Human Capital Investment and Agriculture in Thailand

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Abstract : This study examines the direction of the relationship between human capital and agriculture where education and health are indicators of human capital development in this study. For indicators of agricultural development, we focus on agriculture performance and employment in agriculture. This study uses vector analysis to see the direction of the relationship between education investment, health investment, employment in agriculture and agriculture performance. The data used is secondary data with an annual period from 2000 to 2019. We found that the growth of agriculture performance is in line with or in line with education and health investment in Thailand. This indicates that Thailand has succeeded in successfully investing in education an health to improve agricultural performance. The employment in agriculture graph in Thailand continues to decline. Technology makes human work easier and advances in agricultural technology make agricultural work increasingly requiring less human labor. However, if the decline occurs continuously, it is also worrying because the decline in human resources indicates a decrease in human labor, which is the core factor of production. Of course, the decline in the number of people working in the agricultural sector in Thailand needs to be studied further..

Keywords: Human Capital, Agriculture, Employment in Agriculture, Vector Analysis.

JEL Classification : C01,E24,J24, J43

1 INTRODUCTION

Currently, there are many Thai startups working with foreign countries to develop these advanced Agritechs. Take Ricult, for example, a credit risk assessment platform for small farmers. by predicting agricultural productivity and estimating income To calculate credit scores for credit consideration for small farmers, Ricult acts as an intermediary between farmers and credit providers such as banks, distributors of agricultural products. It also uses machine learning technology and satellite imagery to help analyze crop cultivation. nutrients or minerals in the soil, including climate forecasts. In addition, various Agritech marketing platforms are currently being developed. It is a platform for trading agricultural products in B2C and B2B formats which still needs further development. to lead to widespread commercial use. Agri-technology in Thailand is well developed. In Thailand, although Agritech has started to help in agriculture. But not widespread, the big problem is the high cost and broad access of farmers. Thai farmers use agricultural drones to sow seeds, spray fertilizers, and pesticides including exploring agricultural areas (Widarni & Drean,2021).

Technology development is inseparable from education. Education increases human intelligence, including the ability to master and develop the technology. Education plays a vital role in the development of technology and science. "Education" is very important for the development of human resources and becomes the basis for other developments as well because after all, part of the development process must start with human development first. Therefore, human development can be carried out in various forms, the most important aspect of human development is education. Therefore, the country's development must be developed in parallel with human development, by placing education as a priority. Especially in the era of world-leading information technology advances. Education must evolve to keep up with world developments (Widarni & Mora,2021).

In terms of Thailand's national education policy, it can be seen that governments of various eras still attach importance to secondary education over other issues. In fact, education is an important and urgent problem for the country. Thailand sets education policies to achieve national education goals and policies, thereby influencing education reform and guidelines for education personnel. Teachers are a key factor in the development of education. Education in Thailand starts from the culture of the Thai people who have been taught since ancient times to respect and obey teachers. Thailand's current education system according to the National Education Act, B.E. The education system in Thailand is still organized within the school system. This law will not discriminate between non-formal and informal education (Fry, 2018).

This study examines the direction of the relationship between human capital and agriculture where education and health are indicators of human capital development in this study. For indicators of agricultural development, we focus on agriculture performance and employment in agriculture.

2 LITERATURE REVIEW

In its most basic sense, "human capital" refers to the group of people who work for or are qualified to work for an organization - "employees" in the larger sense, the elements necessary to create an available supply of labor. the theoretical basis of human capital and is important to the economic and social health of the countries of the world (Widarni & Bawono,2020). In economics, "capital" refers to all the assets a business needs to produce the goods and services it sells. In this case, capital includes equipment, land, buildings, money, and, of course, people - human capital. However, in a deeper sense, human capital is more than the physical labor of the people who work for the organization. All the intangible qualities that people bring to an organization can help them succeed, including education, skills, experience, creativity, personality, good health, and moral traits.

In the long term, when employers and employees jointly invest in human resource development, not only but the organization, employees, and customers will only benefit. But so is society as a whole. For example, some societies are less educated new world economic growth (Mora & Afriani,2021). For employers, investing in human capital involves commitments such as worker training, apprenticeship programs, educational bonuses and benefits, family support, and college scholarships. For employees, education is the most tangible investment in human capital. Neither the employer nor the employee guarantees a return on investment in human capital. For example, even college graduates struggle to find work during an economic crisis, and employers may train employees only to see them hired by another company. Ultimately, the level of investment in human capital is directly related to economic and social health.

The human capital theory states that it is possible to estimate the value of these investments for employees, employers, and society as a whole. According to human capital theory, adequate investment in people will result in economic growth. For example, some countries offer college education to their citizens for free because they recognize that a highly educated population tends to earn more and spend more, thereby boosting the economy. In the field of business administration, human capital theory is an extension of human resource management. Human capital means knowledge, abilities, or skills or expertise. Including everyone's experience accumulated within him and able to bring these things together to the potential of the organization or is it an important and valuable resource? This will give the organization the ability to create an edge over competitors (Afriani,2021).

Agriculture and agro-industry This is a very relevant word because the agricultural industry must bring agricultural products, add value by processing them so that they bring benefits in various fields, such as the use of agricultural products to be processed into medicine, food, clothing. or various uses. Agricultural industry This is the main method of converting agricultural raw materials into value-added products. which generate income and create jobs and contribute to the overall economic development of the country (Drean & Bawono,2021). The agricultural industry uses various technologies ranging from traditional technologies such as drying to more complex agricultural technologies such as radiation, etc. Therefore, agriculture and agro-industry should be used together as they complement each other.

If the agricultural sector produces fewer processing products it will inevitably decrease as well. including a marketing system that supports products from agro-industry and agricultural processing that there is a market to support the marketing of agricultural products. One of the goals of agro-industry is to reduce post-harvest losses by processing agricultural products. Effective food irradiation has been introduced. To carry out disinfection, inhibition of the spread of bacteria or disease which extends production life This keeps the product fresh longer. In some countries, there are also agricultural innovations that apply nuclear techniques for food preservation. Utilization of agricultural waste is considered as another goal of agroindustry, namely the utilization of agricultural by-products, and residues from the agricultural sector to develop benefits and added value to take advantage of the product as much as possible because we are aware of the value of food (Lenz et al,2019 ; XU et al.,2020).

3 RESEARCH OBJECTIVE AND METHODOLOGY

This study uses vector analysis to see the direction of the relationship between education investment, health investment, employment in agriculture and agriculture performance. The data used is secondary data with an annual period from 2000 to 2019.

4 RESULTS AND DISCUSSION

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	EDUCATION	EMPLOYMENT_IN_AGRICULTURE	HEALTH
Mean	2.95E+10	1.32E+10	1.46E+07	1.10E+10
Median	3.22E+10	1.14E+10	1.50E+07	1.09E+10
Maximum	4.76E+10	2.48E+10	1.71E+07	2.07E+10
Minimum	1.03E+10	5.19E+09	1.20E+07	3.64E+09
Std. Dev.	1.28E+10	6.26E+09	1.68E+06	5.36E+09

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, and Health investment 11 billion 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.

Cointegration test to see if there is a long-term relationship between variables and a causality test to see a reciprocal relationship between variables. 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			5.33E+01	0.00E+00
ADF - Choi Z-stat			-6.01E+00	0.00E+00
Series	Prob.	Lag	Max Lag	Obs
D(AGRICULTURE_PERFORMANCE,2)	2.10E-03	0.00E+00	3.00E+00	1.70E+01
D(EDUCATION,2)	5.00E-04	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(HEALTH,2)	3.60E-03	1.00E+00	3.00E+00	1.60E+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 Panel 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 *	9.19E-01	6.92E+01	4.79E+01	2.00E-04
At most 1	5.22E-01	2.40E+01	2.98E+01	2.01E-01
At most 2	3.58E-01	1.07E+01	1.55E+01	2.31E-01
At most 3	1.40E-01	2.71E+00	3.84E+00	9.98E-02

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 result, the critical value is less than the Trace Statistics value and the Max-Eigen Statistics value which shows that there is have cointegration relationship in the variable equation so that the next method that can be used to determine the long-term and short-term relationship is the Vector Error Correction Model 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

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1.52E+03	NA	3.55E+68	1.69E+02	1.69E+02	1.69E+02
1	-1.45E+03	9.26E+01	1.80E+66	1.64E+02	1.65E+02	1.64E+02
2	-1.42E+03	30.58163*	4.98e+65*	162.2300*	164.0107*	162.4755*

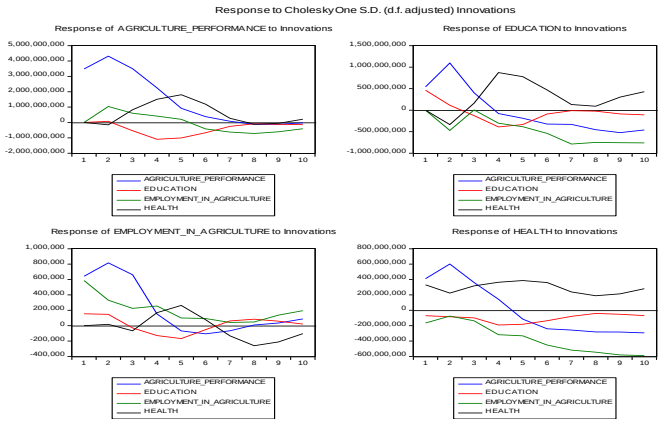
* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

From the results of the Optimum lag test, it can be seen that the optimum lag is found in lag 2. The results of the Vector Autoregressive are shown in Table 5.

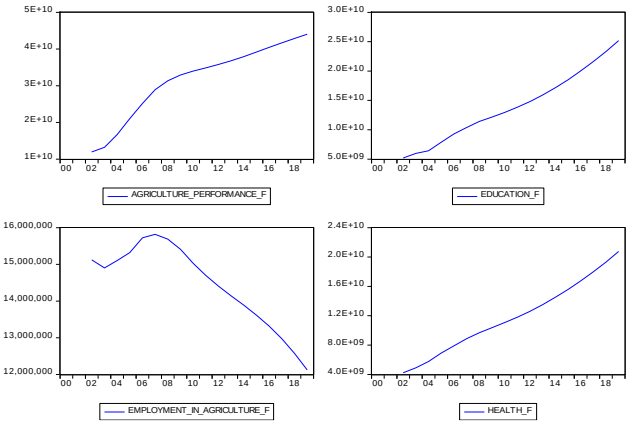
Table 5. The results of the Vector Error Correction Model estimation

	AGRICULTURE_PERFORMANCE	EDUCATION	EMPLOYMENT_IN_AGRICULTURE	HEALTH
AGRICULTURE_PERFORMANCE(-1)	1.06E+00*	5.63E-01	1.01E-04*	9.73E-02*
	-5.98E-01	-1.23E-01	-1.50E-04	-9.58E-02
	[1.78016]	[4.59741]	[0.66901]	[1.01576]
AGRICULTURE_PERFORMANCE(-2)	-3.92E-01*	-5.77E-01*	-6.01E-05*	-1.24E-01*
	-5.73E-01	-1.17E-01	-1.50E-04	-9.18E-02
	[-0.68488]	[-4.91294]	[-0.41362]	[-1.34828]
EDUCATION(-1)	-4.62E-01	4.53E-01*	1.33E-04*	-9.90E-02*
	-1.05E+00	-2.14E-01	-2.70E-04	-1.68E-01
	[-0.44163]	[2.11428]	[0.50050]	[-0.59093]
EDUCATION(-2)	-9.16E-01*	-1.50E-01*	-2.91E-04*	7.03E-02*
	-9.77E-01	-2.00E-01	-2.50E-04	-1.57E-01
	[-0.93706]	[-0.75091]	[-1.17247]	[0.44902]
EMPLOYMENT_IN_AGRICULTURE(-1)	1.64E+03	-1.08E+03	5.78E-01*	6.17E+01
	-1.68E+03	-3.44E+02	-4.25E-01	-2.69E+02
	[0.97631]	[-3.15608]	[1.35802]	[0.22952]
EMPLOYMENT_IN_AGRICULTURE(-2)	-1.42E+03*	4.07E+02*	-3.29E-02*	-3.08E+02
	-1.61E+03	-3.30E+02	-4.09E-01	-2.58E+02
	[-0.88490]	[1.23369]	[-0.08063]	[-1.19284]
HEALTH(-1)	-4.61E-01	-1.01E+00	5.06E-05	6.75E-01
	-2.69E+00	-5.51E-01	-6.80E-04	-4.31E-01
	[-0.17152]	[-1.82751]	[0.07427]	[1.56626]
HEALTH(-2)	2.76E+00	1.94E+00	-8.65E-05	4.45E-01
	-2.82E+00	-5.79E-01	-7.20E-04	-4.53E-01
	[0.97688]	[3.35065]	[-0.12074]	[0.98228]
C	2.56E+09	1.07E+10	7.21E+06	4.73E+09
	-2.40E+10	-4.90E+09	-6.01E+06	-3.80E+09
	[0.10820]	[2.20009]	[1.19918]	[1.24497]
R-squared	9.53E-01	9.93E-01	8.41E-01	9.93E-01
Adj. R-squared	9.11E-01	9.86E-01	6.99E-01	9.88E-01
Sum sq. resids	1.09E+20	4.59E+18	7.03E+12	2.80E+18
S.E. equation	3.48E+09	7.14E+08	8.84E+05	5.58E+08
F-statistic	2.28E+01	1.55E+02	5.93E+00	1.71E+02
Log likelihood	-4.15E+02	-3.86E+02	-2.66E+02	-3.82E+02
Akaike AIC	4.71E+01	4.39E+01	3.05E+01	4.34E+01
Schwarz SC	4.75E+01	4.44E+01	3.10E+01	4.39E+01
Mean dependent	3.16E+10	1.40E+10	1.44E+07	1.18E+10
S.D. dependent	1.17E+10	6.11E+09	1.61E+06	5.03E+09

Based on the results of the estimated output, it can be indicated the direction of the relationship, and the significance of each variable and each period. Negatively related variables are marked (-). Significant relationships are marked with a sign (*). The value of the coefficient of determination (Adj. R-Square) shows the degree of truth of the estimate of 0.988. This means 99% 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:



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:



Based on the forecasting graph, it can be seen that the growth of agriculture performance is in line with or in line with education and health investment in Thailand. This indicates that Thailand has succeeded in successfully investing in education an health to improve agricultural performance. The employment in agriculture graph in Thailand continues to decline. Technology makes human work easier and advances in agricultural technology make agricultural work increasingly requiring less human labor. However, if the decline occurs continuously, it is also worrying because the decline in human resources indicates a decrease in human labor, which is the core factor of production. Of course, the decline in the number of people working in the agricultural sector in Thailand needs to be studied further.

5 CONCLUSION

The growth of agriculture performance is in line with or in line with education and health investment in Thailand. This indicates that Thailand has succeeded in successfully investing in education an health to improve agricultural performance. The employment in agriculture graph in Thailand continues to decline. Technology makes human work easier and advances in agricultural technology make agricultural work increasingly requiring less human labor. However, if the decline occurs continuously, it is also worrying because the decline in human resources indicates a decrease in human labor, which is the core factor of production. Of course, the decline in the number of people working in the agricultural sector in Thailand needs to be studied further.

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