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Role of Technology Adoption, Labor Force and Capital Formation on the Rice Production in Malaysia

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Rice production is getting global attention due to its significant role in economic growth (gross domestic product), and this aspect shows its importance and needs. Thus, the current article examines the impact of technology adoption, labor force, human capital and capital formation on rice production in Malaysia. The current article extracted the secondary data from World Development Indicators (WDI) and Statista databases and extracted data from 1991 to 2020. The current study examines the unit root using the Augmented Dickey-Fuller (ADF) test and investigates the association among constructs using the autoregressive distributed lag (ARDL) model. The results indicated that technology adoption, labor force, human capital, and capital formation have a positive and significant linkage with rice production in Malaysia. This study helps the upcoming researchers in investigating this topic in the future and also guides the policymakers in establishing the policies related to rice production using technology adoption, labor force, human capital and capital formation factors.

Key words: Technology adoption, labor force, human capital, capital formation, rice production, the Malaysian economy.

1. INTRODUCTION

Rice production has great significance in the world. It contributes to economic development, protection of the environment, and health of the people by providing them with nutritious food. The production of rice raises earnings for the government; it contributes to the country's gross domestic product significantly, it creates many job opportunities for the farmers and workers as there are many activities to be performed in land preparation for the cultivation of the crop, paddy transplanting, harvesting, and cleaning of the rice and increasing the purchasing power develops prosperity within the country (Goodman, 2020). Rice is the world's most significant food crop. More than half of the world's population eats rice as their primary source of nutrition. Many of them are also at risk from increased rice costs. More than 3.3 billion people in developing countries rely on rice for more than twenty percent of their calories. Rice produces 15% of global human protein and 21% of global human calories per capita. Although rice protein has a great nutritional quality, it has a low protein level. Rice also contains vitamins, fiber, and minerals, albeit milling reduces all elements except carbs (Tsujimoto, Rakotoson, Tanaka, & Saito, 2019). And keeping the atmosphere clean and the water level in the soil in balance contributes to environmental quality. The improvement in rice production provides resources for present use and arranges for a sustainable country's development (Abbas & Mayo, 2021).

Rice production improvement is dependent on several factors, including technological adoption, labor force, human capital, and capital development. Numerous technological breakthroughs have been made in crop production, particularly rice cultivation, ranging from rice field preparation to rice milling. Adopting these technologies in place of traditional rice production procedures increases both the quantity and quality of rice produced (Van Oort & Zwart, 2018). Rice production entails a variety of labor-intensive procedures. The increase in the labor force facilitates the performance of rice production operations and contributes to the achievement of high rice production (Liang, Yang, Xu, & Hu, 2021). Human capital development aims to strengthen human resources' education, knowledge, training, experience, and cognitive and physical abilities. Thus, as a result of human capital development, an efficient labor force and management increase the efficiency of rice production and increase rice volume with higher quality. Capital formation is a term that refers to a growth in the production of capital goods such as machinery, instruments, raw materials, and other natural resources inside a country during a specified period. Promoting capital formation within the country enables farmers to produce large rice (Maraseni, Deo, Qu, Gentle, & Neupane, 2018).

The current study evaluates technology adoption, labor force, human capital, and capital accumulation in Malaysian rice production. Malaysia is a developing upper-middle-income economy, with a GDP of $415.375 billion anticipated for 2022. Rice is one of the most important crops in Japan and many other Asian countries. Malaysia's rice production volume was predicted to reach 1.51 million metric tons in 2020, according to 2020 data. Rice is the country's staple food. Malaysia's rice farming system directly employs over one million people and indirectly employs the bulk population. Peninsular Malaysia accounts for 85.5% of total paddy production in Malaysia. IADA PP, MADA, Kerian, Seberang Perak, KADA, Barat Laut Selangor, Ketara, and Kemasin are the primary rice producing areas in Malaysia (Harun, Hanafiah, & Aziz, 2021). Rice farming began around 10,000 years ago in East Asia. After decades of development and improvement, rice cultivation has been modernized via new technology techniques and machines. In Malaysia, rice production technology such as germination nursery trays for seed planting and nursery, tractor, transplanter, furrow opener, weeder, combine harvester, reaper binder, huller, and destoner is being introduced and implemented. Nonetheless, Malaysia has paid little attention to implementing contemporary technology in rice cultivation (Akhtar, Masud, & Afroz, 2019). Figure 1 illustrates some statistics about rice output in Malaysia.

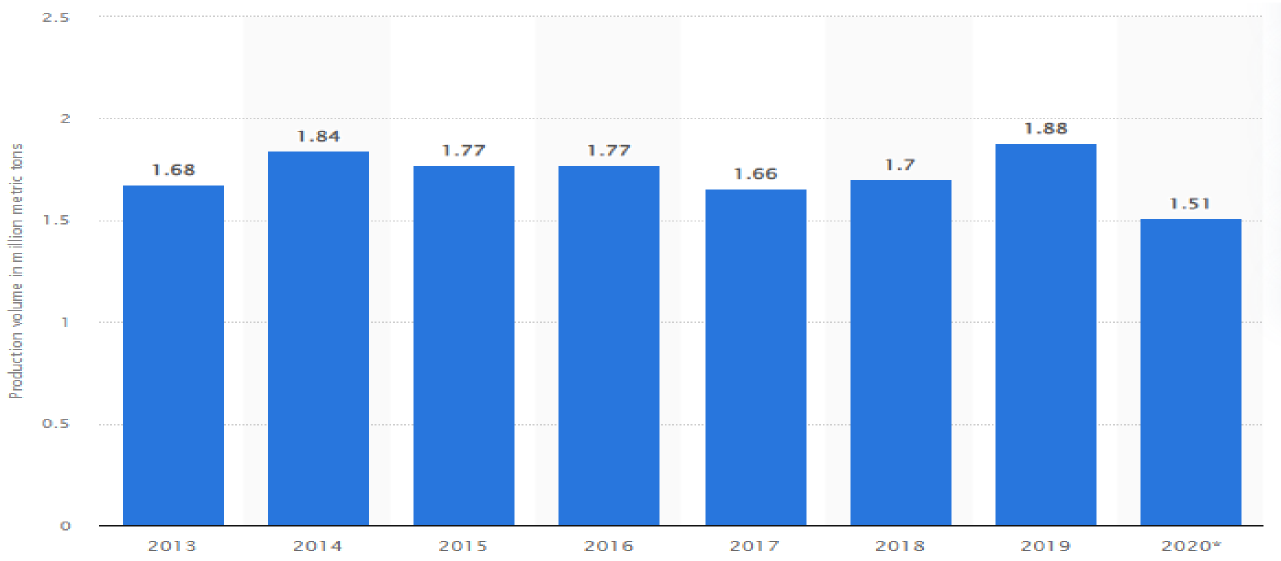

Figure 1: Rice Production in Malaysia

In Malaysia, rice is the most favored crop as a source of nutritious food and crop production is carried on within the country on a large scale. Still, the crop production is not enough to meet the food need and contribute to the country's exports and foreign exchange. The objective of the present study is to give ways to boost rice production within the country. So, the study aims to analyze the influences of technology adoption, labor force, human capital, and capital formation on rice production. Rice production has been a favorite topic to discuss among scholars. Still, the present study is a great contribution to the agriculture literature. 1) In the previously conducted literature, technology adoption, labor force, human capital, and capital formation impacts on rice production have been addressed. But nowhere the research covers the simultaneous analysis of technology adoption, labor force, human capital, and capital formation role in rice production. So, the present study makes a distinction in literature to explore the influences of all these factors on rice production. 2) In prior literature, the studies have either discussed the role of technology and physical resources or human resources while analyzing crop production. The current study contributes to the literature, which gives equal significance to physical and human resources for rice production. 3) The selection of Malaysia as the context of analysis for the impacts of technology adoption, labor force, human capital, and capital formation on rice production is a significant addition to the literature.

The rest of the paper is composed in the following manner: In the 2nd portion, the literature review on the impacts of technology adoption, labor force, human capital, and capital formation on rice production is presented. In the third portion, the study methodology, including the methods to attain data and the process of analysis of nexus among given factors, have been given. Then, study results are found and compared with those of other studies. In the end, the study's implication, the conclusion in short, and limitations are given.

2. LITERATURE REVIEW

Rice cultivation is critical to economic growth and development in practically all countries, particularly those in the Asian region. It ensures food security, provides nutritious food, and protects the environment. As a result, it safeguards the health of humans and other living species. Rice production also generates jobs, raises the standard of life, stimulates other linked industries such as seed preparation, fertilization, and manufacturing of technologies or other instruments, increases rice exports, and increases government revenue (Asravor, Wiredu, Siddig, & Onumah, 2019). Both human and physical resources influence rice production efficiency. The current study examines the function of human and physical resources in rice production, including technology adoption, labor force, human capital, and capital development. Rice production efficiency is improved by adopting novel technology specific to rice cultivation, an increase in labor force employment, an increase in human capital, and an increase in capital creation. The relationship between technological adoption, labor force, human capital, capital formation and rice production is crucial in the literary world. The following section summarizes the literature on the effects of technology adoption, labor force composition, human capital, and capital development on rice output.

Chandio, Shah, Sethi, and Mushtaq (2022) did a study on sustainable rice production in which they examined the effects of the labor force, fertilizer usage, and planted area, as well as various climate parameters. The data were gathered from a sample of Asia's major rice-producing countries between 1961 and 2016. The heterogeneous panel cointegration test, DOLS, examined the connection between the selected factors and rice production. The study concludes that labor has a considerable positive effect on the sustainability of rice production. The increased labor force in rural areas increases the availability of workers for rice farming.

When the number of workers increases at any step of rice production, such as land preparation, seed planting, and harvesting, the labor may be done more efficiently, which adds to sustainable rice production. Shekhawat, Rathore, and Chauhan (2020) studied the impact of the labor force on rice output in a country. At various stages of rice production, such as field preparation and cleaning, paddy transplanting, reaping, stacking, handling, threshing, rice cleaning and hauling, and rice preparation after harvesting, employing an efficient labor force increases productivity and ultimately results in higher quality production. Thus, labor force participation had a beneficial effect on rice production. Tu, Can, Takahashi, Kopp, and Yabe (2018) examined the role of labor force inefficient rice production in a study on factors influencing the adoption of eco-friendly rice production. A survey of 202 rice farmers in the Vietnamese Mekong Delta was conducted to ascertain the effects of labor force membership in agricultural cooperatives or clubs, farming experience, perceived ease of use, perception of biodiversity loss, and perceived price differential on eco-friendly rice production. This study reveals that laborers who exhibit these characteristics are more likely to use ecologically friendly manufacturing procedures, potentially improving rice quality. Thus, the labor force has a beneficial effect on rice output. Chen et al. (2020) literary workout investigates the worker force's influence on rice production efficiency. The study suggests that when enterprises engaged in rice cultivation can hire more labor and more efficient labor, they can increase production and improve rice nutrition. As a result, the labor force has a favorable relationship with rice productivity.

Through a deep investigation, Bashir and Yuliana (2019) identify rice production and consumption factors. The authors analyzed the influences of human capital, labor force, wages, urban population, wetland, and rice prices on rice production and consumption in Indonesia over the period 1990-to 2014. The data regarding the research was gathered from the Central Bureau of Statistics (BPS). The model is based on an OLS estimator's multiple linear regression equation. The study reveals that human capital impacts rice production over the period selected for analysis. The countries where the human capital is being paid much attention to different aspects like knowledge, training, skills development, and cognitive abilities, an active and efficient labor force can be provided for rice production who not rely on the traditional ways of rice production but also gets proficient in utilizing modern technological resources. Chandel, Khan, Li, and Xia (2022) examine human capital influences rice production. They find that improved human capital offers a workforce in various sectors of rice production with suitable training on how to manage rice production fields and undertake rice production operations. Rice productivity improves with such a workforce. According to the findings, capital formation has a favorable relationship with rice output. In an article on financial development and climate change's role in agricultural production, Chandio et al. (2022) investigate the impact of institutional quality, human capital, and renewable energy on rice production. The research survey was towards 4 ASEAN economies, Indonesia, the Philippines, Malaysia, and Thailand, from 1990 to 2016, to analyze the impacts of institutional quality, human capital, and renewable energy through second-generation modelling techniques and the CS-ARDL model. The study implies that human capital is positively bound to rice production. When human resources are taught in such a way that environmentally friendly knowledge is developed, environmentally friendly rice producing practices become more prevalent. Rice output increases when clean materials and environmentally friendly procedures are used.

Through empirical research, Devkota et al. (2020) assess the alternative technological crop establishment methods in the sustainability development of rice production systems. For conducting this study, an empirical survey was administered to 652 households in Odisha, India, in 2016. This study compares puddling and manual transplanting (PTR), a traditional way of rice production to dry direct-seeded rice (DSR) and machine transplanted rice (MTR). The study finds that adopting new technologies based on rice production methods like DSR and MTR in place of the traditional method of rice production like PTR is more efficient and cost-effective because the modern methods give better rice production with the minimum resources and number of laborers employed. Achandi et al. (2018) examine the relationship between technology adoption and rice production.

The study demonstrates that agricultural innovations are critical. In rice production, the adoption of specific technologies at various stages of the rice production process, such as field preparation for rice planting, rice paddy transplantation, rice harvesting, and other post-harvest operations. This saves time, resources, and rice wastage. As a result, technology adoption makes a significant contribution to rice output. According to Ojo, Baiyegunhi, Adetoro, and Ogundeji (2021), precision farming is used in agricultural production. It entails using GPS, rice production monitoring technology, and variable rate application technologies to more precisely apply agricultural inputs to improve growth, reduce expenses, and minimize environmental degradation. Precision farming, which is based on technology or technical processes, increases the country's rice production. According to Song et al. (2021), the increased use of technologies for various rice production operations includes land selection or preparation for rice cultivation, rice paddy transplantation, reaping, stacking, handling, threshing, and cleaning and hauling, improves the quality and volume of rice production.

Capital formation refers to the increase in real capital accumulation in a country. To put it another way, capital formation entails the creation of more capital goods, such as factories, machinery, instruments, transportation equipment, materials, electricity, and other infrastructure, all of which are needed in future commodities production (Abdul-Rahaman, Issahaku, & Zereyesus, 2021). Rice production contains different smaller individual production processes based on raw materials like seeds and fertilizers, technology of different sorts, and mechanical instruments. So, capital formation provides resources like technology, instruments, seeds, fertilizer, and many other machines to enhance rice crop production and grains (Samoy-Pascual et al., 2021). The literary article of Takahashi, Mano, and Otsuka (2019) investigates the impacts of capital formation on rice production. This study proclaims that when a country's capital goods output, such as raw materials, machinery, and instruments, rises through production or imports, rice production rises as well. The use of higher-quality raw materials, faster machinery, and the most up-to-date tools boosts land and labor productivity. As a result, more rice can be produced in the same amount of time. With an empirical analysis, Mishra, Bairagi, Velasco, and Mohanty (2018) integrate the relationship of abiotic stress and access to capital goods on rice production efficiency. Information regarding abiotic stress and access to capital goods related to rice farming production efficiency in Cambodia. The study states that there may be adverse impacts of droughts or floods on the production of rice crops. If the country is proficient in capital formation or can have the capital goods from outside sources, the impacts of the imbalanced weather pattern can be controlled and the rice production efficiency can be maintained. Hence, capital formation plays a positive role in sustaining rice production efficiency.

3. RESEARCH METHODOLOGY

The article examines the impact of technology adoption, labor force, human capital and capital formation on rice production in Malaysia. The current article extracted the secondary data from WDI and Statista databases and extracted data from 1991 to 2020. The current study uses the ADF test to examine the unit root and investigate the association among constructs using the ARDL model. The authors have established the equation using understudy constructs as given:

$$RP_t = \alpha_0 + \beta_1 TA_t + \beta_2 LF_t + \beta_3 HCI_t + \beta_4 CF_t + e_t \quad \textbf{(1)}$$

Where;

RP	=	Rice Production
t	=	Time Period
TA	=	Technology Adoption
LF	=	Labor Force
HCI	=	Human Capital Index
CF	=	Capital Formation

The current research has taken rice production as the predictive variable and measured it as the logarithm of rice production in a million metric tons. In addition, the current research has taken four predictors such as technology adoption measured as high technology export (% of manufactured exports), labor force measured as labor force participation rate (% of the total population age 15 to 64 years), human capital measured as HCI (scale 0 to 1) and capital formation measured as the capital formation (% of GDP). Table 1 shows the measurements and sources.

Table 1: Variables with Measurements

S#	Variables	Measurement	Sources
01	Rice Production	Rice production in million metric tons	Statista
02	Technology Adoption	High technology export (% of manufactured exports)	WDI
03	Labor Force	Labor force participation rate (% of total population age 15 to 64 years)	WDI
04	Human Capital	Human capital index (scale 0 to 1)	WDI
05	Capital Formation	Capital formation (% of GDP)	WDI

The current research has executed the correlation matrix that shows the directional association among variables. In addition, the present article has also applied the variance inflation factor (VIF) test to examine multicollinearity. The equations are given as under:

R^2_Y ⟹ $Y_{it} = \alpha_0 + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + \beta_5 X_{5it} + e_{it}$ **(2)**

$j = R^2_Y, R^2_{X1}, R^2_{X2}, R^2_{X3}, R^2_{X4}, R^2_{X5}$ **(3)**

$Tolrance = 1 - R^2_j VIF = \frac{1}{Tolerance}$ **(4)**

Moreover, the current research has also executed the ADF test to investigate the unit root among the variables. The stationarity checking is necessary to select the appropriate model. The equation is given below:

$d(Y_t) = \alpha_0 + \beta t + \Upsilon Y_{t-1} + d(Y_t(-1)) + \varepsilon_t$ **(5)**

In addition, the stationarity among variables has been examined individually. Thus, the separate equations are given for each variable as under:

Rice Production

$d(RP_t) = \alpha_0 + \beta t + \Upsilon RP_{t-1} + d(RP_t(-1)) + \varepsilon_t$ **(6)**

Technology Adoption

$d(TA_t) = \alpha_0 + \beta t + \Upsilon TA_{t-1} + d(TA_t(-1)) + \varepsilon_t$ **(7)**

Labor Force

$d(LF_t) = \alpha_0 + \beta t + \Upsilon LF_{t-1} + d(LF(-1)) + \varepsilon_t$ **(8)**

Human Capital Index

$d(HCI_t) = \alpha_0 + \beta t + \Upsilon HCI_{t-1} + d(HCI_t(-1)) + \varepsilon_t$ **(9)**

Capital Formation

$d(CF_t) = \alpha_0 + \beta t + \Upsilon CF_{t-1} + d(CF_t(-1)) + \varepsilon_t$ **(10)**

The stationarity results exposed that some variables are stationary at the level, but some are stationary at the first difference, which is the best condition for applying the ARDL model (Kisswani & Zaitouni, 2021). In addition, the ARDL model provides the short and long-run results among variables together (Sharma, Shrivastava, Rohatgi, & Mishra, 2021). Moreover, the ARDL also controls the autocorrelation and heteroscedasticity effects (Atmaca & Karadaş, 2020). The equation is given below:

$\Delta RP_t = \alpha_0 + \sum\delta_1 \Delta RP_{t-1} + \sum\delta_2 \Delta TA_{t-1} + \sum\delta_3 \Delta LF_{t-1} + \sum\delta_4 \Delta HCI_{t-1} + \sum\delta_5 \Delta CF_{t-1} + \varphi_1 RP_{t-1} + \varphi_2 TA_{t-1} + \varphi_3 LF_{t-1} + \varphi_4 HCI_{t-1} + \varphi_5 CF_{t-1} + \varepsilon_1$ **(11)**

4. Research Findings

The current research has executed the correlation matrix that shows the directional association among variables. The results indicated that technology adoption, labor force, human capital, and capital formation have a positive and significant linkage with rice production in Malaysia. Table 2 presents the correlation matrix.

Table 2: Matrix of correlations

Variables	LRP	TA	LF	HCI	CF
LRP	1.000				
TA	0.543	1.000			
LF	0.109	-0.299	1.000		
HCI	0.201	0.201	0.302	1.000	
CF	0.599	0.622	0.493	0.411	1.000

In addition, the present article has also applied the VIF test to examine multicollinearity. The results indicated that the values of VIF are lower than five, and values of reciprocal of VIF are larger than 0.20 and exposed no multicollinearity. Table 3 presents the VIF results.

Table 3: Variance inflation factor

	VIF	1/VIF
LRP	3.092	0.323
TA	2.879	0.347
LF	2.009	0.498
HCI	1.652	0.605
CF	2.620	0.382
Mean VIF	2.450	.

Moreover, the current research has also executed the ADF test to investigate the unit root among the variables. The results indicated that the LRP, TA and HCI are stationary at the level, and LF and CF are stationary at first difference. Table 4 presents ADF results.

Table 4: Unit Root Test

Augmented Dickey-Fuller Test (ADF)	Level	t-statistics	p-values
LRP	I(0)	-2.192	0.040
TA	I(0)	-2.229	0.033
LF	I(1)	-6.201	0.000
HCI	I(0)	-2.001	0.047
CF	I(1)	-5.877	0.000

The bound test was also executed to investigate the cointegration among variables. The results exposed that the 6.822 calculated f-statistics value is higher than the critical values at the five percent significance level. Table 5 presents ARDL bound test results.

Table 5: ARDL Bound Test

Model	F-statistics	Lag	Level of Significance	Bound test critical values	
				I(0)	I(1)
RP/ (TA, LF, HCI, CF)	6.822	4	1%	7.119	7.723
			5%	6.342	6.620
			10%	5.322	5.891

The results of the ARDL model indicated that technology adoption, labor force, human capital, and capital formation have a positive and significant linkage with rice production in Malaysia in the short run. In addition, the R square value indicated that 49.1 percent of variations in rice production are due to all the predictors used in the study. Table 6 presents short-run associations.

Table 6: Short Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(TA)	1.653	0.439	3.765	0.012
D(LF)	1.109	0.411	2.698	0.032
D(HCI)	0.982	0.301	3.262	0.018
D(CF)	2.092	0.901	2.322	0.037
CointEq(-1)*	-1.422	0.527	-2.698	0.032
R-squared	0.491	Mean dependent var		-0.055
Adjusted R-squared	0.462	S.D. dependent var		2.622

The results of the ARDL model indicated that technology adoption, labor force, human capital, and capital formation have a positive and significant linkage with rice production in Malaysia in the long-run. Table 7 presents long-run associations.

Table 7: Long Term Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TA	1.882	0.493	3.817	0.011
LF	3.102	0.872	3.557	0.017
HCI	2.091	0.910	2.298	0.034
CF	0.830	0.305	2.721	0.024
C	0.672	0.203	3.310	0.21

5. DISCUSSIONS

The findings imply that technology has a beneficial effect on rice output. These findings corroborate Balwinder et al. (2020) observation that rice production is a multi-step process. All of these stages necessitate the use of specialized services. Certain technology in these locations for specific services benefits the completed products produced in all of these rice production zones. These findings are corroborated by Nguyen, Grote, and Nguyen (2019), who demonstrate that increasing the use of technologies for various rice production processes, including land selection or preparation for rice production, rice paddy transplantation, reaping, stacking, handling, threshing, cleaning, and hauling, improves rice production quality and volume.

Additionally, the data suggested that the labor force has a beneficial effect on rice production. These findings corroborate Smith and Mohanty (2018) assertion that rice production is a lengthy process comprising numerous phases. Increased workforce utilization improves and accelerates production operations at these levels. Increased workforce capacity not only increases output but also improves its quality. These findings are also consistent with Komatsu, Saito, and Sakurai (2022), who demonstrate that increasing the labor force decreases time wastage and, with increased efficiency, produces more rice with fewer inputs.

The results indicated that human capital has a positive relation to rice production. These results are supported by Donkor and Owusu (2019), which highlight that the improved human capital provides the workforce in different areas of rice production who have proper training on how to manage the rice production field and perform rice production activities. Such a labor force improves the productivity of rice. The results indicated that capital formation has a positive relation to rice production. These results are in line with Pike and Grosse (2018), when the production of capital goods like raw material, machines, and instruments increases through production or imports, the activity in rice production increases. The use of better-quality raw materials, fast machines, and the latest tools increase land and labor productivity. So, within the same period, more rice production can be attained. These results also match with Rayamajhee, Guo, and Bohara (2021), which shows that the tendency to enhance the capital formation within the country results in the creation of fertile soil and irrigation system. The presence of more pieces of fertile land and a better irrigation system enhances the country's capacity to produce rice.

6. IMPLICATIONS

The current study makes a lot of theoretical contributions. This study explores the influences of technology adoption, labor force, human capital, and capital formation on rice production. In prior literature, technology adoption, labor force, human capital, and capital formation role in rice production have been examined. The present study, which amalgamates technology adoption, labor force, human capital, and capital formation on rice production, adds to the existing literature. The present study examines rice production and the role of technology adoption, labor force, human capital, and capital formation in it the economy of Malaysia, which in itself is a great addition to the literature. The current work has significant empirical implications for emerging economies that rely heavily on crop production, as it proposes a set of strategies for improving crop quality. This report advises the government to prioritize technology improvements, capital formation, and human capital development inside the country in order to boost rice production. This study assists future researchers in exploring this problem further and also assists policymakers in developing policies connected to rice production by examining elements such as technology adoption, labor force, human capital, and capital formation. It is also a handbook for rice farmers on how to advance their careers through the benefits of technology adoption, labor force development, human capital development, and capital formation.

7. CONCLUSIONS

The study aimed to analyze how technology adoption, labor force, human capital, and capital formation affect rice production. Using the quantitative research method, information about the technology adoption, labor force, human capital, and capital formation and their influences on rice production was collected from Malaysia. The study outcomes from the empirical research on Malaysia indicated that technology adoption, labor force, human capital, and capital formation are positively associated with rice production. The results revealed that using peculiar technology in the preparation of land, paddy transplanting, harvesting, and post-harvesting processes enhances rice production. The results stated that though the use of technologies in the modern farming industry is getting higher, the labour to run these technologies and carry on many production processes is still required. The increase in the strength of the labor force makes it possible to expand rice production. The results also showed that the improvement of human capital, which includes education, health protection of humans, skills development, and professional training, provides an efficient workforce for the management of rice farms and the production of rice. Moreover, the increase in capital formation within the country enhances the raw material and other resources for farming. So, an increase in capital formation enhances rice production.

8. LIMITATIONS

The present study also has some limitations, expected to be removed in future literature. The study examines only the impacts of technology adoption, labor force, human capital, and capital formation on rice production. The study throws no light on other factors like geographical conditions, financial development, and international trade for examining rice production. Future must analyze more factors that affect rice production for comprehensive study. And the present article analyzes the role of technology adoption, labor force, human capital, and capital formation in rice production for a limited period. This provides little information on technology adoption, labor force, human capital, and capital formation in rice production. Future literature requires the analysis of technology adoption, labor force, human capital, and capital formation impacts on rice production for an extended period.

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