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Vector Analysis of Education ,Employment Performance, and Employment in Agriculture in Thailand

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Abstract

This study aims to understand the direction of the relationship between employment in agriculture, education, and agriculture performance. This study uses the VAR method to see the response and encouragement between variables so that the dependent variable in this study is employment in agriculture,employment performance, and education in Thailand. We found that productivity which is the result of developing human resources through education mechanisms is getting bigger. Where labor productivity increases over time. However, looking at the graph of labor absorption in the agricultural sector which continues to decline very sharply, it becomes a threat in itself in the future. Because there is a decline in performance in the future due to labor shortages and it is possible that the agricultural sector will be completely destroyed when there is a shortage of labor in this sector if the interest of the Thailand youth in the agricultural sector is not invested.

Keywords: Agriculture, Employment, Thailand
JEL Classification : C10, J24

Background

Thailand has an area of 514,000 square kilometers and is located in Southeast Asia, bordered by Laos to the northeast, the southeast by Cambodia and the Gulf of Thailand, the south by Malaysia, and a tropical climate. The most important crops in Thailand are rice, cassava, rubber, corn, sugarcane, coconut, and soybeans. The most important crops for local consumption are rice, maize, potatoes, chili, cassava, eggplant, and beans. The most important crops for export are rice, sugarcane, tobacco, rubber, coconut, hemp, pineapple, and maize, soybeans, green beans, oil palm, and cotton. Climatic and soil conditions allow the cultivation of various crops. Not only tropical varieties but also widely found in subtropical and temperate regions. But until the late 1950s, the main focus in agriculture was on rice and then rubber, which accounted for more than half the value of all merchandise exports. Other crops grown regularly include corn, cassava, potatoes, and beans. Sugarcane, fruits, cotton, and various vegetable oils, but all complement each other and are intended primarily for domestic use (Hussaini et al,2016 ; Thomas,2014) .

The resilience of Thai farmers is evidenced by the unprecedented shift from rice production to other crops produced by families. Many farmers also continue to produce rice for various purposes while expanding their activities to grow market-oriented crops. In the mid-1980s, the main export crops included not only rice and rubber, but also maize, cassava, sugarcane, tobacco, and sorghum. Other important crops that are widely cultivated are pineapple, peanut, cashew, soybean, banana, sesame, coconut, cotton, and castor. Thailand is also a major exporter of flowers, and was for a time one of the top five vanilla-producing countries but is not anymore (Formoso,2021 ; Cramb, 2020).

The education sector in Thailand receives great attention from the Thai government, and perhaps the most important universities in the country are geographically spread across four major cities, including the charming capital Bangkok, which includes one of the oldest universities in Thailand, Kasetsart University, which has been studying since 1943, apart from Chulalongkorn University and Thammasat University. Aimed at students from different parts of the world due to the great fame of the scholarships offered by Sirindhorn Institute within this university and there are other important places to study in Bangkok such as the King Mongkut University of Technology Thonburi and Srinakharinuirot University. The second best city to study in Thailand is Chiang Mai with its seven universities (University of Chiang Mai - Maiju University - Payap University - Rajamangala Lana University of Technology - Chiang Mai Rajpat University - Chiang Mai North University). Then came Hua Hin with its two universities (Rajbhat Suan Dusit University / Hua Hin Center - Webster University) in addition to Prince Sonkla University located in Phuket (Fry,2018 ; Pimdee,2020).

This study aims to understand the direction of the relationship between employment in agriculture, education, and agriculture performance.

Literature review

Education can be defined as the process of acquiring and discovering changing skills, principles, and beliefs. Learning is a process that brings about a change in human thinking and its ability to do many different things, and through this, we find that the educational process is not about taking educational courses or obtaining certificates from certificates or qualifications. There is no evidence of achieving the desired goals except to integrate These skills, certificates, and courses in memory, taking advantage of them and being able to apply them practically, and benefiting from them in life situations, as an experience that causes a change or impact on the way a person thinks, feels or behaves falls within the definition of education. What is meant by education includes reading, gathering information, research, and analysis, as well as writing and discussing, as well as the ability to think logically away from emotions and feelings, but that does not mean he wants to marginalize emotions. because emotions are also a means to process information (WIDARNI & BAWONO, 2021).

Agriculture is defined as the process of utilizing natural resources such as fiber, wood, and leaves to produce food, industrial raw materials, and energy sources. Matters related to processing agricultural products in terms of packaging, storage, sales, fertilizers, agricultural pesticides, and so on. Agriculture requires skilled labor in agriculture. And to acquire these skills requires training and education. Education has a role in improving skills, including expertise in agriculture. Education makes a person gain new knowledge and new understanding, including new skills (Widarni & Drean,2021).

Research Methodology

The type of data used in this research is quantitative data, while the data source in this study is secondary data. Secondary data is data that already exists and is collected for research purposes. Population data can be defined as a collection of all possible observations. The population in this study were all employment in agriculture, rural residents, the added value of agriculture in Thailand. The sample in this study is represented by all users of employment in agriculture, agricultural performance and education in Thailand, which is recorded by the world bank.

This study uses the VAR method to see the response and encouragement between variables so that the dependent variable in this study is employment in agriculture,employment performance, and education in Thailand.

The independent variable is a variable that is believed to be a predictor that causes fluctuations in the dependent variable. The independent variable of this study uses the VAR method to see the response and encouragement between variables so that the independent variables in this study are employed in agriculture, rural residents, the added value of agriculture in Thailand.

Based on mathematical models and literature reviews, it is possible to simulate possible responses and impulses between variables with unknown future economic data. To see the responses and impulses of the main economic variables that we discuss in this journal, We use the Vector Autoregression (VAR) method to estimate the possibility that could happen in the future based on simulations or forecasting. Follows the following equation model:

$Y_t = C + A_1 Y_{t-1} + ... A_p Y_{t-p} + e_t$

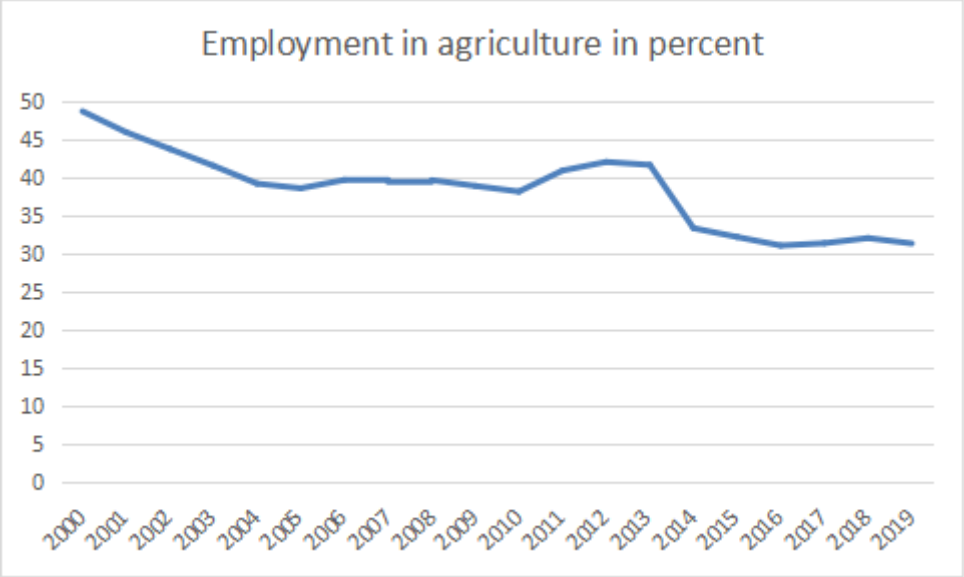
Where $Y_t=(Y_{1t},...,Y_{Kt})$ is the set of K time series variables, c is K x 1 constant vector, A is the coefficient matrix K x K and et is the error term

The vector Autoregression Model (VAR) is an extension of the univariate autoregression model for multivariate time series data. The VAR model is a multi-equation system in which all variables are treated as endogenous (dependent). There is one equation for each variable as the dependent variable.

We focused on simulating pre-corona responses and impulses based on past data sets for the period 2000 to 2019 with the assumption that variables outside the key variables we studied did not change.

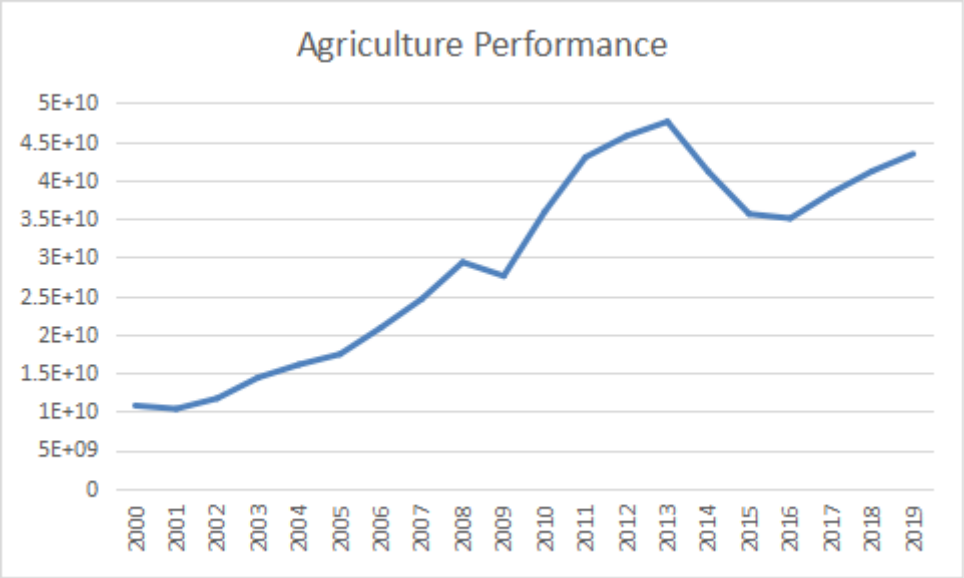
Results and Discussion

The majority of Thailand's population is Theravada Buddhists. Thai people's lives are influenced by Buddhist teachings, including the many temples where people pray according to the Buddhist way. Thailand has beautiful nature with tropical natural beauty. Agriculture in Thailand is well managed. Agriculture contributed more than 30% to employment in 2019.



Source: 2021 world bank data, processed

From the graph above, it can be seen that the share of the agricultural sector in employment continues to decline over time. In 2000, the share of the agricultural sector in Thailand's workforce was above 45%. However, in 2019 less than 35% of the agricultural sector contributed to the workforce in Thailand. Although the number of workers continues to decline along with the turn of the year. However, agricultural performance in the economy continues to increase from year to year.



Source: 2021 world bank data, processed

The increase in the performance of the agricultural sector shows that the productivity of farmers in Thailand continues to increase, this is evidenced by their declining numbers but their performance continues to increase from year to year in 2000, agricultural performance in Thailand contributed 10.7 billion dollars in the value of USD in January 2021 in the Thailand economy. Thailand's agricultural performance continues to increase until 2019, agricultural performance in Thailand contributed 43.4 billion USD. The increase in agricultural performance when the number of farmers or workers working in the agricultural sector decreases is a reflection of the success of developing human capital in Thailand, especially

those working in the agricultural sector. The table below presents a summary of descriptive statistics of several variables used in this study during the period 2000 to 2019.

Table 1. Descriptive statistics of agricultural performance in USD value in January 2021, education (investment in education in USD value in January 2021), and employment in agriculture (total working population).

	AGRICULTURE_PERFORMANCE	EMPLOYMENT_IN_AGRICULTURE	EDUCATION
Mean	29500000000	14643610	13200000000
Median	32200000000	15028309	11400000000
Maximum	47600000000	17086795	24800000000
Minimum	10300000000	12047815	5190000000
Std. Dev.	12800000000	1679354	6260000000

Source: 2021 world bank data, processed

Based on Table 1 above, it appears that from the period 2000 to 2019, the average agricultural performance in Thailand is very high at around 29.5 billion USD which can be seen from the mean value in table 1. with a high level of volatility at 12.8 billion USD. With an average number of workers 14.6 million people with an average educational investment value of 13.2 billion USD. However, this statistical descriptive analysis table is not sufficient to provide a general description of human capital investment through educational mechanisms on agricultural performance as seen from the productivity of workers in Thailand. If it is divided between the average performance in the study period and the average number of workers, it can be seen that the average productivity level of investment in human capital in Thailand is 29.5 billion USD divided by 14.6 million workers, which is $1979.8 per worker. From the results of the average productivity per worker, it can be seen that the level of effectiveness of Thailand's human capital investment in the agricultural sector is $1979.8 per worker divided by the investment per worker of 13.2 billion USD divided by 14.6 million people, which is $904.1 per worker. So every USD invested can generate $1979.8 divided by $904.1 = $2.19 per USD.

To see a more detailed and careful relationship of influence, vector analysis is carried out, namely Vector Autoregressive. Before estimating using Vector Autoregressive, there are several conditions that must be met from several observed variables, namely Stationarity Test, and Optimum Lag Test. Estimation using the VAR model requires all variables to be stationary at the level, if the variable is not stationary at the level, the estimation is carried out using the VECM model on the condition that all variables formed are cointegrated with each other where the results are shown in Table 2 below:

Table 2. stationarity test

Method			Statistic	Prob.**
ADF - Fisher Chi-square			4.20E+01	0.00E+00
ADF - Choi Z-stat			-5.39E+00	0.00E+00
** Probabilities for Fisher tests are computed using an asymptotic Chi				
-square distribution. All other tests assume asymptotic normality.				
Intermediate ADF test results D(UNTITLED,2)				
Series	Prob.	Lag	Max Lag	Obs
D(AGRICULTURE_PERFORMANCE,2)	2.10E-03	0.00E+00	3.00E+00	1.70E+01
D(EMPLOYMENT_IN_AGRICULTURE,2)	8.00E-04	0.00E+00	3.00E+00	1.70E+01
D(EDUCATION,2)	5.00E-04	0.00E+00	3.00E+00	1.70E+01

From the results of stationarity testing with Augmented Dickey-Fuller, it can be seen that at the 2nd level the difference is stationary and vector estimation uses Vector Autoregressive. It can be seen that the probability is less than 0.05 in each tested variable. After doing the stationarity test, a cointegration test was conducted to see the long-term integration between variables. If there is cointegration between variables, the estimation is made using the Vector Error Correction Model (VECM) method, but if there is no cointegration, the estimation is made using the Vector Autoregressive method. Cointegration test results are shown in table 3.

Table 3. Cointegration test results

Hypothesized		Trace	5.00E-02	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	7.61E-01	3.37E+01	2.98E+01	1.70E-02
At most 1	3.51E-01	7.91E+00	1.55E+01	4.75E-01
At most 2	6.40E-03	1.15E-01	3.84E+00	7.34E-01

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

From the cointegration results, the critical value is smaller than the Trace Statistics value and the Max-Eigen Statistics value which indicates that there is a cointegration relationship in the variable equation so that the next method that can be used to determine long-term and short-term relationships is the Vector error correction model (VECM) method.

Optimum lag test is used to determine the time period of the influence of a variable on other variables which will give optimal results. This is because changes in the movement of a variable are not directly responded to by changes in other variables, but there is still a certain grace period. Therefore it is important to know the lag length. The optimum lag test can be seen in table 4.

Table 4. Optimum lag test

Chi-squared test statistics for lag exclusion:				
Numbers in [ ] are p-values				
	D(AGRICULTURE_PERFORMANCE)	D(EMPLOYMENT_IN_AGRICULTURE)	D(EDUCATION)	Joint
DLag 1	7.03E+00	1.37E+01	1.05E+01	7.57E+01
	[0.0709]	[0.0033]	[0.0148]	[0.0000]
DLag 2	6.07E+00	9.07E+00	8.86E+00	4.37E+01
	[0.1080]	[0.0284]	[0.0312]	[0.0000]
df	3.00E+00	3.00E+00	3.00E+00	9.00E+00

From the results of the Optimum lag test, it can be seen that the optimum lag is found in lag 1. The results of the Vector error correction model estimation are shown in table 5.

Table 5. The results of the Vector error correction model estimation

Cointegrating Eq:	CointEq1		
AGRICULTURE_PERFORMANCE(-1)	1.00E+00		
EMPLOYMENT_IN_AGRICULTURE(-1	-5.29E+03		

)			
	-1.45E+03		
	[-3.63479]		
EDUCATION(-1)	-6.11E-01		
	-2.96E-01		
	[-2.06530]		
C	5.42E+10		
Error Correction:	D(AGRICULTURE_PERFORMANCE)	D(EMPLOYMENT_IN_AGRICULTURE)	D(EDUCATION)
CointEq1	-2.75E-01	-6.19E-05	1.34E-02
	-1.20E-01	-2.80E-05	-3.94E-02
	[-2.30210]	[-2.18343]	[0.34090]
D(AGRICULTURE_PERFORMANCE(-1))	-3.47E-01	6.32E-05	3.20E-01
	-4.24E-01	-1.00E-04	-1.40E-01
	[-0.81960]	[0.62861]	[2.28897]
D(AGRICULTURE_PERFORMANCE(-2))	-1.16E+00	-2.58E-04	-2.98E-01
	-4.76E-01	-1.10E-04	-1.57E-01
	[-2.43057]	[-2.28427]	[-1.89976]
D(EMPLOYMENT_IN_AGRICULTURE(-1))	1.25E+02	-8.41E-01	-6.78E+02
	-1.67E+03	-3.97E-01	-5.52E+02
	[0.07480]	[-2.11656]	[-1.22890]
D(EMPLOYMENT_IN_AGRICULTURE(-2))	2.55E+03	7.05E-02	6.51E+01
	-1.81E+03	-4.29E-01	-5.95E+02
	[1.40843]	[0.16441]	[0.10936]
D(EDUCATION(-1))	2.32E+00	7.70E-04	2.05E-01
	-1.14E+00	-2.70E-04	-3.76E-01
	[2.03732]	[2.84587]	[0.54602]
D(EDUCATION(-2))	1.10E+00	5.03E-04	1.32E-01
	-9.31E-01	-2.20E-04	-3.07E-01
	[1.17601]	[2.27560]	[0.43109]
C	1.91E+09	-1.26E+06	6.14E+08
	-2.10E+09	-5.04E+05	-7.00E+08
	[0.89897]	[-2.49802]	[0.87859]
R-squared	5.65E-01	6.32E-01	6.82E-01
Adj. R-squared	2.26E-01	3.46E-01	4.35E-01
Sum sq. resids	1.01E+20	5.67E+12	1.09E+19
S.E. equation	3.35E+09	7.94E+05	1.10E+09
F-statistic	1.67E+00	2.21E+00	2.76E+00
Log likelihood	-3.92E+02	-2.50E+02	-3.73E+02
Akaike AIC	4.70E+01	3.03E+01	4.48E+01
Schwarz SC	4.74E+01	3.07E+01	4.52E+01
Mean dependent	1.87E+09	-2.09E+05	1.16E+09
S.D. dependent	3.80E+09	9.81E+05	1.47E+09

Agriculture Performance in period one is not significantly negatively related to agriculture performance itself with a t-table value of -0.81960 and a coefficient value of -0.35. There is a significant positive relationship with employment in agriculture with a t-table value of 0.62861 and a coefficient value of 0.0000632. There is no significant negative correlation with

education with a t-table value of 2.28897 and a coefficient value of 0.32. However, in the second period, there was a significant negative correlation with agriculture performance itself with a t-table value of -2.43057 and a coefficient value of -1.16. Significantly negative correlation with employment in agriculture with a t-table value of -2.28427 and a coefficient value of -0.000258. And has a significant negative relationship with education with a t-table value of -1.89976 and a coefficient value of -0.30.

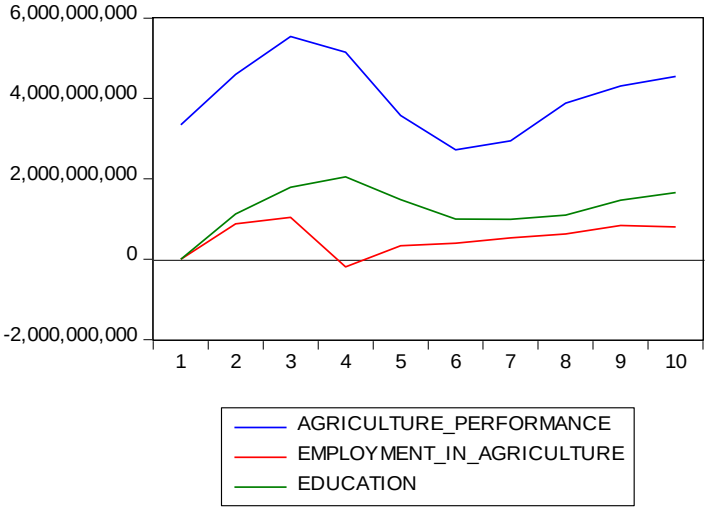
Employment in Agriculture in the first period was not significantly positively related to agriculture performance with a t-table value of 0.0748 and a coefficient value of 125.26. Significantly negative correlation with employment in agriculture itself with a t-table value of -2.11656 and a coefficient value of -0.840766. There is no significant negative relationship with education with a table value of -1.22890 and a coefficient value of 677.86. In the second period, employment in agriculture has a positive and insignificant correlation with agriculture performance with a t-table value of 1.40843 and a coefficient value of 2545. It has a significant positive relationship with employment in agriculture itself with a t-table value of 0.16441 and a coefficient value of 0.0704960. There is no significant positive correlation with the t-table value of 0.10936 and the coefficient value of 65.11.

Education is not significantly positively related in the first period to agriculture performance with a t-table value of 2.03732 and a coefficient value of 2.32. There is a significant positive correlation with employment in agriculture with a t-table value of 2.84587 and a coefficient value of 0.0007700. And has a significant positive relationship with education itself with a t-table value of 0.54602 and a coefficient value of 0.21. In the second period, there was a significant positive correlation with agriculture performance with a t-table value of 1.17601 and a coefficient value of 1.10. There is a significant positive correlation with employment in agriculture with a coefficient value of 2.2756 and a coefficient value of 0.0005030. There is a significant positive relationship with education with a t-table value of 0.43109 and a coefficient value of 0.13.

From the estimation results, it can be indicated that education in Thailand has a significant positive impact in the second period both in terms of increasing farmer productivity which is indicated by a significant positive relationship between education and agriculture performance in the second period and increasing awareness of the Thai population about the importance of the agricultural sector in Thailand as indicated by There is a significant positive relationship between education and employment in agriculture and in the end it also has a significant positive impact on education itself.. The value of the coefficient of determination (Adj. R-Square) shows the degree of truth of the estimate of 2.26E-01 atau 0.23. This means 23% accuracy of the calculation rate of the vector error correction model. Impulse Response Function (IRF) describes the response of an endogenous variable to shock that occurs in other variables in a dynamic VAR system. IRF can be used to see the effect of fluctuations or shocks from one variable on the value of another variable either now or in the future. The results of the Impulse Response Function (IRF) of the Infrastructure variable against other variables are shown by the following Impulse Response graph:

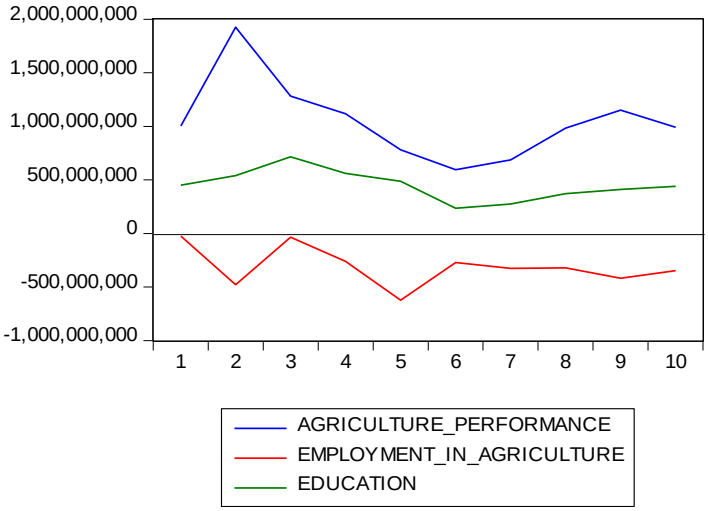
Response to Cholesky One S.D. (d.f. adjusted) Innovations

Response of AGRICULTURE_PERFORMANCE to Innovations

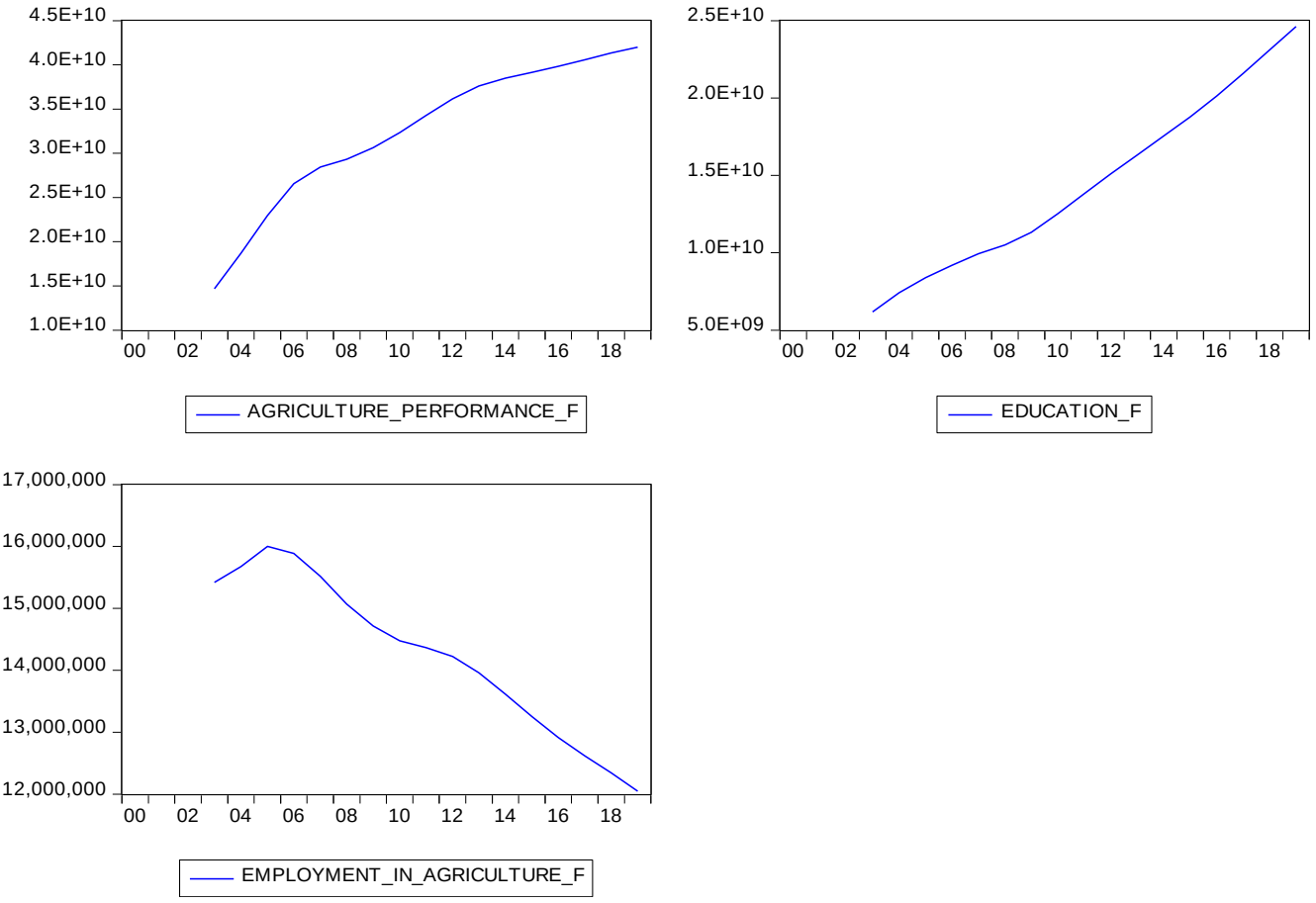


Response of EMPLOYMENT_IN_AGRICULTURE to Innovations

Response of EDUCATION to Innovations



Based on the response and impulse graphs, it can be seen that each variable responds to each other since the first time period with a lag of 2. This shows that in Thailand the three variables influence each other. To see the direction of influence can be seen in the following forecasting chart:



From the forecasting results, it can be seen that education investment has a positive relationship with agricultural performance which was driven by agricultural performance in the previous period and negatively related to employment in agriculture. However, from this it can be seen that productivity which is the result of developing human resources through education mechanisms is getting bigger. Where labor productivity increases over time. However, looking at the graph of labor absorption in the agricultural sector which continues to decline very sharply, it becomes a threat in itself in the future. Because there is a decline in performance in the future due to labor shortages and it is possible that the agricultural sector will be completely destroyed when there is a shortage of labor in this sector if the interest of the Thailand youth in the agricultural sector is not invested.

Conclusion

Productivity which is the result of developing human resources through education mechanisms is getting bigger. Where labor productivity increases over time. However, looking at the graph of labor absorption in the agricultural sector which continues to decline very sharply, it becomes a threat in itself in the future. Because there is a decline in performance in the future due to labor shortages and it is possible that the agricultural sector will be completely destroyed when there is a shortage of labor in this sector if the interest of the Thailand youth in the agricultural sector is not invested.

References

Cramb,R. (2020).White Gold: The Commercialisation of Rice Farming in the Lower Mekong Basin.Singapore : Springer Nature Singapore

Formoso,B. (2021). The agroecological sustainability of petty farmers in Thailand: A challenge for the future. Current Research in Environmental Sustainability,3,70-78.https://doi.org/10.1016/j.crsust.2021.100078

Hussaini, M. , Asef Shafaee, M. and Garang, A. (2016). An Investigation on Existence of Momentum in the Stock Exchange of Thailand. Modern Economy, 7, 327-335. http://dx.doi.org/10.4236/me.2016.73036

Fry,G.W.(2018).Education in Thailand An Old Elephant in Search of a New Mahout.Education in Thailand An Old Elephant in Search of a New Mahout. Singapore : Springer Singapore

Pimdee,P. (2020). Antecedents of Thai student teacher sustainable consumption behavior. Heliyon,6(8),64-76.https://doi.org/10.1016/j.heliyon.2020.e04676

Thomas,M. (2014).Schooling in the ASEAN Region Primary and Secondary Education in Indonesia, Malaysia, the Philippines, Singapore, and Thailand. Oxford : Pergamon Press

WIDARNI, E. L., & BAWONO, S. (2021). Human Capital, Technology, and Economic Growth: A Case Study of Indonesia. The Journal of Asian Finance, Economics and Business, 8(5), 29–35. https://doi.org/10.13106/JAFEB.2021.VOL8.NO5.0029

Widarni,E.L., Drean,B.(2021). Human Capital in Agriculture Sector in Indonesia. Splash Magz,1(2),86-92.