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Empowerment of Farmer Community Group in Indonesian Village Together with Students University in Fruit Plantation Development

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Due to reduced emphasis on farmer community groups, the Indonesian agricultural sector is not developing. Regarding agricultural education and fruit cultivation, the farmer community faces various obstacles. Indonesian farmers have limited access to the most advanced technology. Therefore, the current research investigates the direct effect of farmer access to technology, farmer education, and novel agronomic methods on developing fruit plantations in Indonesia. In addition, this study aimed to examine the moderating effect of university agricultural research on farmer access to technology, farmer education, and innovative agronomic practices. This study's design is cross-sectional, and its population consists of Indonesian farmers. The results demonstrated that Indonesian farmers are interested in gaining access to new technology, education, and agronomic approaches for fruit plants. This research is founded on an original model that addresses a research gap and substantially contributes to the body of knowledge. The outcomes of this study have significant practical and theoretical consequences that are crucial for effective implementation. Additionally, this research includes limitations highlighted in the future directions section to present agriculture research researchers with a path forward.

Key words: Fruit plantation, agriculture development, farmer community, farmer empowerment, agronomy practices

1. INTRODUCTION

Advancement in the agriculture industry is essential for all nations whose economic progress is contingent on the agriculture sector (Ayu Palar et al., 2021). The world's economy is not sustainable due to various challenges in the agriculture industry (Rondhi et al., 2018). The slow growth of the agriculture industry is due to a lack of technological innovation and the sector's reliance on traditional production methods (Utami et al., 2019). The technological development of European nations is the driving force behind their agricultural progress (Mardianto et al., 2019). In poorer nations, the agriculture sector receives less attention (Molina-Maturano et al., 2020). Governments not focusing on sustainable agriculture policy are leading the agriculture sector down an unfavorable growth path (Aacharya et al., 2020). Corruption and the government's lack of interest in agriculture are also significant contributors to the sector's slow growth (Jung et al., 2021). The government's job is to enhance the agricultural sector's growth for economic sustainability and progress (Sekaran et al., 2021). Less emphasis on the education of farmers is also problematic for the expansion and sustainability of the agriculture industry (Rulli et al., 2019; Sibuea et al., 2020; Susilawati et al., 2021). Attention to the agriculture sector is vital for the country's economic survival (Amar et al., 2020; Lubis et al., 2015; Nugraha et al., 2019).

Indonesia's agricultural sector is experiencing a production problem since productivity is not improving strategically (Jelsma et al., 2019). In addition to reducing Indonesia's exports, the agriculture sector's production is mainly consumed by Indonesians (Danilwan et al., 2020; Windarto et al., 2018). This has created a problem for Indonesia's trade balance, as agriculture is considered the most vital industry for economic expansion (Byrareddy et al., 2019). The Indonesian government has shown little care for agricultural development, although other nations, such as Thailand and Malaysia, are actively advancing agricultural sector growth (Berkelmann et al., 2018; Maggasingang et al., 2020; Pratamaa et al., 2020). Appropriate improvement of agricultural growth facilities necessitates agricultural sector expansion (Hakimah et al., 2019; Santika, Wilson, Budiharta, Kusworo, et al., 2019; Tambunan et al., 2022). Indonesia's economic viability can be enhanced by the agriculture sector's continued expansion (Schoneveld et al., 2019). Moreover, if Indonesian farmers live in the community, they must be supplied with the required resources to enhance the agricultural sector's productivity (Atrizka et al., 2022; Purnomo et al., 2020). Corruption in Indonesia's agriculture sector has hindered its productive growth (Kelley, 2018). The agricultural products of countries with no corruption in the agricultural sector are imported (Rulli et al., 2019; Wardhani et al., 2021).

The research on the issues and growth of the agricultural sector investigated the various viewpoints on agricultural output. According to Habibie et al. (2021), agricultural productivity is essential for the growth of the agricultural economy. Similarly, (Santika, Wilson, Budiharta, Law, et al., 2019) found that corruption cannot be tolerated for the progress of the agriculture industry. Prastiyo et al. (2020) stated that agricultural sector progress is attainable if the government works to give all facilities to farmers

associated with the expansion and enhancement of the agricultural sector. According to Khalil et al. (2019), the government is obligated to provide farmers loans for the agriculture sector's growth because these loans are essential for the productive development of goals. Khatiwada et al. (2021) found that agricultural output is feasible if the government develops productively sustainable long-term policies.

Lakitan et al. (2018) also noted that agricultural production could be increased if the government productively subsidizes agricultural products. Maimunah et al. (2018) concluded that the government must play a role in agricultural production to assist farmers. Wijaya et al. (2018) reported that farmers with higher levels of education are increasing agricultural output.

Indeed, the current research in the literature addressed the many viewpoints on agricultural sector development. However, the studies have not analyzed the literature in the context of the new technological advancements, the education of farmers, the new practices and development of the agronomy sector, and the function of agricultural research laboratories. This research aims to examine the direct influence of farmer access to technology, farmer education, and innovative agronomic methods on the development of agriculture in Indonesia. In addition, the purpose of this study was to examine the moderating effect of university agriculture research on the influence of farmer access to technology, farmer education, and innovative agronomic techniques on agriculture development. Thus, the research is founded on an original model that addresses a research gap and substantially contributes to the body of knowledge. Moreover, the findings of this research have significant practical and theoretical consequences that are crucial for the effective execution of the study. Additionally, this research includes limitations highlighted in the future directions section to present agriculture research researchers with a path forward.

2. REVIEW OF LITERATURE

2.1 Agriculture Development

The expansion of the agricultural sector is essential for economic expansion (Sibuea et al., 2020). Due to agriculture's substantial contribution to the economy, the economic performance of countries that excel in the agricultural sector is superior (Rondhi et al., 2018). The new technological innovation is vital for the agriculture sector's proper development, as it is required to enhance economic growth performance (Utami et al., 2019). In addition, farmers are associated with the agriculture sector, and their economic circumstances are directly tied to the agriculture sector (Mardianto et al., 2019). New research in the agriculture sector can boost the sector's productivity (Molina-Maturano et al., 2020; Tanjung et al., 2022).

2.2 University Agriculture Research

Agricultural research is a means to enhance the productivity of the agriculture industry (Aacharya et al., 2020). The universities of countries with a strong reliance on the agricultural sector are doing new research in university laboratories to promote agricultural growth in these nations (Jung et al., 2021). The university's effective creation of seeds and plants is essential to expanding the agriculture industry (Sekaran et al., 2021). To obtain a higher benefit from the agriculture sector, it is vital to preserving the new agricultural technology in a favorable manner (Habibie et al., 2021). Universities in Europe's affluent nations have contributed significantly to the agriculture industry (Santika, Wilson, Budiharta, Law, et al., 2019).

2.3 Farmer Access to Technology

Technological development is essential for the agriculture industry to expand (Prastiyo et al., 2020). The notion of intelligent farming and growth arose with the agriculture sector's emergence when many countries changed to the agricultural technological innovation required for agriculture's productive growth (Khalil et al., 2019). The agriculture sector must adapt to technology to enhance production (Khatiwada et al., 2021). Improved exports significantly contribute to the country's economic viability, aided by the higher crop yields from smart farming (Lakitan et al., 2018). Future technology is required for agricultural improvement, which is essential for the agricultural sector's expansion (Maimunah et al., 2018).

2.4 Farmer Education

Indeed, farmers' education is vital to operate more efficiently in crop production (Jelsma et al., 2019). Educated farmers employ technology in agricultural production because they believe it is vital for intelligent growth (Wijaya et al., 2018). Moreover, farmers with access to pesticide information have significant logical options for land production (Windarto et al., 2018). The role of the farmer is crucial to the expansion of the agriculture sector, and farmers in advanced and developed nations are working on the pattern of smart farming that is essential for the sector's productive growth (Byrareddy et al., 2019). Educated farmers can operate more efficiently than illiterate farmers (Berkelmann et al., 2018).

2.5 New Agronomy Practices

New agronomic procedures are essential to the agricultural sector's production (Santika, Wilson, Budiharta, Kusworo, et al., 2019). Significant agricultural production exists in nations that have built centres for research and development to expand their agriculture industries (Schoneveld et al., 2019). Progress in agriculture is vital since it is used to obtain products more efficiently (Kelley, 2018). Modern agronomic approaches can enhance the performance of the agricultural industry (Rulli et al., 2019). Educated farmers are constantly enthusiastic about the development of the agriculture sector, which is essential for the efficient operation of this sector (Nugraha et al., 2019).

2.6 Hypotheses Development

Figure 1 highlights the framework of this study, which is based on the model of agriculture development. According to Ayu Palar et al. (2021), technological improvement is

required for increased crop yield. Similarly, Rondhi et al. (2018) emphasized that new technological advancements in the agricultural industry are required for the intelligent cultivation of crops. Utami et al. (2019) found that farmers must have access to the latest technologies required to grow and develop their farms' productivity. Mardianto et al. (2019) revealed that the smart method of growth improvement is viable when farmers in any country have access to the new technology required for growth enhancement. Molina-Maturano et al. (2020) concluded that the expansion of the agriculture sector is necessary for farmers to work more efficiently and that it is the responsibility of the government to equip farmers with the most advanced technological tools to increase the rate of their agricultural expansion. Aacharya et al. (2020) noted that farmers' access to technology would benefit the agriculture industry's expansion.

H1: Farmer access to technology has a positive impact on agriculture development.

Jung et al. (2021) noted that any nation's educated farmers significantly impact the productive growth of the fields. Farmers are essential to have access to education, according to Sekaran et al. (2021), since if they were educated, they would adopt new technologies and methods of agricultural development. According to Habibie et al. (2021), educated farmers are more productive at work than ignorant farmers who pay less attention to education. Santika, Wilson, Budiharta, Law, et al. (2019) concluded that education is vital for farmers because if they had the knowledge to do so, they would purchase the newest farming technology to increase production. Prastiyo et al. (2020) noted that educated farmers perform significantly better than ignorant farmers whose labor receives less attention. Khalil et al. (2019) emphasized that the lives of farmers must be enhanced through education to have optimal crop growth.

H2: Farmer education has a positive impact on agriculture development.

According to Khatiwada et al. (2021), new methods in the agronomy department are required to produce new plants and other seeds. According to Lakitan et al. (2018), agronomy's contribution to the increase of agricultural products makes its position in agricultural production significantly. Maimunah et al. (2018) concluded that agriculture's growth must be sustained since it may positively impact the country's economic development, which is made possible by the agronomy department's research and development. Wijaya et al. (2018) noted that countries that have prioritized expanding agriculture in recent years have significantly increased their productivity. According to Jelsma et al. (2019), agronomy institutes' progress and research of new agronomy methods make agricultural expansion possible. Byrareddy et al. (2019) concluded that expansion in the agriculture sector is vital for farmers who desire the agronomy department's innovative farming practices to increase productivity.

H3: New agronomy practices have a positive impact on agriculture development.

According to Santika, Wilson, Budiharta, Law, et al. (2019), the research conducted in the laboratories of various institutions is essential for the production of agriculture development since the consequences of these activities are crucial for farmer development. Schoneveld et al. (2019) highlighted that numerous universities in China and European nations are working diligently to develop the agriculture industry, which is essential for better agricultural practices. Purnomo et al. (2020) stated that the growth of the agriculture sector is conceivable when the government encourages university labs to produce new seeds and pesticides in the agriculture sector. Rulli et al. (2019) reported that effective trials in agronomy labs are important for producing new seeds required for improved agriculture. Nugraha et al. (2019) concluded that in nations that do not provide the agriculture sector with effective economic growth, the advancement of the agricultural economy receives little attention.

H4: University Agriculture research moderates the relationship between farmer access to technology and agriculture development.

According to Kelley (2018)'s research, when farmers are trained through agriculture research and development seminars, they receive the required education to increase their output. Frolova et al. (2021) concluded that modern nations must increase agriculture sector growth by significantly enhancing farming. Rasmussen et al. (2008) claimed that farmers must be educated on the latest research conducted by university labs in the agriculture sector to improve the performance of the agriculture sector. Dos Santos et al. (2010) noted that wealthy nations are supplying farmers with the relevant information for their education, which is essential for farming in an intelligent manner. Nugraha et al. (2019) also indicated that smart farming is possible if farmers are motivated and increase their output more effectively. Teno et al. (2016) stated that a farmer's education enables them to use fewer resources more efficiently to increase productivity.

H5: University Agriculture research moderates the relationship between farmer education and agriculture development.

The research by Berkelmann et al. (2018) revealed that farmers must acquire and implement new technological advances in agronomy methods for crop production. Frolova et al. (2021) observed that less-motivated farmers must attend university agriculture research facilities to observe the favorable application of technology to the agriculture sector for smart farming. According to Nugraha et al. (2019), the director of a university agronomy lab is essential to deliver all relevant information to those involved in the growth of the agriculture sector to stimulate farmers. According to Windarto et al. (2018), the success of the agriculture industry is contingent upon technological innovation and the implementation of productive

employee work practices. Indeed, Nugraha et al. (2019) found that farmer education is vital; nevertheless, they must be provided with the required inflation by the authorized institutes to utilize the new pesticides in the agriculture expansion.

H6: University Agriculture research moderates the relationship between new agronomy practices and agriculture development.

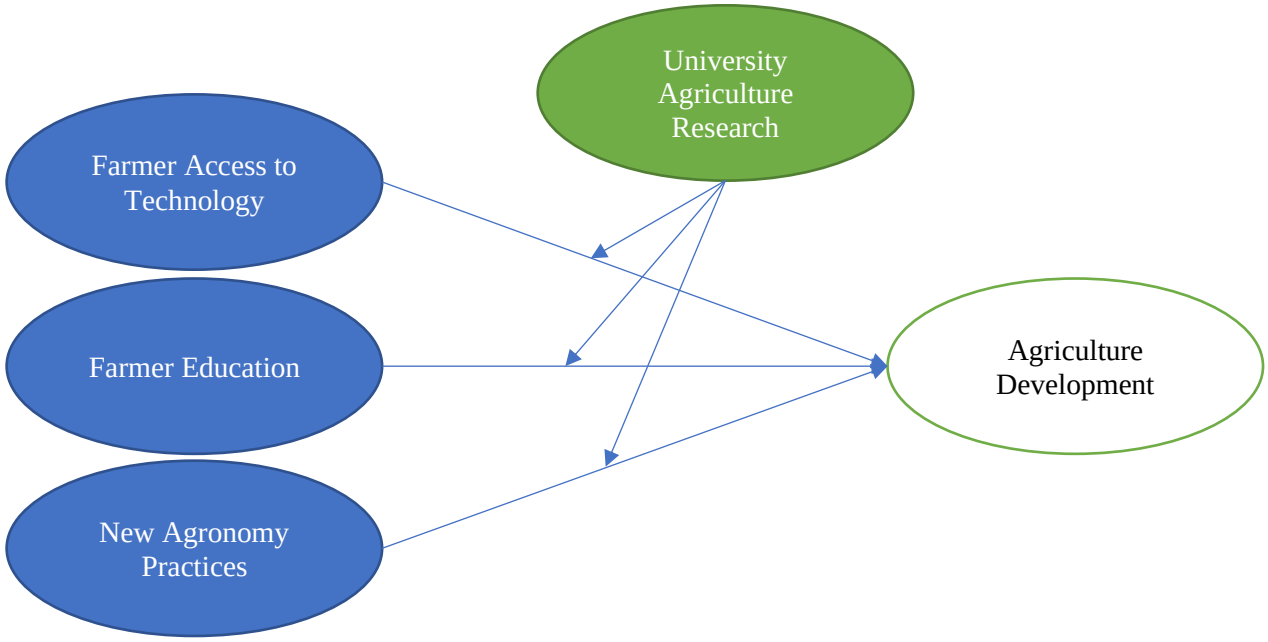

Figure 1: Agriculture Development Theoretical Model

3. METHODOLOGY

This research is based on the development of the agriculture sector; therefore, the farmers of various villages in Indonesia who are directly involved in agriculture production are the primary stakeholders. The study is based on "cross-sectional" data since it is the most efficient way to obtain relevant findings in a restricted time frame. In addition, the "quantitative approach" was used to collect data for this study since it is an appropriate way for the researcher to present empirical proof in the literature on the formed relationship and the study's findings. In this manner, the research employed the "Likert scale" questionnaire since the rating scale assists respondents in providing accurate research data. Consequently, the scale elements for each construct were developed from past research on agriculture development. Before determining the "validity and reliability" of the items, this study examined the interrelationships between the variables. In this regard, the research employed the criterion "Cronbach Alpha > 0.70" for dependable items. Following a significant " > 0.80" value, the research updated the items for farmer access to technology from Misaki et al. (2016). Following a significant " α> 0.79" value, the researchers also altered the items for farmer education from Trede et al. (2000). In addition, this study updated the items for innovative agronomy techniques from Dos Santos et al. (2010) based on an " α> 0.91" value that was statistically significant. In addition, following the significant " α> 0.87" score, the researchers altered the items for university agriculture research from Rasmussen et al. (2008). After a significant " α> 0.73" value for identifying its moderating effect on the study model, the researchers used Teno et al. (2016)'s items for agricultural development. Therefore, these goods were extremely "reliable and valid." Due to the sizeable population of farmers in Indonesia, "Morgan's Table" advised a sample size of 384 for this study's findings and conclusions. In addition, questionnaires were printed and sent to respondents to collect data. Despite the farmers' lack of education, they are supported in data collection and response. The scale elements are further explained to the respondents to acquire accurate data. Respondents completed 394 surveys and were assured that their information would not be shared with anyone else. They were also advised that personal information, including their names, ages, marital status, and annual income, would never be disclosed. This study utilized "Smart PLS" for data analysis because it is a dependable instrument in the social sciences.

4. RESULTS AND DATA ANALYSIS

4.1 Normality Test

This research has initially examined the "normality of data." Field (2013) explains, "Skewness is a measure of symmetry, or more accurately the lack of symmetry, whereas kurtosis is a measure of whether the data are heavy-tailed or light-tailed relative to a normal distribution". "A common guideline for skewness is that if the value is larger than +1 or less than –1, this indicates a significantly skewed distribution," as indicated by Field (2013). "For kurtosis, if the number is greater than +1, the distribution is too peaked". Thus, the research's data are normalized, and the findings are reported in Table 1.

Table 1. Normality Test

Measurements	Mean	Standard Deviation	Excess Kurtosis	Skewness
FAT1	3.242	1.515	-0.491	0.086
FAT2	3.251	1.799	-0.57	0.437
FAT3	3.519	1.884	-0.81	0.3
FAT4	3.494	1.907	-0.792	0.385
FAT5	3.537	1.73	-0.489	0.299
FE1	3.506	1.806	-0.688	0.233
FE2	3.498	1.833	-0.888	0.146
FE3	3.671	1.862	-0.772	0.192
FE4	3.706	1.863	-0.752	0.314
FE5	3.675	1.937	-0.787	0.354
NAP1	3.567	1.885	-0.719	0.375
NAP2	3.58	1.85	-0.628	0.358
NAP3	3.61	1.892	-0.781	0.31
NAP4	3.494	1.79	-0.469	0.451
NAP5	3.537	1.92	-0.929	0.197
UAR1	3.468	1.823	-0.647	0.314
UAR2	3.649	1.776	-0.612	0.266
UAR3	3.061	1.473	-0.084	0.598
UAR4	3.156	1.501	0.464	0.884
UAR5	3.221	1.429	0.866	0.932
AD1	3.143	1.439	0.534	0.792
AD2	3.104	1.379	0.558	0.679
AD3	3.19	1.497	0.353	0.707
AD4	3.117	1.459	0.542	0.831
AD5	3.009	1.42	-0.222	0.441
AD6	3.186	1.353	0.49	0.67

4.2 Convergent Validity

In the second step, data reliability and validity are evaluated. Thus, "factor loading (FL), composite reliability (CR), and extracted average variance (AVE)" were taken into account. According to Hair et al. (2013), "factor loading indicates how well an item represents the underlying construct, and it must be more than 0.70.". Furthermore, Hair et al. (2013) clarify that "Cronbach's alpha ($\alpha > 0.70$) is a measure of internal consistency, that is, how closely connected a set of items are as a group". According to Hair et al. (2013), "Composite reliability (CR > 0.70) is a measure of internal consistency in scale items, similar to Cronbach's alpha". According to Henseler et al. (2014), "Average variance extracted (AVE > 0.50) is a measure of the amount of variance captured by a construct concerning the amount of variance attributable to measurement error". The findings demonstrated the convergent validity of the study (Table 2 and Figure 2).

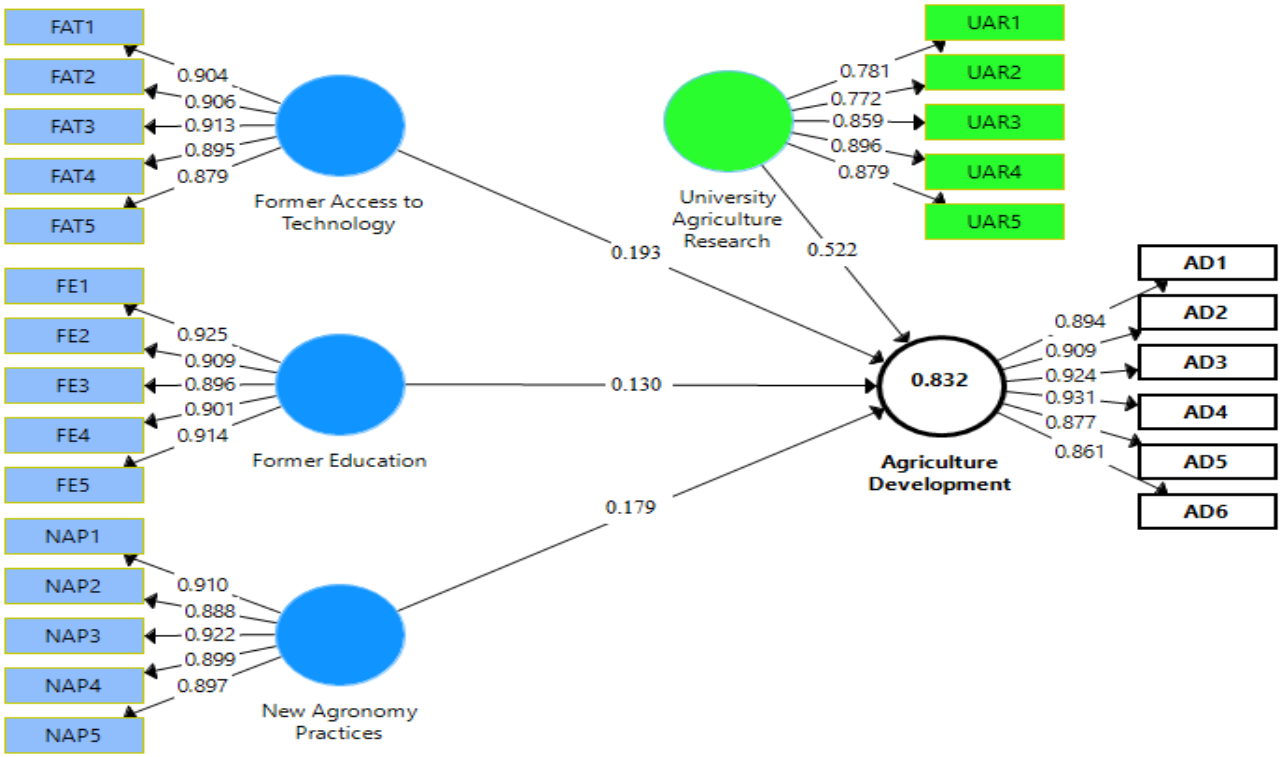

Figure 2. Measurement Model

Table 2. Convergent Validity

Variables	Items	Description	FL	Cronbach's Alpha	CR	AVE
Agriculture Development	AD1	I want to increase the production of farming.	0.894	0.953	0.962	0.809
	AD2	I believe that cheap technology can help me with better farming.	0.909			
	AD3	My production is increasing every year.	0.924			
	AD4	I can get information from the research lab for agriculture production.	0.931			
	AD5	Agriculture production is necessary for economic development in the agriculture sector.	0.877			
	AD6	Agriculture products can provide better revenue by exporting to developed countries.	0.861			
Farmer Access to Technology	FAT1	The government is providing useful technology.	0.904	0.941	0.955	0.809
	FAT2	Technology is helpful in agriculture growth.	0.906			
	FAT3	Technology can increase the exports of agricultural fruits.	0.913			
	FAT4	Technology is easy to purchase.	0.895			
	FAT5	We can get the technology for smart farming.	0.879			
Farmer Education	FE1	I have information about my crops.	0.925	0.947	0.960	0.826
	FE2	I know the way I can use the technology.	0.909			
	FE3	I have information about pesticides.	0.896			
	FE4	I purchase seeds from cheap sellers.	0.901			
	FE5	I get support from the government for my crop production.	0.914			
New Agronomy Practices	NAP1	New seeds are best for production.	0.910	0.944	0.957	0.816
	NAP2	Smart farming helps generate more revenue.	0.888			
	NAP3	Green technology in agriculture is helpful for farmers.	0.922			
	NAP4	Green technology is easy to use for farming.	0.899			
	NAP5	Green production of crops is useful for economic sustainability.	0.897			
University Agriculture Research	UAR1	University seeds are useful for farming fruits.	0.781	0.895	0.922	0.704
	UAR2	The university provides information about new products.	0.772			
	UAR3	University research labs are increasing the production of cotton.	0.859			
	UAR4	I purchase seeds from university research labs.	0.896			
	UAR5	Research labs are used for agriculture improvement.	0.879			

4.3 Discriminant Validity

In this phase of the investigation, "discriminant validity" was determined. According to Gold et al. (2001), "discriminant validity evaluates whether concepts or measurements that are not meant to be connected are unrelated". Gold et al. (2001) explain, "HTMT is a measure of similarity across latent variables, and its threshold is debatable; the majority of articles propose a value below 0.90.". According to Table 3's findings, it possesses discriminant validity.

Table 3. Discriminant Validity

	Agriculture Development	Farmer Access to Technology	Farmer Education	New Agronomy Practices	University Agriculture Research
Agriculture Development					
Farmer Access to Technology	0.749				
Farmer Education	0.704	0.793			
New Agronomy Practices	0.674	0.779	0.789		
University Agriculture Research	0.665	0.709	0.686	0.766	

4.4 Structural Model

Using "t > 1.96 & p 0.05" to determine the validity of the developed relationship, the findings of the "structural model" have been employed at this step to determine the validity of the developed relationship. The study found that the farmer's access to technology has a good and significant effect on the development of agriculture; therefore, H1 is approved. In addition, the study determined that farmer education has a favorable and considerable impact on the development of agriculture. Hence H2 is approved. In addition, the study determined that the new agronomic techniques have a favorable and significant impact on the development of agriculture; therefore, H3 is adopted. Figure 3 and Table 4 display the outcomes of the measurement model.

4.5 Moderating Impacts

In this phase, the significance of moderating effects was evaluated. The data indicated that the moderating effect of university agriculture research favorably influences the favorable association between farmer access to technology and agricultural development and that hypothesis H4 is significant. Graphically, this relationship is depicted in Figure 4.

4.6 Moderating Impacts

In this phase, the significance of moderating effects was evaluated. The data indicated that the moderating effect of university agriculture research favorably influences the favorable association between farmer access to technology

and agricultural development and that hypothesis H4 is significant. Graphically, this relationship is depicted in Figure 4.

Second, the relevance of the second moderating impact was evaluated. The data demonstrated that the moderating effect of university agricultural research favorably influences the favorable association between farmer education and agriculture development, and Hypothesis 5 is supported. Graphically, this relationship is depicted in Figure 5.

Thirdly, the relevance of the second moderating impact was evaluated.

The data indicated that the moderating effect of university agriculture research favorably influences the favorable association between new agronomic techniques and agricultural development and that hypothesis H6 is significant. A graph depicting this association is shown in Figure 6.

4.7 Predictive Relevance

In this stage, the research has determined the strength of the research model. In this way, "Q-square is predictive relevance, measures whether a model has predictive relevance or not ($Q^2 > 0$) is good", explained by Hair et al. (2013). According to the findings in Table 5, the research has strong "predictive relevance".

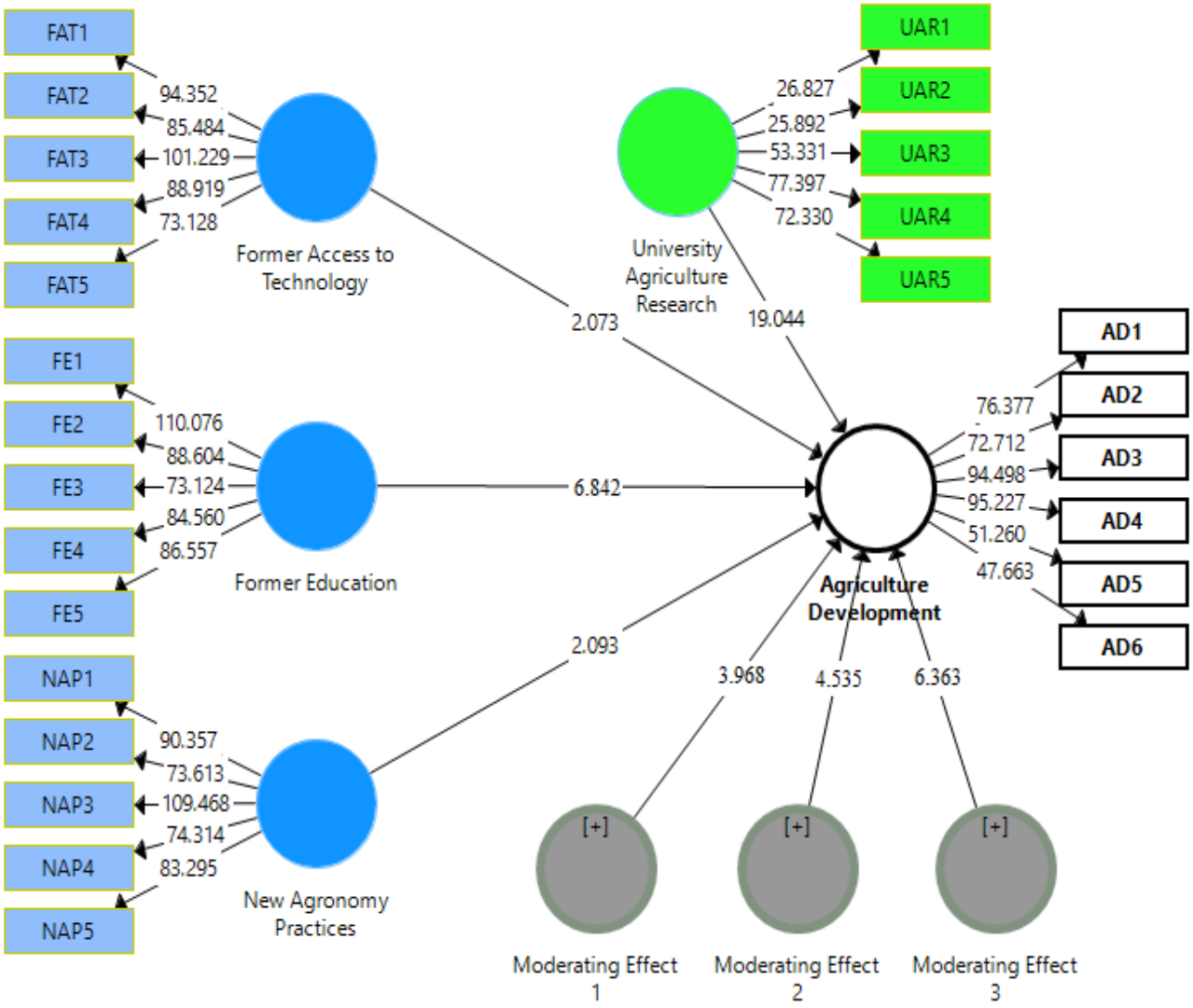

Figure 3. Structural Model

Table 4. Structural Model

	Original Sample	Standard Deviation	T Statistics	P Values	Status
Farmer Access to Technology -> Agriculture Development	0.193	0.093	2.073	0.039	Accepted
Farmer Education -> Agriculture Development	0.130	0.019	6.842	0.000	Accepted
New Agronomy Practices -> Agriculture Development	0.179	0.085	2.093	0.037	Accepted
Moderating Effect 1 -> Agriculture Development	0.127	0.032	3.968	0.000	Accepted
Moderating Effect 2 -> Agriculture Development	0.127	0.028	4.535	0.000	Accepted
Moderating Effect 3 -> Agriculture Development	0.140	0.022	6.363	0.000	Accepted

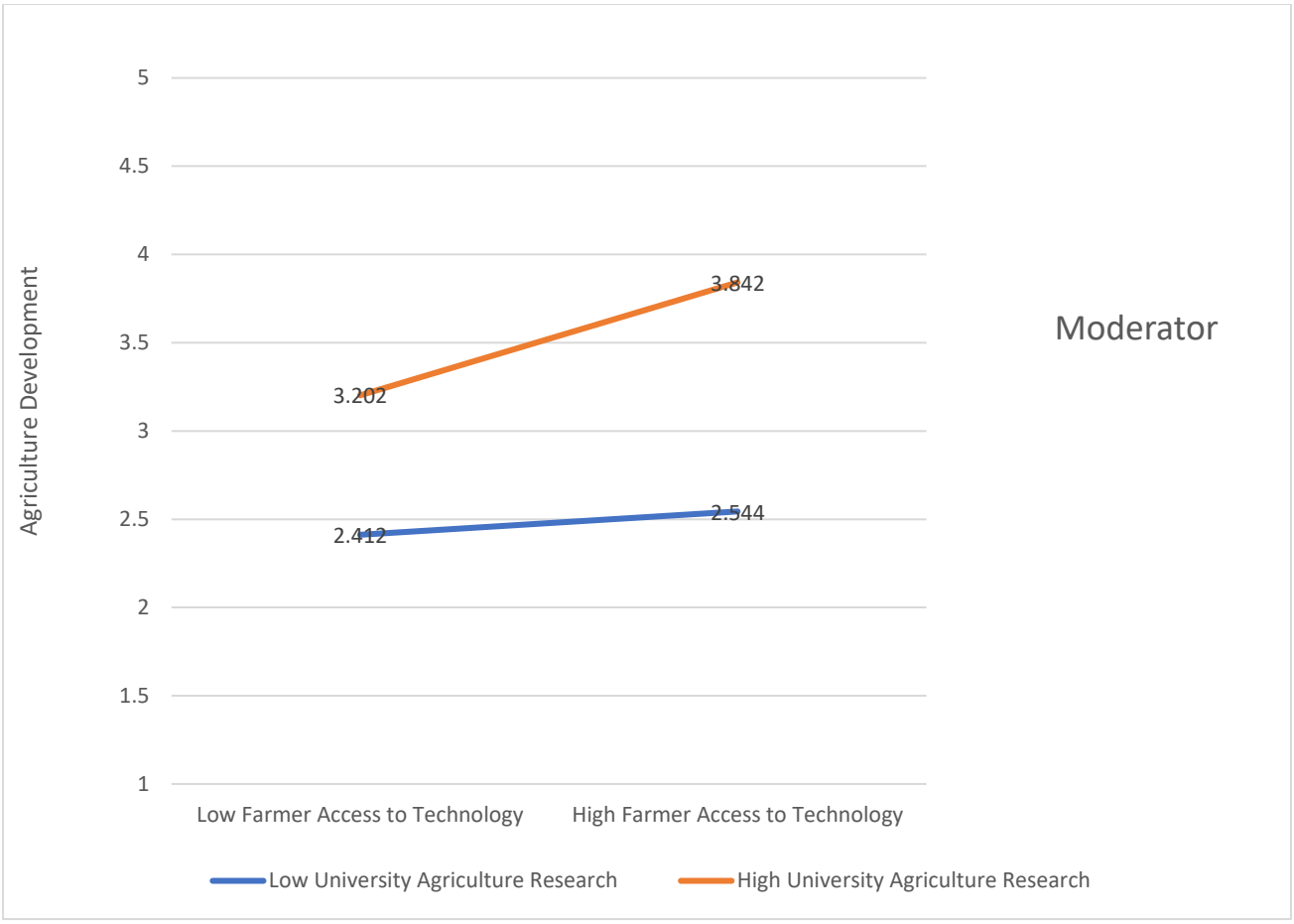

Figure 4. Moderating Impact 1

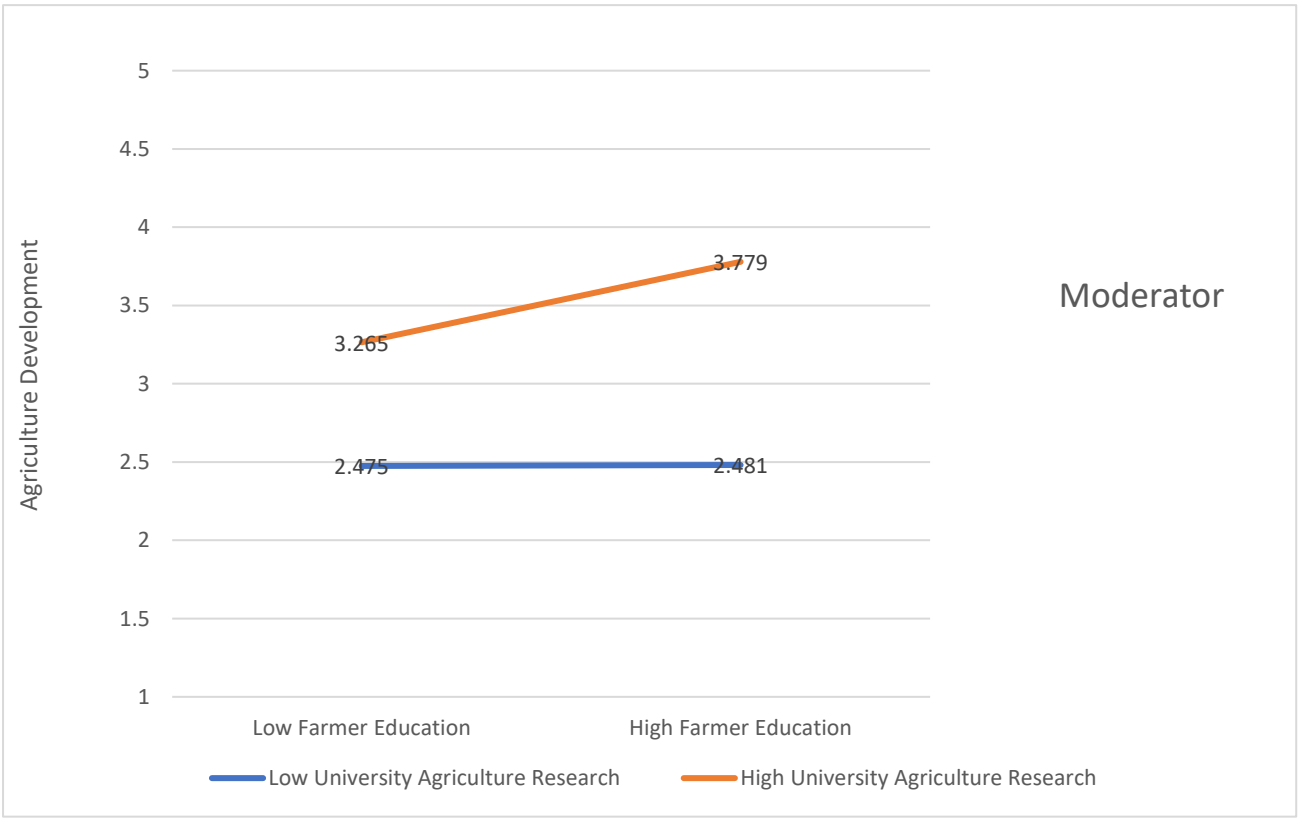

Figure 5. Moderating Impact 2

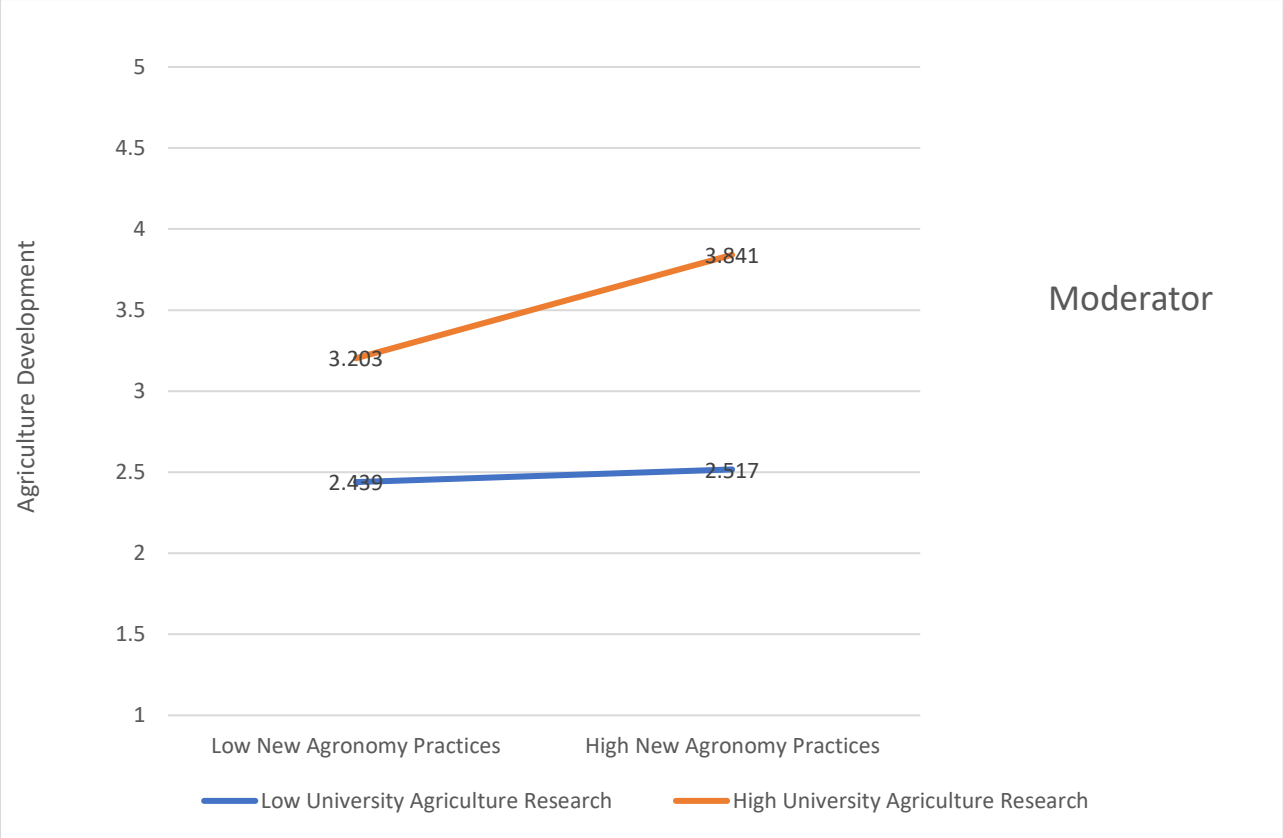

Figure 6: Moderating Impact 3

Table 5. Predictive Relevance

	SSO	SSE	Q^2 (=1-SSE/SSO)
Agriculture Development	1386	459.525	0.668

5. DISCUSSION AND CONCLUSION

The current study's conclusions are based on data analysis that indicates the significance of the association established by this research. All direct and moderating associations are considered significant in this study. Hypothesis 1 demonstrated that farmer access to technology had a direct and positive effect on agricultural development, corroborating the findings of past agricultural research studies. According to Byrareddy et al. (2019), an increase in technological advancement is essential for a rise in crop yield. Similarly, Berkelmann et al. (2018) underlined that the agriculture industry needs new technological developments to boost output rationally. Schoneveld et al. (2019) concluded that farmers required modern technologies to expand and produce more on their farms. According to Purnomo et al. (2020), farmers in any nation might increase their yields if they had the necessary technological advancements. Kelley (2018) found that higher agricultural production is necessary for farmers to work more efficiently. The government must provide farmers with the most advanced technological equipment to improve agricultural productivity. Kelley (2018) underlined that farmers' access to technology would facilitate their success in the agriculture industry. The H2 results revealed that farmer education had a significant direct and positive impact on agricultural development, corroborating the findings of prior agricultural research studies. Rulli et al. (2019) underlined that educated farmers substantially impact any nation's agricultural output. Nugraha et al. (2019) underlined that farmers must have access to knowledge since, after acquiring it, they are more likely to adopt innovative techniques for agricultural progress. According to Nugraha et al. (2019), most farmers are more productive than farmers who lack education and place less value on it. Kelley (2018) concluded that farmers require training because equipped with information, they would invest in cutting-edge farming technologies to boost productivity. Misaki et al. (2016) underlined that educated farmers are significantly more productive than uneducated farmers, who receive minimal attention while working. Trede et al. (2000) stressed the importance of farmers obtaining a higher level of education to enhance their quality of life and ensure that their crops thrive.

The H3 findings demonstrated that novel agronomy methods had a significant direct and positive impact on agricultural development, corroborating the findings of prior agricultural research investigations. According to Windarto et al. (2018), new agricultural department procedures are necessary for new plants and other seeds to grow. Santika, Wilson, Budiharta, Kusworo, et al. (2019) believe that agronomy plays an essential role in agricultural production because it contributes to the growth of agricultural commodities. Nugraha et al. (2019)

concluded that agriculture's expansion must be sustained since it can favorably influence the nation's economic and social development, which is made possible by the agronomy bureau's research and development efforts. Nugraha et al. (2019) noted that nations that have recently focused on expanding the agricultural sector had beneficially increased their productivity. According to Teno et al. (2016), the expansion of agriculture is made feasible by agronomy institutes' invention and analysis of new agronomic techniques. Frolova et al. (2021) determined that farmers need the agricultural sector to expand and want the agronomy department's newly developed farming practices to improve production.

According to H4 results, university agriculture research has a substantial moderating effect between farmer access to technology and agricultural development. This newly discovered moderating link has been validated by past agricultural study findings. Jelsma et al. (2019) assert that because the outcomes of these practices are essential for the growth of farmers, research is necessary for the laboratories of many universities to promote agriculture. According to Maimunah et al. (2018), several institutions in Indonesia and Thailand are working to improve the agriculture industry, which is crucial for the best practices of the business. Wijaya et al. (2018) concluded that the government is accountable for university labs working on the agriculture business to create new seeds and pesticides that are important for the growth of the agriculture industry. According to Lakitan et al. (2018), successful trials in agronomy laboratories aid in developing new seeds essential for improved agriculture. Khatiwada et al. (2021) stated that nations that do not support the agricultural sector with strong economic growth place little emphasis on increasing agricultural production.

The H5 results revealed that university agriculture research has a strong moderating effect between farmer education and agricultural development. This recently discovered moderating link is also confirmed by findings from past agricultural research investigations. According to Jung et al. (2021), peasants who attend the agribusiness research and development department's workshops obtain the essential skills to boost the profitability of their products. Sekaran et al. (2021) concluded that modern societies must drastically enhance farming to raise the agriculture industry's profitability. Khalil et al. (2019) claimed that peasants must be informed of recent research undertaken by academic laboratories in the field to increase the agriculture industry's productivity. Prastiyo et al. (2020) noted that wealthy nations offer peasants pertinent knowledge for their training, which is vital for proper farming employing an intelligent strategy and innovation. Santika, Wilson, Budiharta, Law, et al. (2019) added that intelligent farming is possible when farmers are motivated and enhance their products more effectively. As a result of their education, farmers use fewer resources wisely, resulting in higher output, according to Habibie et al. (2021).

According to the findings of Hypothesis 6, university agriculture research has a considerable moderating effect on the relationship between innovative agronomic methods and agricultural development. This newly discovered moderating link has been validated by past agricultural study findings. Ayu Palar et al. (2021) underlined that peasants must acquire and implement the latest technological breakthroughs in agronomy techniques for crop production. According to Mardianto et al. (2019), producers who lack the motivation to embrace successful technological practices could visit university agriculture research centres to observe successful applications of technology in precision agriculture. Molina-Maturano et al. (2020) claimed that the head of the university's agricultural lab must provide all pertinent information to individuals involved in expanding agricultural production to stimulate farmers. Aacharya et al. (2020) argued that technological advancements and efficient employee practices could increase the agricultural industry. Rondhi et al. (2018) stated that farmers must be informed and obtain the right training from certified institutions to use new pesticides in growing agriculture.

6. THEORETICAL AND PRACTICAL IMPLICATIONS

This research is based on important theoretical implications that significantly advance knowledge. The researcher did not address the newly discovered association in their earlier papers. Initially, the study presented the direct and influential influence of farmer access to technology on agriculture development. Second, the study revealed farmer education's direct and influential impact on agriculture development. Thirdly, the study revealed new agronomic methods' direct and influential impact on agricultural development.

Moreover, important moderating linkages have been introduced by this relationship. The study revealed the moderating effect of university agricultural research on the relationship between farmer access to technology and agricultural progress. Fifthly, the study revealed the moderating effect of university agricultural research on farmer education and agricultural development. The study concluded by highlighting the moderating effect of university agricultural research on the relationship between innovative agronomic methods and agricultural development. Based on these extraordinary ramifications, the model given in this study is an essential contribution to the literature on agriculture development as it presents freshly established relationships within it. In addition, this research model is notable because previous research did not contribute to the body of information with these substantial consequences; it represents a new addition to the understanding of farmer education. This research is also notable from a practical standpoint, as it offered farmers substantial practical implications for agriculture development. According to the research, farmers in Indonesia should have access to new technology for fruit plantation because this technology is essential for expanding the agricultural sector. In addition, the study indicated that new development in the agriculture sector is required and that farmers in Indonesia must be educated on the innovative farming practices essential for smart

farming. This is a crucial means for farmers to obtain new development. Indeed, the function of agricultural education would improve farming practices because they require agricultural knowledge. In addition, new agronomy practices must be ensured for farmers since when they are educated to play a significant role in agricultural growth, the new practices will increase their farming practices. In addition, the researchers indicated that collaboration between the farmer community and equipping them with newly created agricultural tools and cultivation techniques are essential for achieving higher agricultural yields. The Indonesian government must enable universities to make substantial contributions to the agriculture sector's sustainable development.

7. FUTURE DIRECTIONS

Even though the results demonstrated that Indonesian farmers are interested in gaining access to new technology, education, and agronomic practices in fruit plantations, this research is based on a novel model that addresses a research gap and makes a substantial contribution to the body of knowledge. However, this research contains limitations noted in the future directions section to provide agriculture research researchers with a roadmap for the future. Consequently, future research must extend this paradigm and add to the existing body of knowledge. The studies must examine the moderating effect of sustainable agriculture on farmer access to technology and agricultural progress in fruit plantations. In addition, research is required to examine the moderating effect of government policies of sustainable development goals on the relationship between farmer access to technology and agricultural progress in fruit plantations. In addition, research must be conducted on the moderating effect of fair prices on farmer access to technology and agricultural progress in fruit plantations. Future research must also study the moderating effect of green agriculture on the relationship between innovative agronomic methods and agricultural development. These future directions will lead scholars to make substantial contributions to the literature on agriculture development.

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