5587	0.0000**
y_{21}	Intercept	0.1844	0.9695	-2.3589	0.1575	-4.7889	0.0002**
	Trend and intercept	-0.9757	0.9397	-3.7841	0.0244**	-4.6017	0.0025**
	None	0.8829	0.8969	-2.1774	0.0294**	-4.8164	0.0000**
Malaysia							
y_{12}	Intercept	-3.0447	0.0357**	-2.5443	0.3067	-5.1783	0.0000**
	Trend and intercept	0.1538	0.9972	-4.0310	0.0120**	-5.1459	0.0004**
	None	1.2483	0.9448	-1.2837	0.1819	-5.0162	0.0000**
y_{22}	Intercept	-0.3493	0.5556	-3.1097	0.0304**	-3.9438	0.0030**
	Trend and intercept	-2.5443	0.3067	-3.7173	0.0277**	-3.9057	0.0172**
	None	-0.3493	0.5556	-3.1344	0.0021**	-3.9455	0.0002**
The Philippines							
y_{13}	Intercept	-3.4211	0.0135**	-2.1148	0.2397	-4.2599	0.0011**
	Trend and intercept	-0.5744	0.9773	-4.0678	0.0108**	-4.2515	0.0066**
	None	1.1712	0.9366	-1.4399	0.1387	-4.1477	0.0001**
y_{23}	Intercept	-1.9962	0.2879	-3.8058	0.0045**	-3.6802	0.0066**
	Trend and intercept	-1.6268	0.7722	-4.0595	0.0111**	-3.6510	0.0330**
	None	0.6590	0.8561	-3.6426	0.0004**	-3.7147	0.0003**
Thailand							
y_{14}	Intercept	-2.0387	0.2700	-3.8225	0.0043**	-2.8682	0.0544
	Trend and intercept	-1.8176	0.6855	-4.1148	0.0095**	-2.8435	0.1873
	None	1.7852	0.9813	-3.2351	0.0016**	-2.8893	0.0044**
y_{24}	Intercept	-0.3662	0.9084	-3.3502	0.0163**	-2.7348	0.0734
	Trend and intercept	-2.2919	0.4325	-3.3466	0.0674	-2.7290	0.2287
	None	1.1630	0.9356	-3.0311	0.0029**	-2.7550	0.0065**
Vietnam							
y_{15}	Intercept	2.3327	0.9999	-1.2289	0.6554	-3.7243	0.0065**
	Trend and intercept	1.3507	1.0000	-2.1354	0.5146	-4.3946	0.0051**
	None	2.2193	0.9930	0.5586	0.8336	-3.6580	0.0005**
y_{25}	Intercept	-1.2161	0.6610	-2.9617	0.0452**	-4.2300	0.0015**
	Trend and intercept	-1.1196	0.9159	-3.6574	0.0343**	-4.1814	0.0092**
	None	-0.3180	0.5663	-3.0691	0.0028**	-4.1521	0.0001**

Note: The asterisk ** denoted statistically significant at the 0.05 level.

Table 4. Results of Johansen cointegration test.

Variables	Trend assumption	Lags interval (In 1st differences)	Hypothesized number of cointegration				Conclusion
			None		At most 1		
			Trace statistic	MacKinnon-Haug-Michelis *p*-value	Trace statistic	MacKinnon-Haug-Michelis *p*-value	
Indonesia Δy_{11} and Δy_{21}	Quadratic deterministic trend	1 to 7	67.3422	0.0000	16.4080	0.0001	Trace test indicates 2 cointegrating equations at the 0.05 level
Malaysia Δy_{12} and Δy_{22}	Quadratic deterministic trend	1 to 5	50.5318	0.0000	20.4916	0.0000	Trace test indicates 2 cointegrating equations at the 0.05 level
The Philippines Δy_{13} and Δy_{23}	Quadratic deterministic trend	1 to 13	35.3924	0.0001	16.4165	0.0001	Trace test indicates 2 cointegrating equations at the 0.05 level
Thailand Δy_{14} and Δy_{24}	Quadratic deterministic trend	1 to 9	37.2793	0.0000	12.0680	0.0005	Trace test indicates 2 cointegrating equations at the 0.05 level
Vietnam Δy_{15} and Δy_{25}	No deterministic trend (Restricted constant)	1 to 17	50.0580	0.0000	13.6085	0.0068	Trace test indicates 1 cointegrating equation at the 0.05 level

Note: Since the 2nd difference data sets are employed for the error correction model in each country, the 1st the cointegration test is basically run by the 1st difference data sets. *p*-value represented.

Table 5. Estimation results of error correction model.

Variable	$\Delta^2 y_{1st}$				
	Indonesia $(s=1)$	Malaysia $(s=2)$	The Philippines $(s=3)$	Thailand $(s=4)$	Vietnam $(s=5)$
Constant	5.3279 (0.6090)	-0.0207 (-0.0064)	-0.9858 (-0.3196)	0.1027 (0.0190)	-
Trend	-0.0953 (-0.4835)	0.0057 (0.0840)	0.0573 (0.8698)	-0.0015 (-0.0140)	-
ECM_{st-1}	-0.2756 (-2.6314) **	-0.3444 (-5.0808) **	-0.4387 (-3.4683) **	-0.3103 (-4.5391) **	-4.9523 (-3.3938) **
$\Delta^2 y_{1st-1}$	-0.0378 (-0.2344)	0.8558 (8.4015) **	1.0236 (7.1513) **	0.7741 (6.6170) **	5.1046 (4.2773) **
$\Delta^2 y_{1st-2}$	0.1942 (1.2176)	0.1542 (2.0689) **	0.3465 (1.8576) *	0.2117 (1.4457)	5.1931 (3.3410) **
$\Delta^2 y_{1st-3}$	0.2666 (1.7178) *	0.1565 (2.1002) **	0.3558 (1.8882) *	0.1809 (1.3079)	4.6731 (3.1932) **
$\Delta^2 y_{1st-4}$	-0.0860 (-0.5924)	-0.6560 (-8.7847) **	-0.8875 (-4.7401) **	-0.3427 (-2.4461) **	3.4586 (2.3398) **
$\Delta^2 y_{1st-5}$	0.09814 (0.6531)	0.5735 (6.2352) **	1.0968 (4.9788) **	0.4960 (3.5363) **	5.0981 (4.3442) **
$\Delta^2 y_{1st-6}$	0.1636 (1.0958)	-	0.2196 (0.9525)	0.0614 (0.5826)	5.3843 (3.1130) **
$\Delta^2 y_{1st-7}$	0.2581 (1.8300) *	-	0.2212 (0.9581)	0.0824 (0.8252)	2.1294 (1.2100)
$\Delta^2 y_{1st-8}$	-	-	-0.6894 (-2.9935) **	-0.2724 (-2.7284) **	4.9761 (2.4458) **
$\Delta^2 y_{1st-9}$	-	-	0.8042 (3.6170) **	0.2950 (3.3312) **	2.9457 (1.4247)
$\Delta^2 y_{1st-10}$	-	-	0.0877 (0.5511)	-	5.3321 (2.5681) **
$\Delta^2 y_{1st-11}$	-	-	0.0784 (0.4935)	-	1.4798 (0.6711)
$\Delta^2 y_{1st-12}$	-	-	-0.4078 (-2.5539) **	-	7.0141 (2.7959) **
$\Delta^2 y_{1st-13}$	-	-	0.42792 (3.1702) **	-	2.3708 (0.8607)
$\Delta^2 y_{1st-14}$	-	-	-	-	1.5935 (1.9217) *
$\Delta^2 y_{1st-15}$	-	-	-	-	-1.6864 (-1.1009)
$\Delta^2 y_{1st-16}$	-	-	-	-	3.3689 (1.8514) *
$\Delta^2 y_{1st-17}$	-	-	-	-	-1.3419 (-0.9127)
$\Delta^2 y_{2st-1}$	0.2026 (2.3002) **	0.1919 (1.6345)	0.15419 (0.9947)	0.1693 (1.2242)	5.2409 (2.1101) **
$\Delta^2 y_{2st-2}$	0.1868 (2.2469) **	0.1786 (1.7446) *	0.2021 (1.0834)	0.1815 (1.3133)	1.6678 (1.1847)
$\Delta^2 y_{2st-3}$	0.1767 (2.2151) **	0.1785 (1.7434) *	0.1745 (0.9411)	0.1475 (1.1725)	4.0854 (2.1460) **
$\Delta^2 y_{2st-4}$	0.1038 (1.8959) *	-0.0731 (-0.7137)	0.2498 (1.3155)	0.4244 (3.3423) **	-0.8101 (-0.4001)
$\Delta^2 y_{2st-5}$	0.0765 (1.4396)	0.2643 (2.3111) **	0.0719 (0.2581)	0.0028 (0.0146)	3.9327 (1.7307) *
$\Delta^2 y_{2st-6}$	0.0692 (1.3556)		0.1185 (0.4320)	0.0772 (0.6108)	-0.1278 (-0.0625)

Table 5. Continue

Variable	$\Delta^2 y_{1st}$				
	Indonesia $(s=1)$	**Malaysia** $(s=2)$	**The Philippines** $(s=3)$	**Thailand** $(s=4)$	**Vietnam** $(s=5)$
$\Delta^2 y_{2st-7}$	0.0561 (1.1479)	-	0.0776 (0.2784)	0.0538 (0.4476)	5.5263 (1.6731)*
$\Delta^2 y_{2st-8}$	-	-	0.4179 (1.4646)	0.4397 (3.6451)**	-5.2417 (-1.4178)
$\Delta^2 y_{2st-9}$	-	-	-0.0959 (-0.3248)	-0.0971 (-0.7430)	5.2453 (1.7765)*
$\Delta^2 y_{2st-10}$	-	-	0.0372 (0.2071)	-	1.6141 (0.9585)
$\Delta^2 y_{2st-11}$	-	-	0.0151 (0.0834)	-	5.4840 (2.1071)**
$\Delta^2 y_{2st-12}$	-	-	0.3860 (2.1058)**	-	-1.1111 (-0.3925)
$\Delta^2 y_{2st-13}$	-	-	-0.1676 (-1.0158)	-	5.6040 (2.6373)**
$\Delta^2 y_{2st-14}$	-	-	-	-	1.6671 (1.6546)
$\Delta^2 y_{2st-15}$	-	-	-	-	2.9075 (2.3314)**
$\Delta^2 y_{2st-16}$	-	-	-	-	1.5062 (1.1648)
$\Delta^2 y_{2st-17}$	-	-	-	-	3.1032 (2.1394)**
R-squared	29.5910	88.7534	88.6364	85.1106	98.2266
S.E. equation	28.3002	12.1784	9.0726	17.4973	10.1973
Observations	63	73	65	69	45
p-value LM test (Lag h)	0.0698 (h=7)	0.4536 (h=5)	0.2320 (h=13)	0.8760 (h=9)	0.9057 (h=17)
p-value White test (Joint test)	0.5953	0.1875	0.2378	0.8583	N/A

Note: Number in parenthesis means t-statistics. The asterisk ** and * denoted statistically significantly at the 0.05 and 0.10 level, respectively. LM test at lag h represents VEC residual serial correlation LM tests. The null hypothesis is also no serial correlation at lag h. White test represents VEC residual heteroskedasticity tests without cross terms (Levels and squares) in all almost countries except white test in case of Malaysia. We use the test with cross terms (Levels and squares). N/A means the estimated model doesn't show a positive or non-negative argument.

From an econometrics perspective, we describe the impact of government spending on the development of the agricultural sector in ASEAN-5 countries as follows: From 2000 to 2012, Indonesia's agricultural policy focused on revitalizing the sector by reinstating fertilizer subsidies, increasing spending on extension services, research and development (R&D), and irrigation, and implementing trade controls and tariffs. From 2012 to 2023, the focus shifted to achieving self-sufficiency in staple foods. Key measures included enhancing Indonesia Logistics Bureau's role in rice imports, distributing rice at low prices through programs, increasing input subsidies, providing machinery grants to farmers, and launching the "food estate" program (OECD, 2023). Nonetheless, the World Bank (2010) remarked that despite a significant rise in government agricultural spending over the past decade, a substantial portion of this expenditure was directed towards subsidizing private inputs.

Based on the assessment by the World Bank (2019) unlike many governments in developing countries, Malaysia's government avoided damaging the agricultural sector through taxation, instead reinvesting significant revenue back into it. The World Bank recognized the successful transformation that resulted from their substantial investments in agricultural and rural infrastructure from 2010 to 2020. Agriculture boosted food supplies, foreign exchange earnings, and labor for other sectors. As the sector matured, Malaysian agricultural firms became transnational companies. Rising farmer incomes also stimulated the manufacturing sector and revitalized rural areas and small towns.

The Philippine government supports agricultural development through initiatives like irrigation development, land distribution, agricultural loans, agrarian reform, and rice distribution (Mapa et al., 2020). The World Bank (2007) emphasized that improving the composition of budget spending, rather than increasing its level, would enhance pro-poor agricultural growth. Effective reallocation of the agricultural budget requires a strategic adjustment in the rice self-sufficiency policy. Briones (2021) suggested focusing government resources on public goods that boost long-term agricultural productivity, such as R&D.

In 2022, Thailand's government allocated agricultural funds to land management, farmer support, price stabilization, pest control, forestry, fishery, and R&D (Budget, 2022). The long-term goal is for Thai farmers to escape the middle-income trap, aiming for a per capita income of over 13,000 US$ by 2036, with improved specialization, efficient farmer institutions, and high-quality agricultural products (Office of Agricultural Economic, 2017). However, the OECD (2020) remarked that agricultural productivity remains low compared to other sectors, and shifting labor to other industries could boost overall productivity. Temsumrit and Sriket (2023) pointed out that the agriculture sector has been neglected in favor of the industrial sector for decades.

Vietnam's agricultural policy has focused on enhancing water productivity and supporting agricultural services while maintaining irrigation spending (World Bank, 2017). From 2010 to 2020, various incentives, such as tax/fee exemptions, credit access, land access, technology transfer, and trade promotion, attracted private sector investment in agriculture (Diem & Thuy, 2019). The Socio-Economic Development Strategy (2021-2030) envisions Vietnam becoming a green, sustainable, and modern industrialized nation (Linh, 2021). Significant government efforts aim to achieve agricultural growth, improve farmers' livelihoods, and develop rural areas (Ngoc, Hung, & Pham, 2021). The Asian Development Bank (2022) recommended preparing a transition strategy to address the impact of technological progress on traditional agricultural workers.

4. CONCLUSION AND POLICY IMPLICATION

From 2001 to 2021, the ratio of central government spending on agriculture, forestry, and fishery to total central government spending in Thailand, which was about 5.99%, was ranked the highest. Although the average value of central government spending on agriculture, forestry, and fishery in Indonesia was obviously greater than that of Vietnam, its ratio to total central government spending was not much different. Theoretically, government agricultural expenditure has played a role in driving real agricultural GDP expansion. At the same time, the empirical evidence of ASEAN-5 countries, i.e., Indonesia, Malaysia, the Philippines, Thailand, and Vietnam, which are significant countries in terms of agriculture, has been limited up to the present time. So the main goal of the study is to look into how government spending on agriculture affects agricultural value added in ASEAN-5 countries in the short and long term.

As for the results, the trace test statistics from the Johansen cointegration test indicate that government agricultural expenditures have a long-run impact on the agricultural value added. The error correction model's estimation results suggest that we can correct the disequilibrium in the short-run impacts. Government agricultural expenditure positively affects the agricultural value added in the short run. Moreover, the time lag of the government agricultural expenditure impact on agricultural sectors in Indonesia and Vietnam is just 1 quarter, while the time lags of such an impact in Malaysia and Thailand are 2 and 4 quarters, respectively. Therefore, the government has played a significant role in enhancing agricultural value-added in ASEAN-5 countries up to the present. To achieve the vision and mission of agricultural policy in each country, the government should effectively allocate its agricultural expenditure to agricultural development programs. Additionally, as government expenditure is an instrument of fiscal policy, the efficient allocation of the government agricultural budget can support the achievement of fiscal policy implementation to boost economic growth in the short run in ASEAN-5 countries. On the other hand, the remarks from the previous literature should be noted: A large share of Indonesia's government agriculture expenditure has been allocated to subsidizing private input; Vietnam still needs to make ready a transition strategy to succeed in dealing with the effects of technological progress on traditional agricultural workers; boosting the agricultural sector's productivity has been a longstanding policy agenda in Thailand; and the reallocation of the Philippines's agricultural budget expenditures would produce greater effects with a reform of the policy of rice self-sufficiency.

Funding: This research is supported by Faculty of Economics, Srinakharinwirot University (Grant number: 479/2566).
Institutional Review Board Statement: The Ethical Committee of the Srinakharinwirot University, Thailand has granted approval for this study on 14 July 2023 (Ref. No. SWUEC-662013).
Transparency: The author states that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.
Competing Interests: The author declares that there are no conflicts of interests regarding the publication of this paper.

REFERENCES

Abdullahi, S. A. (2021). Impact of government expenditure on agriculture in Nigeria: A subsector analysis. *Agricultural Research Journal*, *58*(2), 306-311.

Akinjare, V. B., Adetiloye, K. A., & Oladeji, T. (2014). *Public sector agricultural expenditure and output in Nigeria*. Paper presented at the The Vision 2020: Sustainable Growth, Economic Development, and Global Competitiveness - Proceedings of the 23rd International Business Information Management Association Conference, IBIMA.

Ani, D., Biam, C., & Kantiok, M. (2014). Patterns and impact of public expenditure on agriculture: Empirical evidence from Benue State, Nigeria. *Journal of Agricultural & Food Information*, *15*(4), 311-323. https://doi.org/10.1080/10496505.2014.958933

Armas, E., B., Osorio, C., G., Moreno-Dodson, B., & Abriningrum, D., E. (2012). *Agriculture public spending and growth in Indonesia. Policy Research Working Paper 5977, Poverty Reduction and Economic Management Unit, East Asia Region, The World Bank*. Retrieved from https://documents1.worldbank.org/curated/en/

Asian Development Bank. (2022). *Agriculture, natural resources and rural development sector assessment, strategy and road map - viet nam 2021–2025. ADB sector assessment, strategy and road map*. Retrieved from https://www.adb.org/sites/default/files/institutional-document/763181/viet-nam-2021-2025-agriculture-sector-assessment-strategy-road-map.pdf

Barbosa, M. W. (2024). Government support mechanisms for sustainable agriculture: A systematic literature review and future research agenda. *Sustainability, 16*(5), 2185. https://doi.org/10.3390/su16052185
Benin, S., & Mogues, T. (2012). *Agricultural and rural public spending in Africa. In T. Mogues and S. Benin (Eds.), Public expenditures for agricultural and rural development in Africa*. New York: Routledge.
Briones, R., M. (2021). *Philippine agriculture: Current state, challenges, and ways forward Philippine institute for development studies*. Retrieved from https://pidswebs.pids.gov.ph/CDN/PUBLICATIONS/pidspn2112.pdf
Budget, B. (2022). *Thailand's budget in brief fiscal year 2022*. Retrieved from https://bbstore.bb.go.th/cms/1642148540_8414.pdf
De, U. (2018). Public expenditure on agriculture and economic growth: A case study of Meghalaya. *Agricultural Economics Research Review, 31*(2), 271-279. https://doi.org/10.5958/0974-0279.2018.00044.7
Diem, H. X., & Thuy, D. T. T. (2019). *Investment in agriculture in recent times: The case of Vietnam. In S. Sakata (Ed.), New trends and challenges for agriculture in the mekong region: From food security to development of agri-businesses JETRO Bangkok*. Retrieved from https://www.ide.go.jp/library/English/Publish/Reports/Brc/pdf/25_05.pdf
Fan, S., Hazell, H., & Thorat, S. (1999). *Linkages between government spending, growth, and poverty in rural India. International Food Policy Research Institute*. Retrieved from https://ageconsearch.umn.edu/record/37898
Fan, S., Jitsuchon, S., & Methakunnavut, N. (2004). *The importance of public investment for reducing rural poverty in middle-income countries: The case of Thailand*. Retrieved from DSGD Discussion Paper No. 7, International Food Policy Research Institute: http://ageconsearch.umn.edu/record/60171/files/dsgdp07.pdf
Fan, S., & Pardey, P. G. (1998). Government spending on Asian agriculture: Trends and production consequences. *Agricultural ic Finance Policy in Asia Report of the APO Study Meeting on Agricultural ic Finance Policy Held in Taipei, Taiwan, 4-12 June 1997*, 49-87.
Fan, S., & Rao, N. (2003). *Public spending in developing countries: Trends, determination, and impact. EPTD discussion Paper no:99. International food policy research institute*. Retrieved from https://ageconsearch.umn.edu/record/16080?v=pdf
FAOSTAT. (2023). *Food and agriculture data*. Retrieved from https://www.fao.org/faostat/en/#data
Hong, L., C. (2016). Sectoral impact of fiscal policy in Malaysia. *Jurnal Ekonomi Malaysia, 50*(1), 81-98. https://doi.org/10.17576/JEM-2016-5001-07
Lawal, A. I., Fidelis, E. O., Babajide, A. A., Obasaju, B. O., Oyetade, O., Lawal-Adedoyin, B., . . . Olaniru, O. S. (2019). Impact of fiscal policy on agricultural output in Nigeria. *Journal of Environmental Management and Tourism, 9*(7), 1428-1442. https://doi.org/10.14505/jemt.v9.7(31).08
Linh, N. (2021). *Vietnam issues green growth strategy 2021-2030 vision to 2050. United States Department of Agriculture*. Retrieved from https://apps.fas.usda.gov/newgainapi/api/Report/DownloadReportByFileName?fileName=Vietnam%20Issues%20Green%20Growth%20Strategy%202021-2030%20Vision%20to%202050%20_Hanoi_Vietnam_11-02-2021.pdf
Mapa, C. D. S., Bautista, R. P., Ilarina, V. R., Duran, M. C. G., Nalugon, M. S., De Guzman, M. C. E., . . . Villain, M. C. (2020). *Government support in agriculture sector*. Retrieved from Agricultural Indicators System (AIS), The Philippine Statistics Authority (PSA):
Megbowon, E. T., Mothae, L., & Relebohile, J. R. (2022). Effect of government agricultural expenditure on economic growth: Evidence from a developing country. *Studia Universitatis Babes-Bolyai Oeconomica, 67*(2), 1-20. https://doi.org/10.2478/subboec-2022-0006
Mulugeta Emeru, G. (2023). Effect of public expenditure on economic growth in the case of Ethiopia. *The Scientific World Journal, 2023*(1), 9305196. https://doi.org/10.1155/2023/9305196
Musaba, E. C., Chilonda, P., & Matchaya, G. (2013). Impact of government sectoral expenditure on economic growth in Malawi, 1980-2007. *Journal of Economics and Sustainable Development, 4*(2), 71-78.
Ngobeni, E., & Muchopa, C. L. (2022). The impact of government expenditure in agriculture and other selected variables on the value of agricultural production in South Africa (1983–2019): Vector autoregressive approach. *Economies, 10*(9), 205. https://doi.org/10.3390/economies10090205
Ngoc, V. B., Hung, N. M., & Pham, P. T. (2021). Agricultural restructure policy in Vietnam and practical application for sustainable development in agriculture. *Journal of Nanomaterials, 2021*(1), 5801913. https://doi.org/10.1155/2021/5801913
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*, 39-54.
OECD. (2020). *OECD economic surveys: Thailand 2020: Economic assessment*. Paris: OECD Publishing.
OECD. (2023). *Agricultural policy monitoring and evaluation 2023: Adapting agriculture to climate change*. Paris: OECD Publishing,.
Office of Agricultural Economic. (2017). *The twenty-year agriculture and cooperative strategy (2017-2036) and the five-year agriculture development plan under the twelfth national economic and social development plan (2017-2021)* Retrieved from https://qsds.go.th/newopdc/wp-content/uploads/sites/7/2020/01/Cooperatives3.pdf
Ogah, O. M., Bartholomew, B., & Ezihe, J. A. C. (2023). *A vector error correction model approach to government agricultural expenditure on agricultural growth in Nigeria under the period of uninterrupted democracy (1999–2020). In: Odularu, G.O.A. (eds) Agricultural Transformation in Africa. Advances in African Economic, Social and Political Development*. Cham: Springer.
Omodero, C. O. (2019). Government sectoral expenditure and poverty alleviation in Nigeria. *Research in World Economy, 10*(1), 80-90. https://doi.org/10.5430/rwe.v10n1p80
Oyinbo, O., Zakari, A., & Rekwot, G. Z. (2013). Agricultural budgetary allocation and economic growth in Nigeria: Implications for agricultural transformation in Nigeria. *Consilience, 10*(1), 16-27. https://doi.org/10.7916/D86W9BGP
Rajagukguk, W. (2021). Agriculture and regional economic growth in Indonesia. *E3S Web of Conferences, 258*. https://doi.org/10.1051/e3sconf/202125806037
Saengchai, S., Sriyakul, T., & Jermsittiparsert, K. (2019). Analyzing the role of government agriculture expenditure, extension services and agricultural credit on real agricultural GDP in ASEAN countries. *International Journal of Innovation, Creativity and Change, 7*(2), 126-141.
Temsumrit, N., & Sriket, H. (2023). The structural transformation of Thailand: The role of policy distortion. *Asian Development Review, 40*(01), 203-245. https://doi.org/10.1142/s0116110523500087
Tijani, A. A., Oluwasola, O., & Baruwa, O. I. (2015). Public sector expenditure in agriculture and economic growth in Nigeria: An empirical investigation. *Agrekon, 54*(2), 76-92. https://doi.org/10.1080/03031853.2015.1073000
Wang, S., Zhu, J., Wang, L., & Zhong, S. (2022). The inhibitory effect of agricultural fiscal expenditure on agricultural green total factor productivity. *Scientific Reports, 12*(1), 20933. https://doi.org/10.1038/s41598-022-24225-2

World Bank. (2007). *Philippines: Agriculture public expenditure technical Working Paper, 40493, Sustainable development department, East Asia and pacific region.* Retrieved from http://documents.worldbank.org/curated/en/508941468298444655/Philippines-Agriculture-public-expenditure-review

World Bank. (2010). *Indonesia: Agriculture public expenditure review.* Retrieved from http://documents.worldbank.org/curated/en/297881468038713079/Indonesia-Agriculture-public-expenditure-review-2010

World Bank. (2017). *Vietnam public expenditure review fiscal policies towards sustainability, efficiency, and equity*. Retrieved from https://documents1.worldbank.org/curated/en/156711508765460281/pdf/120605-PER-v1-PUBLIC-44p-VietnamPublicExpenditureReviewSummaryReportEN.pdf

World Bank. (2019). *Agricultural transformation and inclusive growth the Malaysian experience knowledge & research, the Malaysia development experience series.* Retrieved from http://documents.worldbank.org/curated/en/617611574179512389/Agricultural-Transformation-and-Inclusive-Growth-The-Malaysian-Experience

Yamada, J. (1998). *Capital outflow from the agriculture sector in Thailand.* World Bank Publications. No. 1910.

Zeng, G., Zhang, C., Li, S., & Sun, H. (2021). The dynamic impact of agricultural fiscal expenditures and gross agricultural output on poverty reduction: A VAR model analysis. *Sustainability, 13*(11), 5766. https://doi.org/10.3390/su13115766

Zhang, S., & Zhang, X. (2024). Fiscal agricultural expenditures' impact on sustainable agricultural economic development: Dynamic marginal effects and impact mechanism. *Plos One, 19*(2), e0299070. https://doi.org/10.1371/journal.pone.0299070

Zhi, H. L., & Wong, K. K. S. (2020). Assessment of government agriculture and rural development expenditure impact on the Malaysia's agriculture production. *Malaysian Journal of Agricultural Economics, 29*(1). https://doi.org/10.36877/mjae.a0000158