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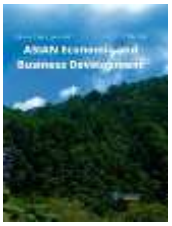

Human Capital and Agriculture Performance in Indonesia

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Abstract

This study aims to investigate the vector direction of the relationship between agriculture performance, employment in agriculture, and education in Indonesia.This research uses vector analysis method. where the dependent variable and the independent variable take turns to see the direction of the relationship of each variable to each other.All data used in this study are sourced from the world bank data. We found that labor absorption in the agricultural sector in Indonesia continues to decline very sharply, it becomes a threat in agriculture performance 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 Indonesian youth in the agricultural sector is not invested.

Keywords: Human Capital, Agriculture, Indonesia
JEL Classification : C0, J24,J64

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Background

The quality of human resources can be indicated by the human capital owned by each individual in a country. Human capital is an important factor in the development of economic growth. Economic growth is influenced by the quality of human capital (Eslamloueyan & Jafari, 2021). Managi et al. (2021) research states that human capital is a key factor in improving the welfare of the population. The research of Managi et al. (2021), concludes that increasing human capital does not only have an impact on increasing welfare. But it also has an impact on environmental sustainability.

The research results of Managi et al. (2021) related to human capital and the environment contradict the research of Sharma et al. (2021) who investigated the impact of human capital on the environment, especially in agriculture. Sharma et al. (2021) conclude that increasing human capital is not sufficient to reduce the environmental damage caused by agricultural activities.

Research by Zivin et al. (2020) explained that environmental damage due to forest fires for agricultural activities has an impact on the decline in human resources. This shows that environmental sustainability and human capital are interrelated. Increasing human capital through Education raises awareness to protect the environment. Human capital can be increased through Educational mechanisms. Human capital has an impact on better work performance. This is followed by good Education and a good level of environmental awareness (WIDARNI, & BAWONO, 2021). Research Naval et al. (2020) explains that human capital has an impact on employment. So that employment and human capital become factors that influence each other.

From the results of previous studies, temporary conclusions can be formulated in the form of hypotheses as follows:

H1. Human capital is shaped or influenced by Education.

H2. Human capital has an impact on employment in the agricultural sector.

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

Literature Review

Human capital is a collection of skills and everything that allows humans to work and generate income. Human capital can be developed through Education. And with a good Education, is able to increase the human capital needed by the business sector. When sufficient human capital meets the needs of the business sector in meeting human capital needs, employment will occur (WIDARNI, & BAWONO, 2021).

Malaysia is a country that is prone to natural disasters. Malaysia in its agricultural sector has to deal with the risk of natural disasters (Alam et al,2020). Education plays a role in raising awareness of environmental sustainability. Agriculture is a sector related to nature and nature conservation (Mehmood,2021).

Human capital and the performance of the agricultural sector are interrelated in the agricultural business. Agriculture can be improved through increased human capital. Good human capital can increase employment (Bawono & Drean,2021). Education increases employment in agriculture and improves agriculture performance (Feisali & Niknami,2021).

Research Method

This research uses vector analysis method. where the dependent variable and the independent variable take turns to see the direction of the relationship of each variable to each other. With the following equation :

$$\Delta Xt = c + \Pi Xt\text{-}1 + \sum_{i=1}^{k-1} Ti\Delta Xt\text{-}1 + et \quad t = 1,2,\ldots..T \qquad (1)$$

Where Δ is the difference operator (ΔXt = Xt - Xt-1), Xt is a (2 × 1) vector, c is a (2 × 1) intercept vector, Π is a (2 × 2) coefficient matrix, Γi is a (2 × 2) matrix of short-term dynamics coefficients, et is a (2 × 1)error vector. According to the Johansen cointegration relationship, there exist matrix ϕ and matrix β that can form Π = ϕβ'

Based on previous research, the following econometric equations can be formulated:

Agriculture Performancet = β0 + β1Employment In Agriculturet1 + β2Educationt2 + et (2)

Based on equations 1 and 2, the vector equation can be formulated as follows:

Agriculture Performancet = β0 + β1Employment In Agriculturet1 + β2Educationt2 + et

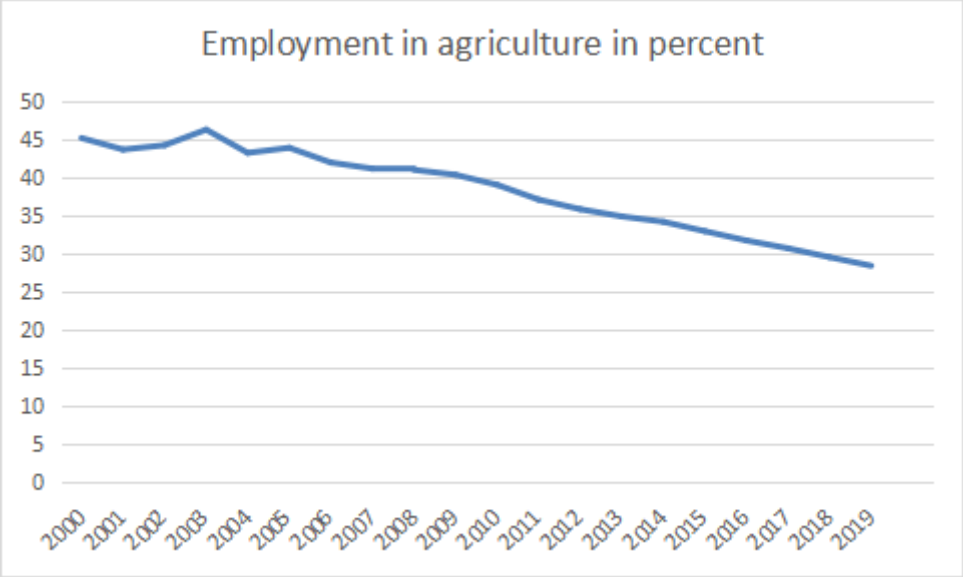
Employment In Agriculturet = β0 + β1Agriculture Performancet1 + β2Educationt2 + et

Educationt = β0 + β1Employment In Agriculturet1 + β2Agriculture Performancet2 + et

All data used in this study are sourced from the world bank data

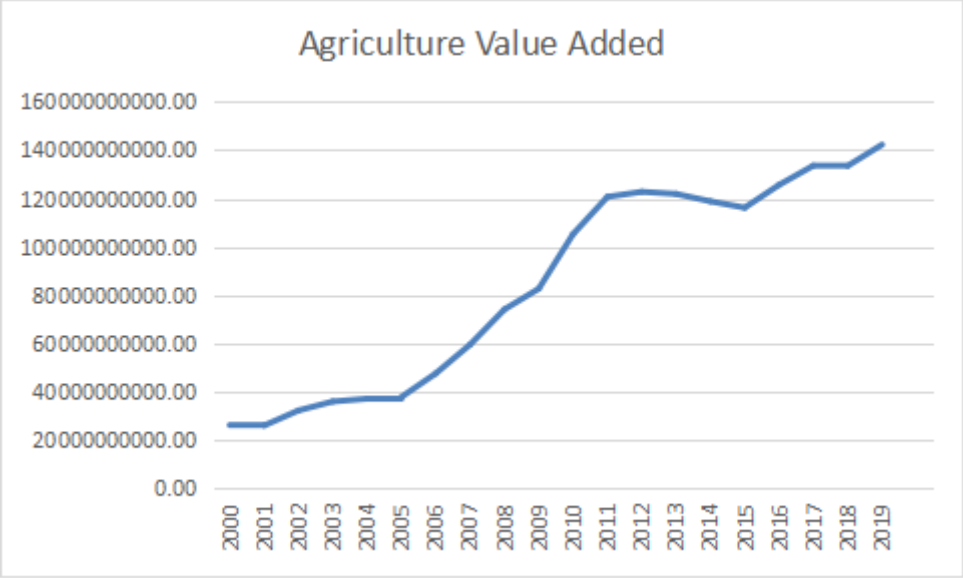
Result and Discussion

Indonesia is known for its friendly people. Indonesia respects everyone, including everyone's beliefs. Where every believer in Indonesia is protected so that all can worship and live life according to their respective beliefs and beliefs. Indonesia is full of tolerance and mutual respect for one another. A work environment that is full of the spirit of helping each other, including working in the fields. Indonesia, which has large agricultural land and a large population, requires large food production as well. This encourages the Indonesian population to increase their agricultural output. However, the interest of the Indonesian population to work in the agricultural sector continues to decline. This can be seen from the contribution of the agricultural sector to employment in Indonesia.



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 Indonesia's workforce was above 45%. However, in 2019 less than 30% of the agricultural sector contributed to the workforce in Indonesia. 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 Indonesia 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 Indonesia contributed 25.87 billion dollars in the value of USD in January 2021 in the Indonesian economy. Indonesia's agricultural performance continues to increase until 2019, agricultural performance in Indonesia contributed 142.33 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 Indonesia, 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	8.48E+10	43143235	2.14E+10
Median	9.38E+10	43672827	2.10E+10
Maximum	1.42E+11	46240097	4.43E+10
Minimum	2.57E+10	38703822	3.68E+09
Std. Dev.	4.31E+10	2267787	1.36E+10

Source: 2021 world bank data, processed

Based on Table 1 above, it appears that from the period 2000 to 2019, the average agricultural performance (Agriculture Value Added) in Indonesia is very high at around 84.8 billion USD which can be seen from the mean value in Table 1. with a high level of volatility at 43.1 billion USD. With an average number of workers 43.1 million people with an average Educational investment value of 21.4 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 Indonesia. 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 Indonesia is 84.8 billion USD divided by 43.1 million workers, which is $1967.5 per worker. From the results of the average productivity per worker, it can be seen that the level of effectiveness of Indonesia's human capital investment in the agricultural sector is $1967.5 per worker divided by the investment per worker of 21.4 billion USD divided by 43.1 million people, which is $496.5 per worker. So every USD invested can generate $1967.5 divided by $496.5 = $3.96 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. This book will also include a 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			4.95E+01	0
ADF - Choi Z-stat			-5.93E+00	0
** Probabilities for Fisher tests are computed using an asymptotic Chi				
-square distribution. All other tests assume asymptotic normality.				
Intermediate ADF test results D				
Series	Prob.	Lag	Max Lag	Obs
D(Agriculture Performance,2)	0.0038	0	3.00E+00	17
D(Employment In Agriculture,2)	0.0002	3.00E+00	3.00E+00	14
D(Education,2)	0.0000	0.00E+00	3.00E+00	17

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

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	5.00E-02	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.6836	31.80851	2.98E+01	0.0289
At most 1	0.4413	11.09351	1.55E+01	0.2058
At most 2	0.0337	0.616358	3.84E+00	0.4324
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				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	5.00E-02	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None	0.6836	20.715	2.11E+01	0.0571
At most 1	0.4413	10.47715	1.43E+01	0.1824
At most 2	0.0337	0.616358	3.84E+00	0.4324
Max-eigenvalue test indicates no cointegration 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	13.1518	3.049225	2.24E+00	30.96492
	[0.0043]	[0.3841]	[0.5232]	[0.0003]
DLag 2	4.4413	1.842676	1.17E+00	23.34671
	[0.2176]	[0.6057]	[0.7606]	[0.0055]
df	3.0000	3	3.00E+00	9

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.

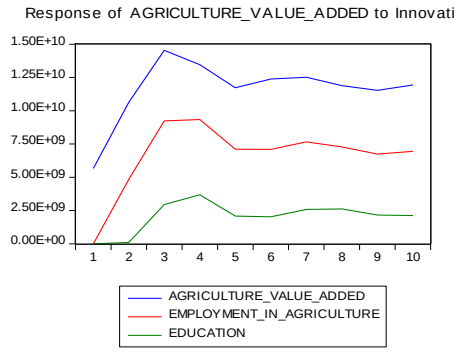
Table 5. The results of the Vector error correction model estimation

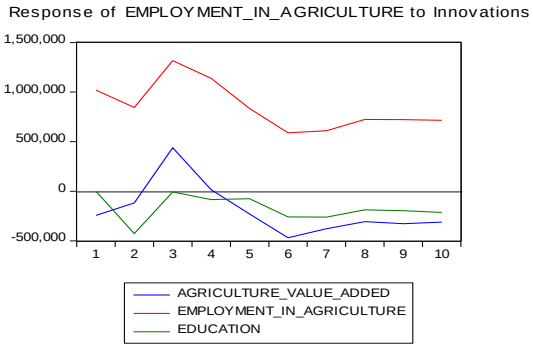
Cointegrating Eq:	CointEq1		

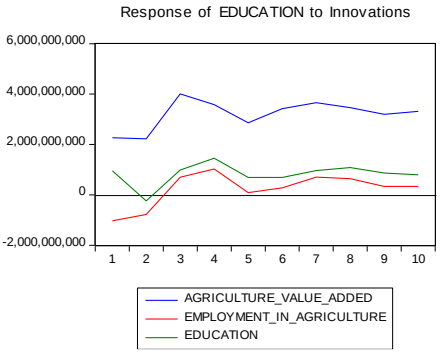
Agriculture Performance(-1)	1.000		
Employment In Agriculture(-1)	(7196.069)		
	(519.468)		
	[-13.8528]		
Education(-1)	(4.208)		
	(0.078)		
	[-54.2897]		
C	316000000000.000		
Error Correction:	D(Agriculture Performance)	D(Employment In Agriculture)	D(Education)
CointEq1	(1.067)	0.00015	0.0918
	(0.597)	(0.00011)	(0.2814)
	[-1.78750]	[1.35849]	[0.32633]
D(Agriculture Performance(-1))	2.112	0.00002	0.3569
	(0.629)	(0.00012)	(0.2966)
	[3.35579]	[0.21051]	[1.20351]
D(Agriculture Performance(-2))	(1.102)	(0.00006)	0.0978
	(0.705)	(0.00013)	(0.3323)
	[-1.56313]	[-0.46847]	[0.29427]
D(Employment In Agriculture(-1))	(2830.318)	0.45489	(352.0030)
	(2428.000)	(0.44919)	(1144.3400)
	[-1.16570]	[1.01269]	[-0.30760]
D(Employment In Agriculture(-2))	(2288.709)	0.29954	(671.3473)
	(1823.840)	(0.33742)	(859.5940)
	[-1.25488]	[0.88776]	[-0.78101]
D(Education(-1))	(4.391)	0.00018	(0.8620)
	(1.584)	(0.00029)	(0.7467)
	[-2.77150]	[0.62634]	[-1.15449]
D(Education(-2))	0.679	0.00022	(0.3925)
	(1.229)	(0.00023)	(0.5794)
	[0.55195]	[0.94575]	[-0.67739]
C	6840000000.000	(712759.70000)	1810000000.0000
	(2500000000.000)	(459149.00000)	(1200000000.0000)
	[2.75742]	[-1.55235]	[1.54522]
R-squared	0.653	0.49598	0.5314
Adj. R-squared	0.384	0.10397	0.1670
Sum sq. resids	28800000000000000000.000	9870000000000.00000	641000000000000000000.0000
S.E. equation	5660000000.000	1047430.00000	2670000000.0000
F-statistic	2.424	1.26521	1.4581
Log likelihood	(400.485)	(254.36750)	(387.6968)
Akaike AIC	48.057	30.86677	46.5526

Schwarz SC	48.449	31.25887	46.9447
Mean dependent	6490000000.000	(300122.10000)	2300000000.0000
S.D. dependent	7210000000.000	1106529.00000	2920000000.0000

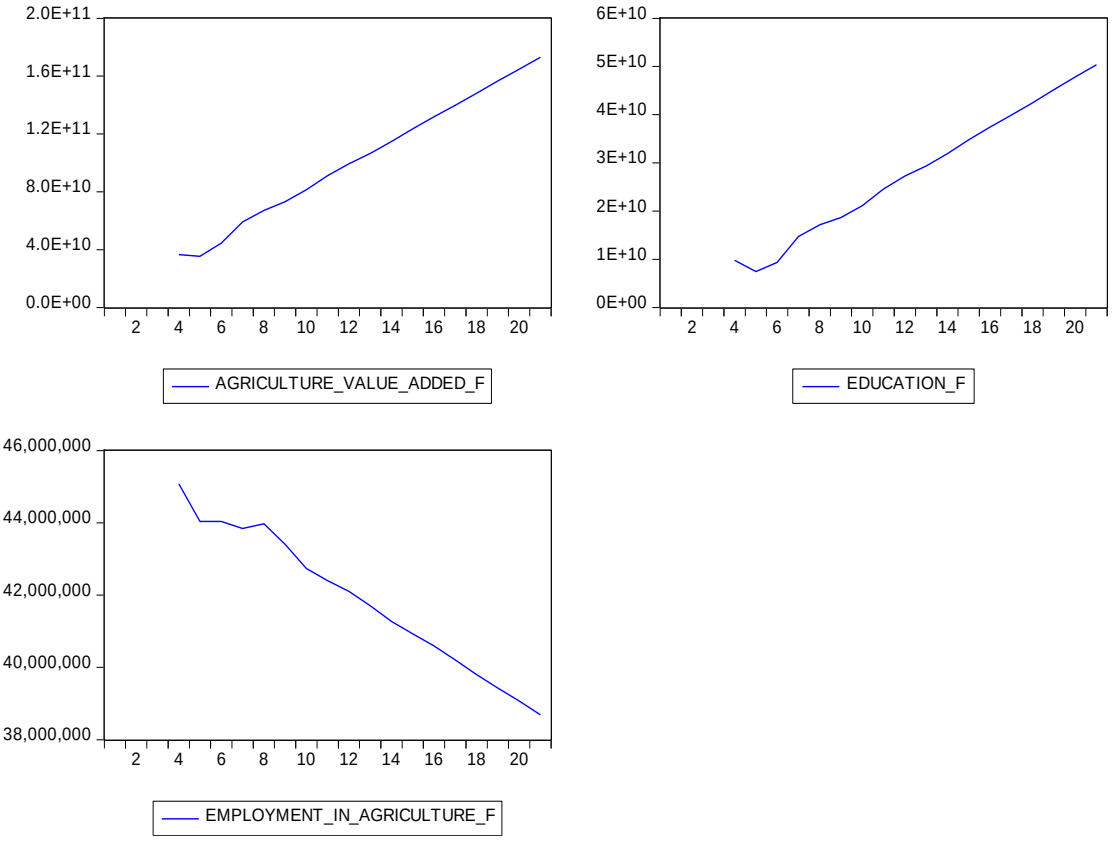
Agriculture performance (Agriculture Value Added) has a significant positive relationship with agricultural value-added itself in period one with a t-table of 3.35579 and a coefficient of 2.112. There is a significant positive correlation with employment in agriculture with a t-table of 0.21051 and a coefficient value of 0.00002. and a significant positive correlation with Education investment as a means of developing human capital with a t-table of 1.20351 and a coefficient value of 0.3569. However, employment in agriculture has a negative and insignificant correlation in periods one and two with agriculture performance with a t-table value in the first period of -1.16570 and a coefficient of -2830.318. Has a significant positive relationship with employment in agriculture itself with a t-table value of 1.01269 and a coefficient value of 0.45489. However, employment in agriculture has a negative and insignificant relationship with Education investment with a t-table value of -0.30760 with a coefficient value of 352.003. Education investment is not significantly negatively related in period one with agriculture performance with t-table -2.77150 and coefficient value -4.391. However, the correlation was not significant in the second period with a t-table value of 0.55195 and a coefficient of 0.679. There is a significant positive relationship with employment in agriculture in both periods one and period two and an insignificant negative relationship with Education itself. The value of the coefficient of determination (Adj. R-Square) shows the degree of truth of the estimate of 0.384. This means 38% 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 Indonesia 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 Indonesian youth in the agricultural sector is not invested.

Conclusion

Labor absorption in the agricultural sector in Indonesia continues to decline very sharply, it becomes a threat in agriculture performance 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 Indonesian youth in the agricultural sector is not invested.

Reference :

Alam,A.S.A.F., Begum,H., Masud,M.M., Al-Amin,A.Q., Filho,W.L. (2020). Agriculture insurance for disaster risk reduction: A case study of Malaysia. International Journal of Disaster Risk Reduction,47(8),16-26. https://doi.org/10.1016/j.ijdrr.2020.101626

Bawono,S., Drean,B. (2021). Agricultural Economics and Agribusiness: How to Start an Agribusiness and Develop Agriculture Economics for Prosperity and Global Food Security. Singapore : Triple Nine Communication Press

Eslamloueyan,K., Jafari,M. (2021). Do high human capital and strong institutions make oil-rich developing countries immune to the oil curse?. Energy Policy,158(11),56-63.https://doi.org/10.1016/j.enpol.2021.112563

Feisali,M., Niknami,M. (2021). Towards sustainable rural employment in agricultural cooperatives: Evidence from Iran's desert area. Journal of the Saudi Society of Agricultural Sciences [Online],https://doi.org/10.1016/j.jssas.2021.05.004

Managi,S., Jimichi,M., Saka,C. (2021). Human capital development: Lessons from global corporate data. Economic Analysis and Policy,72(12),268-275.https://doi.org/10.1016/j.eap.2021.08.013

Mehmood,U. (2021).Contribution of renewable energy towards environmental quality: The role of Education to achieve sustainable development goals in G11 countries. Renewable Energy,178(11),600-607.https://doi.org/10.1016/j.renene.2021.06.118

Naval,J., Silva,J.I., Vázquez-Grenno,J. (2020). Employment effects of on-the-job human capital acquisition. Labour Economics,67(12),97-103. https://doi.org/10.1016/j.labeco.2020.101937

Sharma,G.D., Shah,M.I., Shahzad,U., Jain,M., Chopra,R. (2021). Exploring the nexus between agriculture and greenhouse gas emissions in BIMSTEC region: The role of renewable energy and human capital as moderators. Journal of Environmental Management,297(1), 113-116.https://doi.org/10.1016/j.jenvman.2021.113316

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

Zivin,J.G., Liu,T., Song,Y., Tang,Q., Zhang,P. (2020). The unintended impacts of agricultural fires: Human capital in China. Journal of Development Economics,147(11).12-25.https://doi.org/10.1016/j.jdeveco.2020.102560