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Finding a Mutual Predictor of Contribution of Agricultural Sectors in GDP and Dairy Farming Growth: Role of Extension Services in Panel Data of ASEAN Countries

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The purpose of this study was to analyze the impact of Agricultural extension service (AES) on the GDP and Dairy farming growth (DFG) of ASEAN countries as this research is aimed to assess the mutual predictor of GDP and DFG by collecting panel data for ASEAN countries. The current study adopted the panel data approach because the 30 years' data for ASEAN countries was collected about the current variables through secondary sources. The data was analyzed in EViews 10 where the descriptive, panel unit root, cointegration and heteroscedasticity tests were completed in order to fulfil pre-requisite panel data analysis of macroeconomic data. Two econometric models have been tested in the current study; one with a dependent variable of GDF and other with a dependent variable of DFG. The results of the first econometric model revealed that AES has a significant positive influence on GDP and the results of the second econometric model revealed that AES has significant positive impact on DFG of ASEAN countries. Hence, it has been found in this study that AES is a mutual predictor of DFG and GDP of ASEAN countries. The current study will provide significant implications to theory and practice regarding AES, GDP and DFG particularly to the ASEAN countries.

Key words: *Agricultural Sector, GDP, Dairy Farming Growth, Extension Services, ASEAN Countries.*

Introduction

The sector of agriculture is important for most of ASEAN economies as it delivers a source of income to a large section of these countries. In most ASEAN countries, the agricultural sector hires over sixty per cent of the staff and is a vital driver for development and poverty mitigation (Walters, 2016). In various other republics, the value generation from the sector of agriculture shows a multiplier effect. Studies demonstrate that the agricultural sector in ASEAN countries donates only twelve per cent to their GDP, agribusiness intensifies this value to thirty-five per cent, thus distressing a multiplier worth of around 2.9 (Lim, Schlundt, & Mack, 2018). This private segment is important for empowering this effect, as it pervades in all aspects of value chain, which aids the whole economy. Statistics obtained for further ASEAN markets approve the worth of agricultural sector can be seen in Figure 1 below (Mukherjee & Kapoor, 2018):

Figure 1. GDP of ASEAN countries

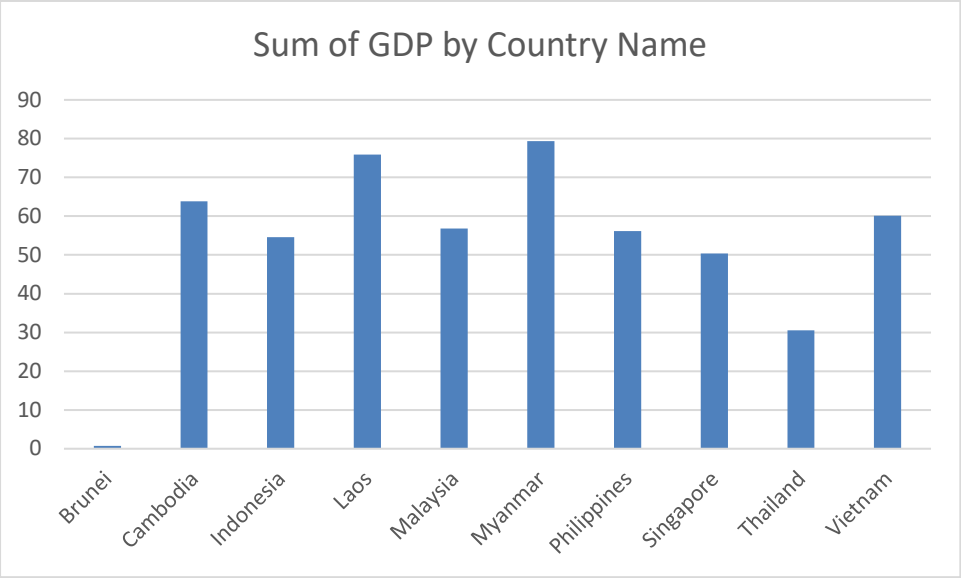

Figure 1 above presents the sum of GDP for 10 years in ASEAN countries. The figure shows that Myanmar has highest GDP while Thailand has lowest GDP in last ten years. In ASEAN republics, the arrival of dairy farming has been beneficial for he farmers and individual sections of the civilization which are conventionally pathetic, comprising the small owners, landless employees as well as womenfolk (Walters, 2016). It has delivered a year-round foundation revenue for individuals who formerly could merely be contingent on profits from minor seasonal harvests or through infrequent labour. It is projected that around 60-65 % of the revenue of this cluster currently originates from dairy farming growth (Johnson, 2016).

Researchers have revealed that dairy farming in rustic parts exceeded crop yield concerning revenue in small, medium-sized or marginal holdings. For agriculturalists from small scales with an irrigated plot, dairy farming as well as crop yield together became extra beneficial and profitable as compared to crop yield alone (Keawtawee, Songsangjinda, Sangnoi, & Uppabullung, 2018).

ASEAN countries have applied abundant collaboration schemes in agriculture as well as dairy farming sectors and it conceals an extensive range of accomplishments fluctuating from information exchange to extension services and training. In the framework of average description, agricultural extension services are an operative instrument and method to deliver the agriculturalists the skills and information they need in their everyday agricultural practice (Hussain & Zaheer, 2016). Agriculturalists are provided with numerous educational measures to prepare and permit them to recover their agriculture rehearses, farming methods; upsurge production competences and augment revenue levels; progress livings and raise the communal, financial and instructive ideals (Hariyanto & Anwar, 2019).

In most ASEAN countries, agriculture is an important sector; however, importance is not given on the implementation of extension services. These extension services are avoided due to multiple reasons such as the lack of resource, awareness, or risk aversion (Johnson, 2016). However, they are vital to progress the dairy farming as well as in increasing the GDP of ASEAN countries (Lim, Schlundt, & Mack, 2018). The issue is present in most ASEAN countries as well as other international republics such as Brazil, Pakistan, India and Africa as all these countries are constantly aiming for agricultural progress and have a large number of population residing which depends on income and dairy products (Hariyanto & Anwar, 2019). Therefore, their intervention and the subsequent affect are necessary to research.

By completing a literature review, gaps were identified throughout the literature, since panel data was not obtained for ASEAN countries. Most studies were conducted for a specific country and how the agriculture sector affects its GDP or dairy farming and not the entire ASEAN organization (Hariyanto & Anwar, 2019). However, extension services were researched for ASEAN countries' agriculture and economy, their role in the GDP and dairy farming was not researched thoroughly (Keawtawee, Songsangjinda, Sangnoi, & Uppabullung, 2018). Hence, thorough exploration is a prerequisite in this area, where the present study will emphasize assessing the influence of extension services on GDP and dairy farming growth of ASEAN countries. The research questions formulated for the study are provided below:

1. To find out the contribution of the agricultural sector in GDP of ASEAN countries

2. To determine the contribution of the agricultural sector in dairy farming growth of ASEAN countries
3. To assess the role of extension services in GDP and dairy farming growth of ASEAN countries.

The role of extension services has gained importance over the years, as it demonstrates positive impacts for peasants and farmers (Fiaz, Noor, & Aldosri, 2018). It contributes in the deliverance of knowledge required for dairy farming and use of modern techniques, which increases the GDP of developing ASEAN countries (Graeub, Chappell, Wittman, Ledermann, Kerr, & Gemmill-Herren, 2016). The dairy farming sector today delivers eighty million families with the multiple assistances of nourishing diet, added revenue and prolific occupations for domestic labour, mostly for women. Most of the research is done in Indonesia, where extension services show maximum output in GDP. Lao PDR and Cambodia accounts for the least employment of extension services (Cole, Wong, & Bong, 2017).

Literature Review

Johnson-Mellor Model and Agricultural in Development Strategies

Altieri (2018) develops frameworks regarding agricultural sector and it also describes the role about development strategies focusing on agricultural development through prioritizing agriculture along with applying simple, specific policies and public investment measures to favour the sector of agriculture (Sachs, 2018). The Johnson and Mellor model describes the role of agriculture which has a central role in development of States GDP, productivity growth and sustainability performance of the sector. This model provides a simple and appropriate framework for thinking about consumptions and production linkages from agriculture (Iglesias & Garrote, 2015). Agriculture is considered one of the fast-moving tracks on which Country's annual productivity and earning depends. It utilizes different forms, policies, reforms and laws to build a constructive as well as a reliable closed economical platform to support the people of the country and to support country itself. Studies by (Bender, Wagg, & van der Heijden, 2016) formalized the role of agriculture in productivity growth related to a closed economy, which simultaneously leads towards higher rural incomes, lower food prices in urban areas, increased savings in rural areas which particularly allow for mobilization process of capital for domestic industry. Economic and financial policies of the country have to favour the agricultural sector, which acts as a vehicle that drives the sustainable growth (Zaman & Abd-el Moemen, 2017) in poor economies which further leads to stable economical areas. Development literature also highlights some factors that lead to the agricultural-centred development strategies which is the most useful technique to reduce poverty with the rise of agricultural efficiency and abilities (Cancino, La Paz, Ramaprasad, & Syn, 2018). Johnson's-Mellor model has provided a strong narrative and conceptual argument for agriculture's role in growth and productivity. However, some of the

examples of Africa, Japan and Europe prove that, suggesting the growth success in these countries was closely linked to agriculture growth and productivity. Theoretical based evidences clearly provide strong predictions of the role of agricultural productivity growth in overall growth, this type of evidence sets a (Zahid, Robinson, & Kelly, 2016) mode for the key assumptions that critics critically analyses the concept of growth and productivity with agriculture sector development.

Extension Services and Contribution of Agricultural Sector in GDP

According to the Johnson-Mellor model that briefly explains the growth of extension services (Clark, 2018) within the agricultural sector which contributes in the development of the agricultural sector and also contributes effectively in the GDP of the Country. GDP of the Country or the State usually rises because of the development in economic sector and in agriculture sector which can be enhanced further by the productivity rate and growth value. However, to calculate the GDP of the Country the analysts include the growth rate of multiple sectors like agriculture, industry, trade and GDP (Ouma, Kimani, & Manyasa, 2016). All these sectors influence the rising rate of GDP per year. Furthermore, the impact of extension services also influences the growth rate of GDP, when involved in agriculture sector. Extension services usually refer to the understanding of past experiences, in the agriculture sector in particular the type of extension services which the private agent is working (Sihlobo & Nel, 2016). Extension services are also considered as dynamic concepts whose interpretation is always changing with the time and policies related to agriculture.

Extension services consist of providing education, information, knowledge and skills regarding the function and practices of agriculture sector, especially to those people who are already involved in this field and those who deliberately want to study or research the sector of agriculture (Narine, Harder, & Roberts, 2019). Extension also provides abilities and technical information that relies upon facts and figures related to the agriculture sector, where the advices given to the farmers and other labour workforces benefit them in the long run (Tiwari, 2018). Extension also includes the use of modern and sustainable methods in the fields of crops (Ragasa & Mazunda, 2018) and farming instead of conventional crop yields and techniques. Apart from information, knowledge and advices, farmers need some form of organization; it is required to develop the farmer's interest and to give them a means for taking collective actions. Studies (Oyinbo et al., 2018) believe, that extension should be concerned with helping to set up, structure and develop organizations consisting of local farmers, to give them confidence and develop their strength and affectivity.

Extension also provides farmers with a lot of motivational skills and self-confidence that will give them support and encouragement because extension works closely with farmers. Promoting farmers in rural areas is more important because usually famers in rural areas lack

self-confidence as they face a lot of problems regarding farming and agriculture. Many companies and authorities of the agriculture sector have set up structure extension services to implement extension programs and projects which will highly facilitate the abilities and capabilities of farmers at both local or international level and in both rural or urban areas, where they can easily add up the value of GDP. Due to various extension facilities (Foxworthy, Chandran, Lau, & Colaluca, 2016), extension services and widespread extension clients in the country, can benefit the growth of GDP and increase crop yield as per the Johnson and Mellor model of agricultural development. Articles by (McCormack, 2018), explain the function of extension services along with its reliability and performance that easily develops relationships with clients and extension authorities or organizers.

Literature studies state there is a connection between extension services that contributes in the agriculture sector and in the GDP production. Extension is considered as the two-way link in which extension-agents transfer knowledge and ideas to farmers and their families to maintain the sustainability of farming and agricultural techniques (Mittal, Mehar, & Hariharan, 2019). There is a flow of information from farmers to extension about the feedback and outcomes of the agriculture productivity and Domestic product earning is equally important for the research workers who draw conclusions regarding the growth and attainment of productivity within the agriculture sector (Ngegba, Moriba, Kandeh, Moiwo, & Massaquoi, 2018). All of these factors and studies can contribute to the agriculture sector as well as to the GDP growth per annum. Thus, the following hypothesis is proposed:

H1: Extension services have a significant impact on contribution in the agricultural sector in GDP.

Extension Services and Dairy Farming growth

Past studies (Lipscomb, Youtie, Shapira, Arora, & Krause, 2018), elaborate on the services produced by extension that are involved in the growth and development of dairy farming. Extension values and services (Mahajan, 2019) highly promote the efficiency and affectivity in the field of agriculture and dairy farming (Buehren, Goldstein, Molina, & Vaillant, 2017) at the same time. Extension services give awareness, confidence and strengthen the beliefs of farmers (Duesberg, Bogue, & Renwick, 2017) and labours who are involved in the dairy farming business for the long time. Extension services support and encourage the growth of dairy farming in the country where authorities of agriculture sector are directly in contact with the farmers and labours of dairy farming. The Johnson Mellor model (Murphy et al., 2017) also proves the sustainability performance of the agriculture sector including dairy farming, through its theoretical and conceptual based analysis. Extension services facilitate the dairy farming farmers in rural and urban areas.

Therefore, farming skills (Mathieu Besson et al., 2017) have access to economic growth with the help of technical ways and techniques that promote the farm management capabilities and performance. Extension services allocate the use of farm resources and equipment that enhances the growth of dairy farming. Suitable learning experiences for the farmers are an essential form of learning through which they can acquire more knowledge and information. Studies (Kimura & Sauer, 2015), believe that agriculture and dairy farming development both need well developed extension services to have a strong grip on its outcome and to increase perceived crop yield. Literature (Bhargava, Ivanov, Donnelly, & Kulatunga, 2016), also explains the joint venture structure or establishment of any such organization which should only be set up with the collective decisions of the farmers and include farmer's consultation process that can help in attaining easier extension services for the farmers at local level or international level. This will otherwise increase the growth and productivity of dairy farms.

Researchers (Schermer, 2017), analyses show there are multiple methods and techniques that enable the growth of dairy farming with the help of extension services and extension practices that support the development of dairy farm production. Due to handling the approved budget, giving charge to the authorities who take care of the farms and will fulfil the requirements of the farms and the farmers at the same time. Other methods include the regular use of resources by the farms and the farmers. However, there are various dynamics that prove to be sufficient for the dairy farming as it increases the intensity of external inputs which are required for the growth of dairy farming (Moreira & Bravo-Ureta, 2016). These inputs constitute of particular fertilizers, feed and water. Thus, intensified dairy farming incur environmental externalities and a stable environmental situation which is very important for the growth of dairy farming (M Besson et al., 2016). Extension services withstand with these externalities and depend upon the environmental and economical stable conditions.

Extension services provide the farmers solutions to protect their land, crops, animals and dairy farms from exploitation or destruction due to weather extremes, health problems and drastic climatic change. Studies (Singbo & Larue, 2016), regarding dairy farming usually investigate about dairy farming cattle, which are being raised according to the needs and requirements of the customers where farmers can earn to their full potential while generating production. Dairy industry contribution to the GDP is of great concern and value. Extension services help the dairy industry to generate more revenue every year, nevertheless the dairy industry accurately reports on its profitability and it tries to maintain its sustainability marketing label. Thus, the following hypothesis is proposed:

H2: Extension services have a significant impact on dairy farming growth

Methodology

Sample and Data

The research is about the impact of Agriculture extension services (AES) on the GDP and "Dairy farming growth" (DFG) for which the panel data from ASEAN countries was collected. It means that the population of the current study consists of the AES, GDP and DFG data of ASEAN countries from which the sample of 30 years was extracted for data collection. The regression modelling was done to analyze the relationships through the data of last 30 years which was collected from the website of "World Bank" about the macroeconomic variables of this study for ASEAN countries.

Definition and Measurement of Variables

There are following variables included in this study:

Dependent variables

There are two dependent variables in the current study that have been examined as the outcome of a single predictor. Two dependent variables of this study are "Dairy farming growth" (DFG) and "Gross domestic Product" (GDP). DFG was measured through "livestock production index" while the data about the GDP was extracted from databases of respective ASEAN countries.

Independent variables

There is only one independent variable in this research the impact of which has been examined on two dependent variables. The name of one and only independent variable of this study "Agricultural extension service" (AES) which was measured as a dummy variable. The value of "1" or "2" was assigned to the ASEAN countries in the respective year.

Control Variables

There are four controled variables that have been added in the present model to get desired results. These variables are "irrigated land (IL), Agricultural land (AGL), Arable land (ARL) and carrier yield (CY)". IL, AGL and ARL were measured by taking percentage of respective land in the total land of ASEAN countries in respective years while CY has been measured as "kg per hector"

Modelling and Methodological Framework

The present research has adopted the panel data approach in which the 30 years' data was collected from ASEAN countries about the current variables in order to know the relationship between AES and DFG and between AES and GDP of selected countries. The panel data approach was used in this study because it helped the researcher to identify the "period random effects".

Two regression models have been tested in this research as there are two dependent variables in the study i.e. "Dairy farming growth" and "GDP". The impact of independent variables and control variables on these dependent variables was examined through fixed regression model. Following are two regression models test in this study:

$$\Delta DP_{it} = \alpha_i + \sum_{j=1}^{m-1}\beta_{ij}\,\Delta AES_{i,t-j} + \sum_{l=0}^{n-1}\varphi_{il}\,\Delta CY_{i,t-l} + \sum_{r=0}^{p-1}\Upsilon_{ir}\,\Delta ARL_{i,t-r} + \sum_{u=0}^{s-1}\theta_{iu}\,\Delta AL_{i,t-u} + \sum_{v=0}^{q-1}\rho_{iv}\,\Delta IL_{i,t-v} + \delta_1 AES_{i.t-1} + \delta_2 CY_{i.t-1} + \delta_3 ARL_{i.t-1} + \delta_4 AL_{i.t-1} + \delta_5 IL_{i.t-1} + \varepsilon_{1i,t}, \quad (1)$$

$$\Delta DF_{it} = \alpha_i + \sum_{j=1}^{m-1}\beta_{ij}\,\Delta AES_{i,t-j} + \sum_{l=0}^{n-1}\varphi_{il}\,\Delta CY_{i,t-l} + \sum_{r=0}^{p-1}\Upsilon_{ir}\,\Delta ARL_{i,t-r} + \sum_{u=0}^{s-1}\theta_{iu}\,\Delta AL_{i,t-u} + \sum_{v=0}^{q-1}\rho_{iv}\,\Delta IL_{i,t-v} + \pi_1 AES_{i.t-1} + \pi_2 CY_{i.t-1} + \pi_3 ARL_{i.t-1} + \pi_4 AL_{i.t-1} + \pi_5 IL_{i.t-1} + \varepsilon_{2i,t}, \quad (2)$$

In the first model, the GDP is dependent variable while in the second model, the DFG is dependent variable. $\boldsymbol{\alpha}_i$ is the constant (intercept) and it is "country-specific" while $\varepsilon_{ki,t}$ is an "error term". The regression for panel data requires the minimization of "Schwarz information criterion" (SBIC) and analysis of co-integration between variables.

Panel Unit Root Test

When the macroeconomic data is included in the study there is an essential need to run "panel unit root test" to assess whether the data set is stationery or not. It means that "error terms" are made consecutively independent in the data set. Checking this aspect of the current data, the "ADF Fisher Chi-square (ADF Fisher) and Levin, Lin & Chi (LLC) unit root tests" were applied on the data. After checking stationery data, the co-integration, heteroscedasticity and regression equation were analyzed to check the hypotheses.

Findings

The panel data in the current research was analyzed by applying the "descriptive statistics, panel unit root test, cointegration test, heteroscedasticity test and Panel ARDL approach"

with the help of EViews 10. The 30 years' data from ASEAN about all variables was put into the analysis.

Descriptive statistics

In descriptive analysis, the normality and appropriateness of data was analyzed through "mean value, minimum value, maximum value, skewness and kurtosis" mainly. Table 1 provides the findings of descriptive analysis of the current data:

Table 1: Descriptive statistics

	GDP	DFG	AES	IL	AGL	ARL	CY
Mean	5.283240	134.3144	0.730000	13.99095	24.04989	13.41265	3482.100
Median	5.973367	130.5750	1.000000	12.94427	28.30239	14.74380	3592.850
Maximum	15.24038	210.1200	1.000000	38.10812	43.27742	32.90336	5601.200
Minimum	-2.465515	13.99000	0.000000	0.024859	0.930889	0.759013	514.7000
Std. Dev.	2.898637	33.08495	0.446196	9.969641	14.65701	10.08351	1332.102
Skewness	-0.480000	0.152884	-1.036131	0.455153	-0.330508	0.237480	-0.504697
Kurtosis	4.395097	4.131130	2.073567	2.577215	1.727416	2.002921	2.587264

The mean values of GDP, DFG, AES, IL, ARL, AGL and CY are all ranging between their respective minimum values and maximum values that are showing that there is no extreme value in the data of any other current variables. Furthermore, the values of skewness and kurtosis of GDP, DFG, AES, IL, ARL, AGL and CY are also showing the data of all the variables is normal because these values ranged from -1 to +1 and 1 to 3 respectively. Hence, the current data is in position to be used for further analysis.

Panel Unit Root Test

This test was applied to check if the data set is stationery or not. The null hypothesis in this test states that data is not stationery while the alternative hypothesis suggested that data is stationery. The methods of the "ADF Fisher Chi-square (ADF Fisher) and Levin, Lin & Chi (LLC) unit root tests" were used to check the current panel data of macroeconomic variables. Table 2 provides the results of "panel unit root test" for all variables:

Table 2: Panel Unit Root test

Variables	ADF Test		LLC Test	
	At level	1st difference	At level	1st difference
AES	8.27332	27.1294***	-1.88661**	-3.30926***
IL	16.0356	52.0806***	-2.75739***	-7.80776***
AGL	44.2402***	39.4451***	-11.1332**	-6.56326***

ARL	33.2776***	37.1779***	-16.6095***	-8.50960***
CY	41.9447***	47.3190***	-6.56632***	-7.70370***
DFG	86.1038***	40.2683***	-20.1091***	-9.11821***
GDP	36.5799**	47.2471***	-0.65915	-2.07879**

The statistics of ADF and LLC tests and their significance have been given in table 2 for all variables of this study. It can be seen the data set of all variables have become stationery at maximum level of 1st difference. It means that all the data of variables of this research is stationery at first level. Hence, the condition of panel data analysis of macroeconomic variables is fulfilled through these results.

Cointegration Analysis

Since, the residuals of all variables are stationery, there must be cointegration in the data. The co-integration test was applied on the data through EViews 10 in which the null hypothesis was that "there is no co-integration between variables" while the alternative hypothesis states that "there is co-integration between variables". Table 3 below provides the values of key statistics found through co-integration test:

Table 3: Co-integration Test

Alternative hypothesis: common AR coefs. (within-dimension)					
				Weighted	
		Statistic	Prob.	Statistic	Prob.
Panel v-Statistic		-1.102626	0.8649	-2.716010	0.9967
Panel rho-Statistic		1.923017	0.9728	3.375588	0.9996
Panel PP-Statistic		-20.88686	0.0000	-7.888293	0.0000
Alternative hypothesis: individual AR coefs. (between-dimension)					
		Statistic	Prob.		
Group rho-Statistic		4.457087	1.0000		
Group PP-Statistic		-11.15901	0.0000		

The results presented in Table 3 show that the p-value against key statistics are less than 0.05 which means the null hypothesis is rejected and it is found there is co-integration in data. The p-value against "Panel v-Statistic, Panel Rho-Statistic and Group rho-Statistic" is more than 0.05. Hence, the overall results are confirming the presence of co-integration in the data.

Heteroscedasticity Test

The test of heteroscedasticity is necessary in financial data to ensure that errors in the data are constant. Table 4 below is providing the results of heteroscedasticity for both models of this study:

Table 4: Heteroscedasticity test

	Value	**df**	**Probability**
Likelihood ratio (Model 1)	78.29521	10	0.5373
Likelihood ratio (Model 2)	193.6391	10	0.7154

Since, the p-value for both models are more than 0.05, the null hypothesis is not rejected and it is found that there is no heteroscedasticity issue in the data of any of the variables.

Regression Model

Two regression equations were tested in the current study. The results of first regression model are provided in Table 5 below:

Table 5: Regression Results (dependent Variable: GDP)

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
AES	0.183786	0.546024	2.801727	0.0451
IL	0.142283	0.035300	4.030671	0.0001
AGL	-0.000422	0.041002	-0.010282	0.9918
ARL	-0.067707	0.055523	-1.219439	0.2261
CY	0.000588	0.000292	2.012768	0.0473
C	2.958502	0.845729	3.498169	0.0007
R-squared	0.408297	Mean dependent var		5.283240
Adjusted R-squared	0.310840	S.D. dependent var		2.898637
S.E. of regression	2.406322	Akaike info criterion		4.731557
Sum squared resid	492.1829	Schwarz criterion		5.122333
Log likelihood	-221.5779	Hannan-Quinn criter.		4.889711
F-statistic	4.189516	Durbin-Watson stat		1.127029
Prob(F-statistic)	0.000015			

The results are indicating that the impact of AES on GDP of ASEAN countries is significant and positive with the coefficient of 18 percent because the p-value is <0.05 and t-statistics is > t-tabulated. Except IL and CY, no control variable significantly influenced the GDP. Overall, the model has 31 percent explanation of GDP. The results of second model are presented in Table 6 below:

Table 6: Regression Results (dependent Variable: DFG)

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
AES	12.72722	6.426805	1.990334	0.0500
IL	0.057958	0.464150	0.124868	0.9009
AGL	-0.971066	0.554150	-1.752354	0.0830
ARL	0.410926	0.748609	0.548920	0.5844
CY	0.007030	0.003853	1.824390	0.0713
C	116.5624	10.71103	10.88246	0.0000
	Effects Specification			
			S.D.	Rho
Period random			0.000000	0.0000
Idiosyncratic random			32.93633	1.0000
	Weighted Statistics			
R-squared	0.124024	Mean dependent var		134.3144
Adjusted R-squared	0.077430	S.D. dependent var		33.08495
S.E. of regression	31.77827	Sum squared resid		94926.70
F-statistic	2.661776	Durbin-Watson stat		0.224598
Prob (F-statistic)	0.026971			

The results are indicating that AES has significant positive influence on DFG because t-statistics is more than t-tabulated. Although, the p-value is exactly equal to 0.05 however, the t-statistics can support the researcher to accept the alternative hypothesis. Therefore, it is found that AES has significant positive impact on DFG while no control variable showed any significant impact on DFG.

Discussion

The aim of this study was to know the impact that agriculture extension service (AES) casts on dairy farming growth (DFG) and on GDP, the aim was also to know about the controlling effects of agricultural land, arable land, cereal yield and irrigated land on DFG and GDP. The first hypothesis proposed in the study was that, "AES has a significant impact on DFG." This hypothesis is accepted and according to the research work of JR. Anderson and G. Feder, it can be said that through the application of AES the DFG increases and AES has a significant and positive impact on DFG. This means the increase in AES, the DFG positively increases. The second hypothesis was, "AES has a significant impact on GDP." This hypothesis is accepted and according to C. Laurent's study, AES contributes in increasing the agricultural production that increases the GDP positively and significantly (Awokuse & Xie, 2015). Then the study focused on the impact of agricultural land on GDP, P. Labarthe and C. Laurent in a research paper concluded that Agricultural land has an insignificant impact on GDP and it is

independent of that. The study focused on the impact of Arable land on GDP, according to the study conducted by RE. Evenson, arable land is marked as an insignificant variable for the GDP. Then the study analyzed the impact of Cereal yield on GDP, according to JC. Aker's Agricultural Economics, Cereal yield has significant impact on GDP positively. Then the study tested the impact of Irrigated on GDP, according to the stats of Public administration and development department, irrigated land significantly impacts GDP (Liu, Zhang, & Bae, 2017). After this, the study focused on the impact of agricultural on DFG, so according to the economic stats, agricultural land has an insignificant impact on DFG. The study also focused on the impact of arable land on DFG, according to the economic stats, arable land has an insignificant impact on DFG. Next the study analyzed the impact of Cereal yield on DFG, according to the FR. Bidinger's research work, cereal yield has an insignificant impact on DFG (Yamauchi, 2016). Then the study focused on the impact of Irrigated land on DFG, according to EL. Bacha's Journal of Development economics, irrigated land has an insignificant impact on DFG.

Conclusion

This study aim was to know about the contribution of agricultural sector in GDP and dairy farming growth, with the help of extension services. This study was conducted by collecting data about the economic indicators from the past thirty years reports provided by the World Bank reports of Indonesia, Thailand, Malaysia, Singapore, Philippines, Vietnam, Brunei, Cambodia, Myanmar and Laos and data was also collected from their economic development sites. The data collected was then analyzed and the results showed that AES has a significant and positive impact on DFG and GDP. Agricultural land, Arable land, Cereal yield and Irrigated land have insignificant impact on DFG while agricultural land and Arable land act significantly on GDP and Cereal yield and Irrigated land act insignificantly on GDP.

Implications of Study

The study has significantly contributed in the literature material of the control variables. AES can be applied practically in order to positively improve the GDP and DFG and government can include AES as a compulsory thing in farmer's education to improve the agricultural sector and the GDP through it.

Limitations and future research indications

This study only focused on ASEAN countries whereas, with the perspective of increasing and improving the GDP and DFG. This study can be conducted in perspective of other countries as well. In future studies independent variable like, Agriculture credit can be used to study the relationship between it and GDP.

REFERENCES

Altieri, M. A. (2018). *Agroecology: the science of sustainable agriculture*: CRC Press.

Awokuse, T. O., & Xie, R. (2015). Does agriculture really matter for economic growth in developing countries? *Canadian Journal of Agricultural Economics/Revue canadienne d'agroeconomie, 63*(1), 77-99.

Bender, S. F., Wagg, C., & van der Heijden, M. G. (2016). An underground revolution: biodiversity and soil ecological engineering for agricultural sustainability. *Trends in Ecology & Evolution, 31*(6), 440-452.

Besson, M., De Boer, I., Vandeputte, M., Van Arendonk, J., Quillet, E., Komen, H., & Aubin, J. (2017). Effect of production quotas on economic and environmental values of growth rate and feed efficiency in sea cage fish farming. *PLoS One, 12*(3), e0173131.

Besson, M., Vandeputte, M., Van Arendonk, J., Aubin, J., De Boer, I., Quillet, E., & Komen, H. (2016). Influence of water temperature on the economic value of growth rate in fish farming: the case of sea bass (Dicentrarchus labrax) cage farming in the Mediterranean. *Aquaculture, 462*, 47-55.

Bhargava, K., Ivanov, S., Donnelly, W., & Kulatunga, C. (2016). *Using edge analytics to improve data collection in precision dairy farming.* Paper presented at the 2016 IEEE 41st Conference on Local Computer Networks Workshops (LCN Workshops).

Buehren, N., Goldstein, M., Molina, E., & Vaillant, J. (2017). *The impact of strengthening agricultural extension services: evidence from Ethiopia*: The World Bank.

Cancino, C. A., La Paz, A. I., Ramaprasad, A., & Syn, T. (2018). Technological innovation for sustainable growth: An ontological perspective. *Journal of Cleaner Production, 179*, 31-41.

Clark, G. (2018). Too much revolution: Agriculture in the industrial revolution, 1700–1860 *The british industrial revolution* (pp. 206-240): Routledge.

Cole, R., Wong, G., & Bong, I. W. (2017). *Implications of the ASEAN Economic Community (AEC) for trans-boundary agricultural commodities, forests and smallholder farmers* (Vol. 178). CIFOR.

Duesberg, S., Bogue, P., & Renwick, A. (2017). Retirement farming or sustainable growth–land transfer choices for farmers without a successor. *Land use policy, 61*, 526-535.

Fiaz, S., Noor, M. A., & Aldosri, F. O. (2018). Achieving food security in the Kingdom of Saudi Arabia through innovation: Potential role of agricultural extension. *Journal of the Saudi Society of Agricultural Sciences*, *17*(4), 365-375.

Foxworthy, M., Chandran, G., Lau, J., & Colaluca, M. (2016). Layer-2 extension services: Google Patents.

Graeub, B. E., Chappell, M. J., Wittman, H., Ledermann, S., Kerr, R. B., & Gemmill-Herren, B. (2016). The state of family farms in the world. *World development*, *87*, 1-15.

Hariyanto, H., & Anwar, M. (2019, April). Socio-technical Approach to Agricultural Information Systems Development. In *1st International Conference on Advanced Multidisciplinary Research (ICAMR 2018)*. Atlantis Press.

Hussain, S., & Zaheer, R. (2016). Challenges to dairy sector and role of media: a case study of Pakistan (1975-2015). *Journal of Mass Communication Department, Dept of Mass Communication, University of Karachi*, *14*.

Iglesias, A., & Garrote, L. (2015). Adaptation strategies for agricultural water management under climate change in Europe. *Agricultural water management, 155*, 113-124.

Johnson, D. G. (2016). *World agriculture in disarray*. Springer.

Keawtawee, T., Songsangjinda, P., Sangnoi, Y., & Uppabullung, A. (2018, April). The current situation and environmental conditions of green mussel farming in the gulf of Thailand. In *IOP Conference Series: Earth and Environmental Science* (Vol. 137, No. 1, p. 012093). IOP Publishing.

Kimura, S., & Sauer, J. (2015). Dynamics of dairy farm productivity growth.

Lim, C. H., Schlundt, J., & Mack, V. (2018). Superbug: Time for ASEAN Collective Action.

Lipscomb, C. A., Youtie, J., Shapira, P., Arora, S., & Krause, A. (2018). Evaluating the impact of manufacturing extension services on establishment performance. *Economic Development Quarterly, 32*(1), 29-43.

Liu, X., Zhang, S., & Bae, J. (2017). The impact of renewable energy and agriculture on carbon dioxide emissions: investigating the environmental Kuznets curve in four selected ASEAN countries. *Journal of Cleaner Production, 164*, 1239-1247.

Mahajan, G. (2019). *Mobile voice based services for agricultural extension services at the Bottom of the Pyramid (BoP).*

McCormack, C. (2018). Key factors in the use of Agricultural Extension Services by women farmers in Babati District, Tanzania.

Mittal, S., Mehar, M., & Hariharan, V. K. (2019). Information and communication technologies for strengthening extension services to reach the last mile in India *Agricultural Extension Reforms in South Asia* (pp. 255-274): Elsevier.

Moreira, V. H., & Bravo-Ureta, B. E. (2016). Total factor productivity change in dairy farming: Empirical evidence from southern Chile. *Journal of dairy science, 99*(10), 8356-8364.

Mukherjee, A., & Kapoor, A. (2018). Facilitating Trade in Organic Food Products: The Case of India and ASEAN. *Journal of Agricultural Science and Technology B*, 253.

Murphy, E., De Boer, I., Van Middelaar, C., Holden, N. M., Shalloo, L., Curran, T., & Upton, J. (2017). Water footprinting of dairy farming in Ireland. *Journal of Cleaner Production, 140*, 547-555.

Narine, L. K., Harder, A., & Roberts, T. G. (2019). Farmers' intention to use text messaging for extension services in Trinidad. *The Journal of Agricultural Education and Extension*, 1-14.

Ngegba, M., Moriba, P., Kandeh, J., Moiwo, J., & Massaquoi, S. (2018). Assessing efficiency of Action Aid Sierra Leone (AASL) extension services in Sierra Leone. *International Journal of Agricultural Extension, 6*(2), 129-138.

Ouma, D., Kimani, T., & Manyasa, E. (2016). Agricultural Trade and Economic Growth in East African Community. *African Journal of Economic Review, 4*(2), 203-221.

Oyinbo, O., Chamberlin, J., Vanlauwe, B., Vranken, L., Craufurd, P., & Maertens, M. (2018). Farmers' preferences for site-specific extension services: Evidence from a choice experiment in Nigeria.

Ragasa, C., & Mazunda, J. (2018). The impact of agricultural extension services in the context of a heavily subsidized input system: The case of Malawi. *World Development, 105*, 25-47.

Sachs, C. E. (2018). *Gendered fields: Rural women, agriculture and environment*: Routledge.

Schermer, M. (2017). From'Additive'to'Multiplicative'Patterns of Growth. *International Journal of Sociology of Agriculture & Food, 24*(1).

Sihlobo, W., & Nel, L. (2016). Is South Africa's agricultural sector addressing inclusive socio-economic development? *Opportunity for Change*, 65.

Singbo, A., & Larue, B. (2016). Scale economies, technical efficiency and the sources of total factor productivity growth of Quebec dairy farms. *Canadian Journal of Agricultural Economics/Revue canadienne d'agroeconomie, 64*(2), 339-363.

Sriyakul, T. & Jermsittiparsert, K. (2017). Politicization of Rice Price: Who Gain and Who Lose from the Populist Policies to Intervene Rice Price in Thailand?. *Asian Political Science Review, 1*(1), 19-31.

Tiwari, R. K. (2018). Empowering women through agricultural extension: a global perspective. *Indian Rural Market: Opportunity and Challenges in the Global Context, 1*(1), 68-75.

Walters, M. (2016). Mewarnai Sumbar Organik: Governmental Influence on Farming and Women in West Sumatra. *Creating ASEAN Futures 2015: Towards Connected Cross-Border Communities*.

Yamauchi, F. (2016). Rising real wages, mechanization and growing advantage of large farms: Evidence from Indonesia. *Food Policy, 58*, 62-69.

Zahid, H. J., Robinson, E., & Kelly, R. L. (2016). Agriculture, population growth and statistical analysis of the radiocarbon record. *Proceedings of the National Academy of Sciences, 113*(4), 931-935.

Zaman, K., & Abd-el Moemen, M. (2017). Energy consumption, carbon dioxide emissions and economic development: evaluating alternative and plausible environmental hypothesis for sustainable growth. *Renewable and Sustainable Energy Reviews, 74*, 1119-1130.