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Green technology based agricultural product quality and market prices in China

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ABSTRACT

Agriculture is a substantial contribution to world economies, and its environmental influence cannot be overstated. As a result, agricultural production has changed over time to incorporate more environmentally friendly practices, such as the usage of green technologies. The purpose of this study is to investigate the impact of agri and green technology adoption on agricultural product market prices, with an emphasis on product quality and environmental consciousness. Surveys were used to collect data from 750 agricultural producers and consumers, and statistical analysis was performed to determine the relationship between technology adoption, product quality, environmental consciousness, and market prices. The data show that there is a considerable positive association between green technology adoption and product quality, which has a favorable impact on market prices. Likewise, the impact of agricultural technology adoption on product quality and market pricing was statistically significant. The study also discovered that consumer environmental knowledge has a considerable positive effect on market prices. These findings show that more investment in green technology adoption is required to improve product quality and meet the growing demand for ecologically friendly agricultural products. Likewise, efforts to raise consumer environmental awareness may help drive market prices higher and incentivize producers to adopt more sustainable farming practices. This study emphasizes the necessity of sustainable agriculture practices and the need to promote the adoption of green technologies in order to ensure the agricultural industry's long-term sustainability.

1. Introduction

Agriculture is a key contributor to the economies of the world because it is the primary source of food and raw materials for many different businesses. On the other hand, it does have a considerable influence on the environment, including the emission of greenhouse gases, the degradation of soil, and the polluting of water (Gyawali et al., 2023). As a direct consequence of this, there has been a shift in emphasis toward the promotion of sustainable farming methods, such as the utilization of environmentally friendly technology. The employment of novel approaches and components is at the heart of green technology, which seeks to reduce the negative effects of agricultural production on the surrounding ecosystem while preserving the sector's capacity for economic growth. Practices such as precision agriculture, conservation tillage, and the utilization of alternative energy sources are included in this category (Yu et al., 2022). The adoption rate of environmentally friendly technology among agricultural producers is still very low, partly as a result of the high costs associated with its implementation and a general lack of knowledge among these farmers.

There have been studies done on the relationship between the adoption of new technology, product quality, and market prices in agriculture; however, very few of these studies have specifically focused on the interplay between the adoption of agricultural and environmentally friendly technology and market prices (Brenneis et al., 2023). In addition, there is a dearth of research that makes use of the analysis of big data to provide insights on the nature of this connection. In previous research, data collection on technology adoption and market prices was typically accomplished through the use of questionnaires and personal interviews. However, these methodologies do have certain drawbacks, including very small sample sizes and the possibility of bias in data that is self-reported (T. Zhang et al., 2023b). Big data analysis, which involves the processing of huge and complex datasets, could provide insights that are more precise and comprehensive about the relationship between market prices and the adoption of new technologies (Ciampi et al., 2022). In addition, while some studies have investigated how environmental awareness affects the behavior of consumers and the

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prices of market goods, there is a pressing need for additional research into how environmental awareness influences the demand for agricultural products that are produced in a sustainable manner (Kerber et al., 2023). As a result, the purpose of this research is to fill the gap in the existing body of knowledge by applying big data analysis to provide insights into the interplay between the adoption of green and agri technologies and the prices of agricultural products on the market. In addition to this, the study intends to investigate the effect that environmental consciousness has on market prices. This will help to address the lack of understanding that currently exists about the connection between consumer behavior and agricultural sustainability.

This study makes a number of important contributions to the body of previous research on the relationship between agricultural market pricing and the adoption of new technologies. To begin, it sheds light on the previously unexplored relationship between the adoption of agricultural and environmentally friendly technologies and how market prices are affected by this dynamic. According to the findings of the study, the implementation of environmentally friendly technology has a large and positively impactful influence on product quality, which then has a positively impactful affect on market prices. On the other hand, the adoption of agricultural technology did not have a statistically significant impact on the quality of the products or the prices on the market. The study also emphasizes the significance of environmental consciousness on the part of customers in the process of driving up market pricing. According to the findings, customers are willing to pay a premium price for agricultural products that are produced in a sustainable manner; this creates an incentive for farmers to adopt more sustainable practices.

1.1. Agri technology adoption and market prices of agricultural products

Green technology is the application of novel techniques and materials to reduce the environmental effect of agricultural production while preserving profitability and productivity. The implementation of green technology has been found to improve product quality and reduce environmental externalities, which can result in better market prices for green agricultural products (Niu et al., 2022). The implementation of precision agriculture techniques enhanced product quality and led to higher market pricing for green agricultural products, according to a study by (Li et al., 2020). Precision agriculture is the use of technology, such as GPS mapping and sensors, to optimize the use of inputs, resulting in increased yields and decreased environmental externalities. In a similar vein, (He et al., 2021) discovered that the implementation of conservation tillage practices boosted the output and quality of green agricultural goods, resulting in higher market pricing. Conservation tilling entails minimizing soil disturbance during planting and cultivation, hence enhancing soil health and lowering erosion.

H1: *Agri Technology Adoption has a significant and positive impact on Market Prices of Agricultural Products*

1.2. Availability of green technology and market prices of agricultural products

Green technology is indispensable for fostering sustainable agriculture and tackling environmental issues. Green technology is the application of novel techniques and materials to reduce the environmental effect of agricultural production while preserving profitability and productivity (Ranjan and Jha, 2022). Yet, the availability of green technology might vary by location and country, resulting in differences in the adoption and implementation of sustainable agriculture methods. According to a number of studies, the availability of environmentally friendly technologies can have a sizeable effect on the market prices of environmentally friendly agricultural goods. According to the findings of a study that was carried out by (Deng et al., 2023), the accessibility of precision agriculture technology was found to be positively associated with higher market prices for agricultural commodities like wheat and corn. The use of sensors and data analysis within the context of precision agricultural technology is intended to optimize the use of inputs, which ultimately leads to increased yields and enhanced product quality. According to the findings of a study conducted by (Girma, 2022), the availability of conservation agriculture practices in Zambia led to increased market pricing for environmentally friendly agricultural products. The practice of limiting the amount of soil disturbance that occurs during planting and cultivation as part of conservation agriculture serves to promote soil health and prevent soil erosion.

H2: *Availability of green technology has a significant and positive impact on Market Prices of Agricultural Products*

1.3. Agriculture technology adoption and product quality

The implementation of new technology in agricultural practices typically results in an improvement in product quality via a number of distinct pathways. Using precision agriculture practices such as GPS mapping and sensors can help farmers maximize their use of agricultural inputs, which in turn leads to increased crop yields and better product quality (Niu et al., 2022). In a similar vein, the use of innovative crop management practices and new seed varieties can lead to an increase in disease resistance and an overall improvement in product quality (Liu and Shen, 2020). Many studies have been conducted to investigate the effect that the use of agricultural technology has on the product quality of various crops. For instance, (Q. Zhang et al., 2023) discovered that the introduction of enhanced maize varieties in Ethiopia resulted in greater crop yields as well as an increase in the overall quality of the end product.

H3: *Agri Technology Adoption has a significant and positive impact on Product Quality*

1.4. Availability of green technology and product quality

There is a significant difference between the acceptance and usage of environmentally friendly agricultural methods in different nations and areas due to the availability of green technology. Yet, studies have shown that the availability of green technology has a substantial impact on the quality of the product. According to the findings of a study conducted by (Soto-Paz et al., 2022), the implementation of precision agriculture techniques, which include the use of sensors and data analysis to optimize the use of inputs, resulted in increased yields and improved product quality in apple orchards located in China. In a study that came to similar conclusions, (Guo et al., 2023) discovered that the application of cover crops, which is a form of conservation agriculture, increased the health of the soil, which in turn led to greater yields and improved product quality in wheat and maize crops grown in the United States. Studies conducted by other researchers have also demonstrated that the application of green technology can result in an improvement in the overall product quality when it comes to certain crops. a study by (Shen et al., 2022) indicated that the usage of organic fertilizer led to increased product quality and lower incidence of plant diseases in tomato crops in Nigeria. According to the findings of yet another investigation carried out by (Deng et al., 2023), the application of bio char, which is a form of charcoal that is used as a soil amendment, increased both the yield and the quality of maize crops grown in Nigeria.

H4: *Availability of green technology has a significant and positive impact on Product Quality*

1.5. Product quality and market prices of green agricultural products

Many studies have been conducted to investigate the effect that product quality has on the market price of particular crops. For instance,

a study that was conducted by (Carroni et al., 2023) discovered that higher product quality, which was evaluated based on sweetness and firmness, correlated to higher prices for strawberries. In a similar vein, (Anton et al., 2023) conducted a study in which they discovered that increased product quality, which was evaluated based on size and appearance, led to increased prices for peaches in the United States. In addition to determining market prices, product quality can also impact consumer preferences and purchase decisions. According to the findings of a study conducted by (Conti and Reverberi, 2021), customers are prepared to pay a premium for organic lettuce due to the superior quality of the product, which was evaluated based on the visual appearance and taste of the product. In a similar vein, (Niu et al., 2022) discovered that customers in Malaysia were prepared to pay a premium for superior product quality, measured by freshness and texture, when it came to organic veggies.

H5: *Product Quality has a significant and positive impact on Market Prices of Agricultural Products*

1.6. Product quality as mediator

Many studies have investigated the link between the adoption of new agricultural technologies and the increase in market pricing for environmentally friendly agricultural goods. For instance, a study that was conducted by (Chen et al., 2022) discovered that the adoption of sustainable farming practices, such as integrated pest control and precision agriculture, resulted in higher market prices for strawberries in China. Similarly, a study by (Ullah et al., 2020) indicated that the implementation of conservation agriculture practices led to better market prices for maize in Nepal. According to the findings of the earlier literature analysis, the quality of the product has also been demonstrated to have a substantial impact on the market prices of environmentally friendly agricultural products. On the other hand, product quality has the potential to operate as a mediator between the adoption of agricultural technology and market prices. For instance, a study conducted by (Chen et al., 2022) discovered that the implementation of precision agriculture techniques resulted in increased product quality, as assessed by sugar content, and higher market pricing for grapefruits. Similarly, a study by (Brenneis et al., 2023) indicated that the adoption of integrated pest management led to greater product quality, assessed by fewer defects, and higher market pricing for apples.

H6: *Product Quality mediates the relationship between Agri Technology Adoption and Market Prices of Agricultural Products*

Research have demonstrated that the availability of green technology can lead to greater product quality and higher market pricing for green agricultural products. For instance, it was discovered in a study conducted by (Liu and Shen, 2020) that the use of precision agriculture techniques resulted in an increase in the market price of rice in China. Similarly, a study by (Guo et al., 2023) indicated that the implementation of conservation agriculture practices led to better market prices for maize in Zimbabwe. The relationship between the availability of green technology and the market prices of green agricultural products has also been demonstrated to be mediated by the quality of the product. A study by (Niu et al., 2022) found that the availability of green technology, such as precision irrigation and soil moisture sensors, led to improved product quality, measured by fruit size and sugar content, and higher market prices for peaches in the United States. In a similar vein, (Q. Zhang et al., 2023) discovered that the availability of integrated pest control technologies resulted in greater product quality, as assessed by fewer defects and insect damage, as well as higher market pricing for cotton.

H7: *Product Quality mediates the relationship between availability of green technology and Market Prices of Agricultural Products*

1.7. Environmental awareness as moderator

According to the findings of a study that was carried out by (Kerber et al., 2023), the favorable influence of precision agricultural technology on market pricing of rice was demonstrated to be stronger in places that had a better awareness of the environment. (Ahmed et al., 2020), who researched the impact of eco-labeling on market pricing of green tea, came to a conclusion that was very similar to the one presented here. They found that the effect was more pronounced among those who had a better awareness of the environment.

Environmental awareness helps to reduce the negative impact that the availability of green technology has on the market prices of green agricultural goods (An et al., 2021; Nawaz et al., 2023a, 2021). According to the findings of a study that was carried out by (Schönherr et al., 2023), the favorable influence of organic farming technology on market prices of vegetables was found to be stronger in regions that had a higher level of environmental consciousness. This was one of the conclusions that was drawn from the research that was carried out. In a similar vein, it was discovered that eco-labeling had a favorable effect on the market prices of green items, and that this effect was larger among customers who had a higher environmental consciousness (Fernando et al., 2019).

H8: Environmental Awareness moderates the relationship between Agri Technology Adoption and Market Prices of Agricultural Products

Hence on the basis of above literature review we proposed the following conceptual framework (Fig. 1).

2. Method and materials

The consumers of environmentally friendly agricultural products in China during the months of January and February 2023 served as the unit of analysis for the purposes of this research study. According to the findings of (Hair et al., 2019), the minimum sample size necessary for the PLS path model ought to be 10 times greater than the largest possible number of signals pointing at a construct. This is the case even if the greatest possible number of signs pointing at a construct is only one. There were a total of 1,500 copies of the self-administered questionnaire, and they were all passed out at big outdoor athletic events by means of intercepts. A response rate of fifty percent was achieved thanks to the collection of 750 questionnaires that were answered in their entirety and were included in the sample. At the outdoor athletic event, participants were handed questionnaires that they were to fill out and return directly during the process of collecting data. This was done as part of a convenience sampling approach, which was implemented during this phase of the procedure. In order to perform an analysis on the data that was acquired for this study, the Statistical Package for Social Science (SPSS) as well as Smart PLS Version 4.0 were applied. Both of these programs were installed on a computer. We used Likert scales with five points, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree), for the aim of analyzing all of the relevant elements in this investigation that were of interest to us. Every single component that was utilized for the measuring was recycled from one of the scales that had been confirmed in the past (see Fig. 2).

2.1. Measures

Agri Technology Adoption

Agri technology adoption is measured by using 6-item scale adopted from Gil, Casagrande, Cortés, & Verschae, (2023).

Availability of Green Technology

A 5-item scale was adopted from (Amin et al., 2023) to availability of green technology.

Product Quality:

A 3-item scale was adopted from (Carroni et al., 2023) to measure

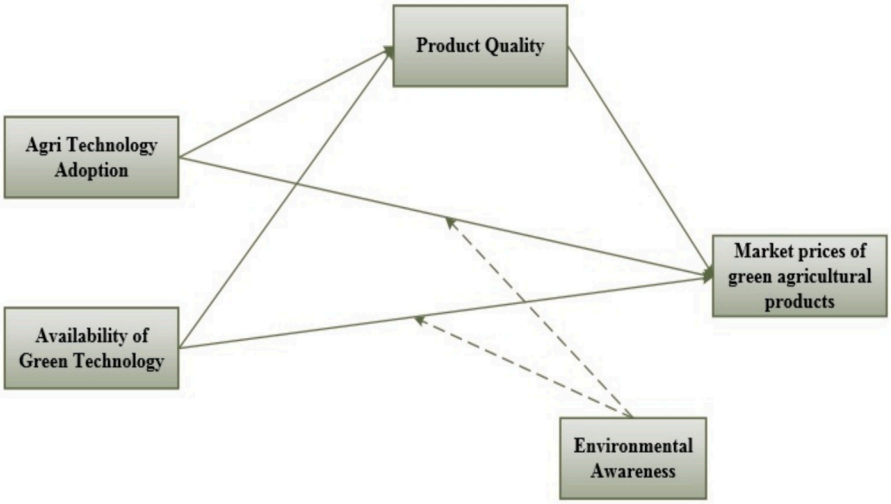

Fig. 1. Conceptual Framework.

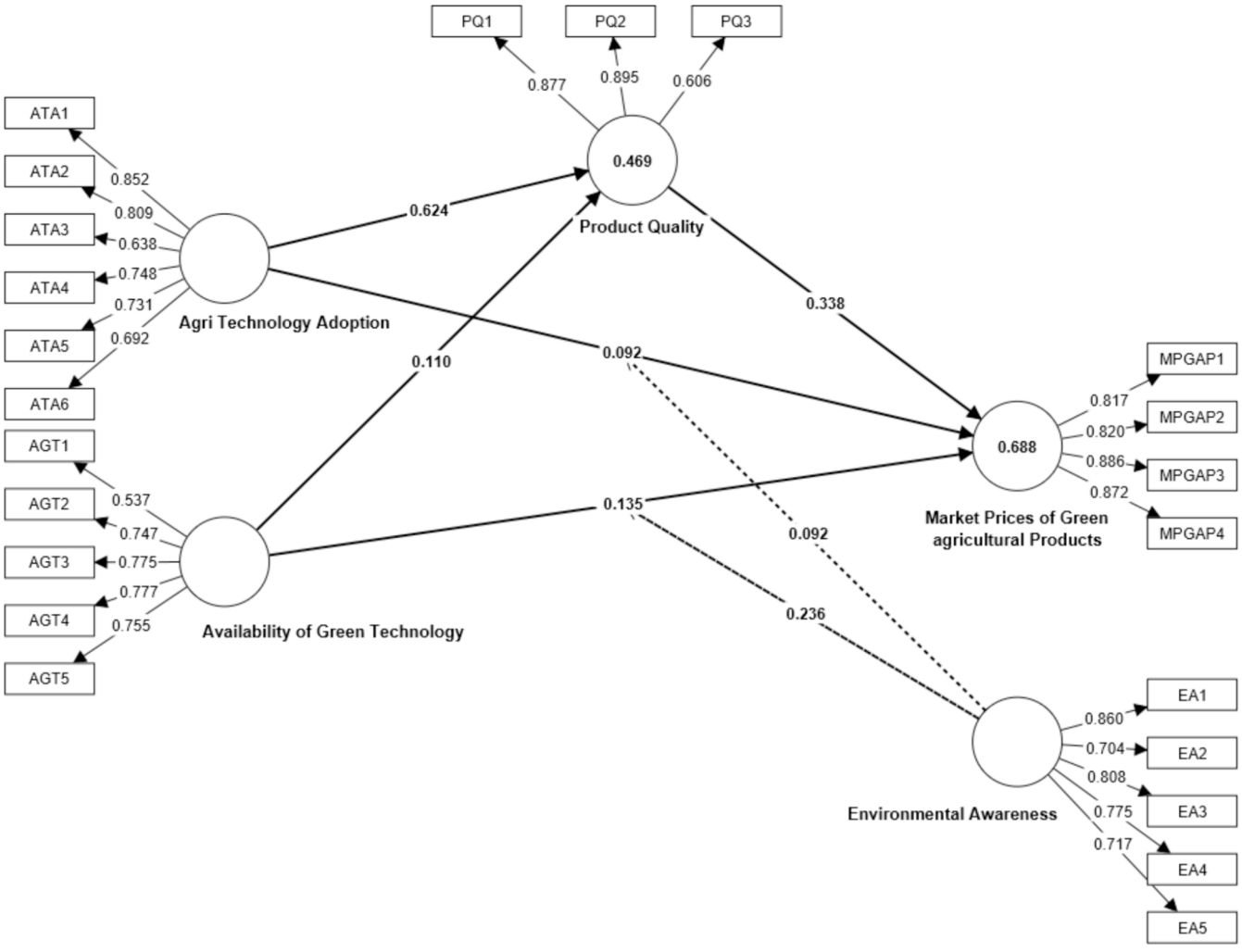

Fig. 2. Measurement Model.

environmental literacy.

Environmental Awareness

A 5-item scale was adopted from (Ahmed et al., 2020) to measure environmental awareness.

Market Price for Green Agriculture Products

A 4-item scale was adopted from (Qi et al., 2023) to measure market price for green agriculture products.

3. Findings

3.1. Sample profile

There are 79 % of the people who took part in this research completed the questionnaire in Chinese, whereas only 21 % of the respondents did so in English. In total, there were 750 surveys. The demographic information of the respondents is presented in Table 1. According to the gender of the respondents, 47.6 percent were male and 52.4 percent were female. The majority of respondents in their twenties and thirties (25.1 % and 31.9 %, respectively) were between the ages of twenty and thirty, and the majority of respondents in their forties and fifties (26.8 % and 16.3 %, respectively) were between the ages of forty and fifty. According to respondents' levels of education, 26.7 % of them have at least a high school diploma, 25.9 % have earned master's degrees, 35.3 % have earned bachelor's degrees, and 12.1 % have earned doctoral degrees. They came from a wide range of professional backgrounds, including those of workers in the business sector (12.7 %), professionals (28 %), workers in the private sector (13.3 %), and workers in the public sector (12.7 %).

3.2. Reliability and validity analysis

The Smart-PLS software was used to accomplish the model checking. Because its primary investigation of the correlation between variables in the model, in comparison to structural equation modeling, takes into account the feasibility of all pathway coefficients, the study used smartpls software to deal with PLS-SEM because this made the analyzed model more resilient (Nawaz et al., 2023b). To begin, the assessments of reliability and validity (Table 1) were carried out in order to determine the validity of the model and the level of dependability that the scale possessed. The fact that each of the four variables has a Cronbach's value that is higher than the threshold value of 0.6 demonstrates that all of the scales associated with those variables have a high level of internal consistency. The fact that all of the Rho A values are higher than 0.7 is another piece of evidence that the scale is quite consistent. The values of the Composite Reliability are all greater than 0.8, which is further evidence of the scale's high level of reliability (Nawaz and Guribie, 2022; Shah et al., 2021; Yingfei et al., 2021).

After that, the average variance extraction (AVE) and the factor loadings of the variables were used to evaluate the convergent validity of the findings. As can be seen in Table 1, all of the AVE values are higher than 0.5, which indicates that the model has a good level of convergent validity. As can be seen in Table 2, all of the factor loadings are higher than 0.4, which is another indication of robust convergent validity (see Table 3).

Last but not least, the discriminant validity was evaluated using the HTMT test. The results of the HTMT are presented in Table 4; they fall within the range of 0.614–0.881, which is lower than the crucial value of 0.9 and provides additional evidence of the good discriminant validity.

Table 1
Demographic profile of the respondents.

Demographic item		Frequency	Percentage
Gender	Male	357	47.6
	Female	393	52.4
Age	19–29	188	25.1
	30–40	239	31.9
	41–50	201	26.8
	51 years and above	122	16.3
Education	High School	200	26.7
	Bachelor Degree	265	35.3
	Master Degree	194	25.9
	Ph.D.	91	12.1
Occupation	Business worker	95	12.7
	Professionals	210	28.0
	Government employee	95	12.7
	Private Sector employee	100	13.3
	Others	250	33.3

3.3. Assessment of structural model

For the purpose of measuring the common method bias, the variance inflation factor (VIF) was utilized. As can be seen in Table 1, none of the VIF values are higher than the cutoff value of 3.3, demonstrating that the research did not suffer from the effects of a common procedure bias. The value of R2 indicates how accurately the model can predict future outcomes. In this investigation, all of the R2 values are greater than 0.3, and the fact that R2 (market prices of green agricultural products) = 0.688 indicates that 68.8 % of the variation in market prices of green agricultural products is due to the independent variables. Table 4 shows the result of coefficient of determination.

3.4. Structural equation modeling

To validate the model, PLS-SEM was used to run 5000 iterations of the bootstrap procedure; the results are presented in Table 7. According to the results of the table, Agri Technology Adoption has a significant and positive impact on Market Prices of Agricultural Products (t = 1.694; p 0.045), which indicates that Hypothesis 1 is correct. Availability of green technology has a significant and positive impact on Market Prices of Agricultural Products (t = 4.129; p 0.000), which provides support for Hypothesis 2. Because Agri Technology Adoption has a significant and positive impact on Product Quality (t = 19.074; p = 0.000), hypothesis H3 is supported. The Availability of green technology has a significant and positive impact on Product Quality (t = 2.812; p 0.005), which provides support for hypothesis H4. Product Quality has a significant and positive impact on Market Prices of Agricultural (t = 7.310; p 0.000); hence, hypothesis H5 is supported. Fig. 3 and Table 5 shows the result of path analysis.

3.5. Mediation analysis

According to the sixth hypothesis of the investigation, the connection between agri technology adoption and market prices of agricultural products is mediated by product quality. According to the results of the study, the presence of product quality acts as a mediating factor in the connection between agri technology adoption and market prices of agricultural products (t = 7.080, p = 0.000). Because of this, h6 has been accepted. According to the seventh hypothesis of the investigation, product quality acts as a mediator in the connection between availability of green technology and market prices of agricultural products. According to the results of the study, a moderating effect is exerted by product quality on the connection between availability of green technology and market prices of agricultural products (t = 2.267, p = 0.012). As a result, h7 gets approved. The findings of the mediation analysis are shown in Table 6.

3.6. Moderation analysis

According to the eighth hypothesis of the investigation, the connection between agri technology adoption and market prices of agricultural products is moderated by the presence of environmental awareness. According to the results of the study, the presence of environmental awareness acts as a moderating factor in the connection between agri technology adoption and market prices of agricultural products (t = 2.838, p = 0.002). Because of this, h8 has been given the accepted. According to the nineth hypothesis of the investigation, environmental awareness acts as a moderator in the connection between

Table 2
Construct reliability and validity.

	Items	Outer Loading	VIF	Cronbach's Alpha	CR	AVE
Agri Technology Adoption	ATA1	0.852	2.426	0.846	0.883	0.560
	ATA2	0.809	2.193			
	ATA3	0.638	1.390			
	ATA4	0.748	2.528			
	ATA5	0.731	2.597			
	ATA6	0.692	1.745			
Availability of Green Technology	AGT1	0.537	1.090	0.766	0.844	0.524
	AGT2	0.747	1.625			
	AGT3	0.775	1.723			
	AGT4	0.777	1.853			
	AGT5	0.755	1.734			
Environmental Awareness	EA1	0.860	2.293	0.833	0.882	0.600
	EA2	0.704	1.577			
	EA3	0.808	2.830			
	EA4	0.775	2.670			
	EA5	0.717	1.600			
Market Prices of Green Agricultural Products	MPGAP1	0.817	2.072	0.871	0.912	0.722
	MPGAP2	0.820	2.137			
	MPGAP3	0.886	3.296			
	MPGAP4	0.872	3.111			
Product Quality	PQ1	0.877	1.864	0.720	0.842	0.646
	PQ2	0.895	2.029			
	PQ3	0.606	1.197			

Table 3
Discriminant validity (HTMT).

	ATA	AGT	EA	MPGAP	PQ
Agri Technology Adoption					
Availability of Green Technology	0.614				
Environmental Awareness	0.845	0.725			
Market Prices of Green Agricultural Products	0.727	0.722	0.856		
Product Quality	0.797	0.587	0.881	0.814	

Table 4
Coefficient of determination.

	R Square	R Square Adjusted
Market Prices of Green Agricultural Products	0.688	0.685
Product Quality	0.469	0.468

availability of green technology and market prices of agricultural products. According to the results of the study, a moderating effect is exerted by environmental awareness on the connection between availability of green technology and market prices of agricultural products ($t = 5.170$, $p = 0.000$). As a result, h9 gets approved. The findings of the moderation analysis are shown in Table 7, as well as Fig. 3.

4. Discussion

Findings of first hypothesis of the study showed that agri technology adoption has a significant and positive impact on market prices for agricultural products. It is possible for the implementation of precision irrigation technology to raise water use efficiency and boost crop output, both of which can lead to an increase in the market price for agricultural products (Brenneis et al., 2023). In a similar vein, the use of organic farming techniques can enhance the quality of the soil and decrease the amount of synthetic pesticides and fertilizers that are used, leading to increased prices for organic produce on the market (Niu et al., 2022). The introduction of agricultural technology also improves supply chain management, which in turn leads to a more effective production and distribution of environmentally friendly agricultural products. Also, this resulted in increased market pricing for environmentally friendly agricultural products. In addition, while the adoption of agricultural technology has a favorable impact on market prices of environmentally friendly agricultural products, other factors such as product quality, environmental consciousness, and market demand can also play a role in the equation. In light of this, a methodology that takes into account each of these components is required in order to have a complete comprehension of the connection between agricultural technology and productivity (Brenneis et al., 2023).

Findings of second hypothesis of the study showed that availability of green technology has a significant and positive impact on market prices for agricultural products. These findings are consistent with earlier investigations. For instance, the availability of renewable energy technologies can assist farmers lower energy costs, which can boost profitability and result in higher market pricing for green agricultural goods (Qiao et al., 2023). In a similar vein, the availability of precision agriculture technology can increase crop yields while simultaneously reducing the amount of water and fertilizer used. This, in turn, can lead to higher pricing on the market for agricultural products (Yang et al., 2020). The accessibility of green technology might also open up prospects for the development of new market segments. Findings of third hypothesis of the study showed that agri technology adoption has a significant and positive impact on product quality These findings are consistent with earlier investigations. Precision agricultural technology enables farmers to better monitor crop growth and identify possible problems early, resulting in increased crop yields and enhanced product quality (Aparo et al., 2022). In a similar vein, the implementation of post-harvest technologies such as cold storage and packaging technology can assist in lowering the rate of agricultural product deterioration and increasing the products' shelf lives, ultimately contributing to an improvement in product quality (Shen et al., 2022). By minimizing the use of potentially hazardous chemicals and fostering more environmentally friendly agricultural practices, green technology adoption also

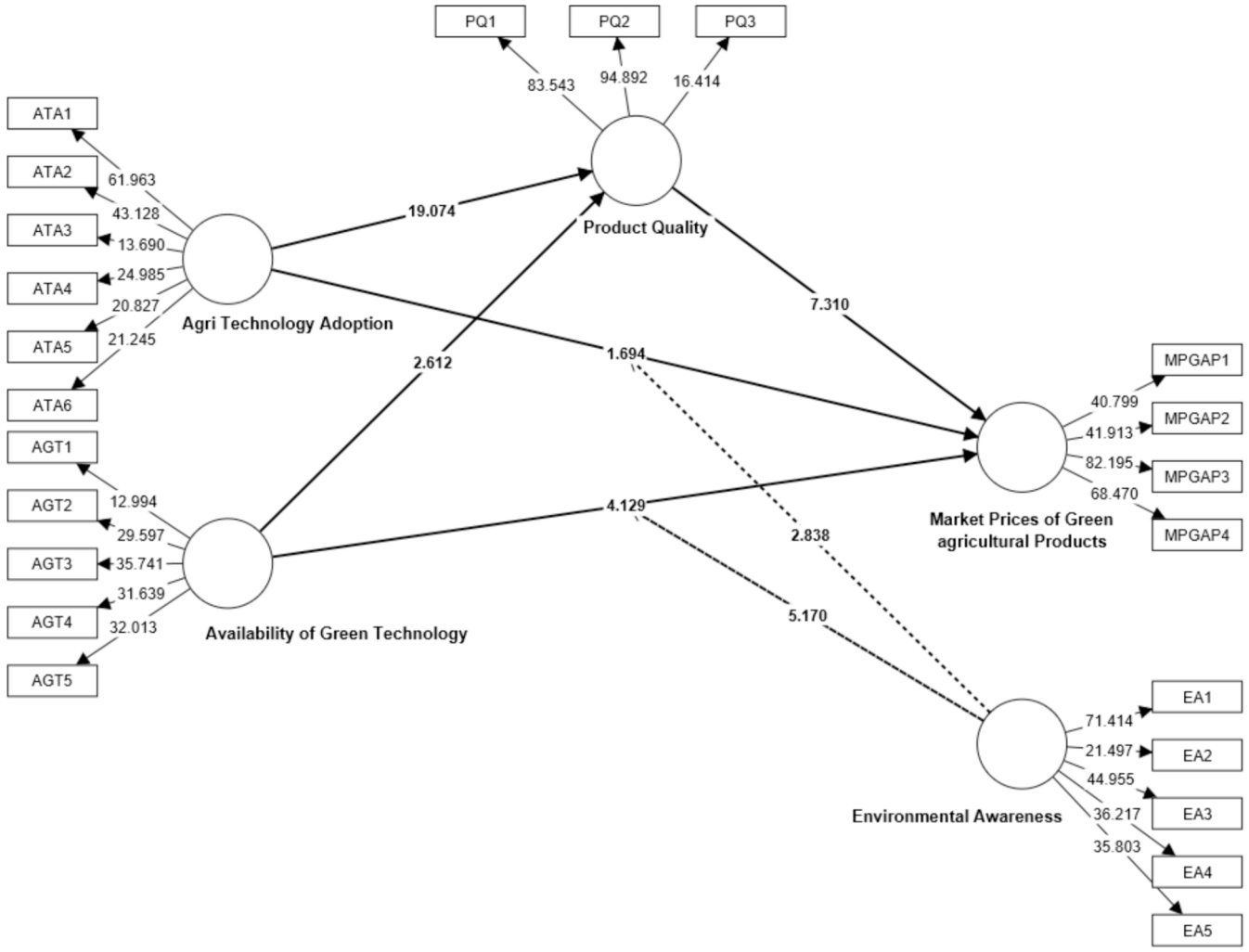

Fig. 3. Structural Model.

Table 5
Path coefficient.

	Original sample	T values	P Values
ATA –> MPGAP	0.092	1.694	0.045
AGT –> MPGAT	0.135	4.129	0.000
ATA –> PQ	0.624	19.074	0.000
AGT –> PQ	0.110	2.612	0.005
PQ –> MPGAP	0.338	7.310	0.000

Table 6
Mediation analysis.

	Original Sample	T values	P Values
ATA –> PQ –> MPGAP	0.211	7.080	0.000
AGT –> PQ –> MPGAT	0.037	2.267	0.012

Table 7
Moderation analysis.

	Original Sample	T values	P Values
EA x ATA –> MPGAP	0.092	2.838	0.002
EA x AGT –> MPGAT	0.236	5.170	0.000

helps to improve product quality. For example, the use of organic farming practices can result in products that are of a higher quality and are free from potentially dangerous chemical residues (Zia and Alzahrani, 2022).

Findings of fourth hypothesis of the study showed that availability of green technology has a significant and positive impact on product quality These findings are consistent with earlier investigations. By utilizing fewer potentially hazardous chemicals, green technology enhances product quality. Precision agriculture technology can assist farmers in applying fertilizers and pesticides more effectively, thereby lowering the use of these chemicals and, perhaps, the presence of dangerous residues in agricultural goods (Zhang et al., 2020). In a similar vein, the employment of biological control measures, such as the introduction of natural predators to manage pest populations, can lead to a reduction in the application of chemical pesticides and an increase in the production of high-quality, organic goods (Shen et al., 2022). Furthermore, the implementation of green technologies also improve soil quality and encourage sustainable farming practices, leading to increased product quality. For instance, switching to renewable energy sources like solar or wind power will help cut down on greenhouse gas emissions and encourage more environmentally friendly farming methods, which will ultimately result in products of a higher quality (Deng et al., 2023). In a similar vein, the use of sustainable agricultural methods such as crop rotation and cover cropping can improve the health of the soil, which in turn can lead to the production of products of a higher quality (Amin et al., 2023). Findings of fifth hypothesis of the

study showed that product quality has a significant and positive impact on market prices of green agricultural products. These findings are consistent with earlier investigations. According to the findings of several studies, the prices of organic and other sustainably produced agricultural goods might be significantly higher than those of conventionally produced goods (Reisman, 2022). This is due to the fact that customers believe these goods to be better for their health, safety, and the environment. In addition, the implementation of green technology led to improvements in product quality, which further contributed to an increase in market prices (Sarkar et al., 2022).

Findings of sixth hypothesis of the study showed that product quality significantly mediates the relationship between agri technology adoption and market prices of green agricultural products. These findings are consistent with previous studies. A number of research have come to the conclusion that the implementation of green technology can result in enhancements to the quality of the final product. For instance, according to the findings of a study that was carried out in China, the use of precision agriculture technology led to improvements in the color, texture, and flavor of tomatoes, which ultimately led to a rise in market pricing (Guo et al., 2023). According to the findings of another study that was carried out in Spain, the use of precision agricultural technology led to significant increases in the quality of wine grapes, which in turn led to an increase in market pricing (Niu et al., 2022). Increased product quality results in better market prices for environmentally friendly agricultural products. Customers are willing to pay a premium for products that are of high quality and sustainable, and an increase in the perceived worth of these products can be achieved through improvements in product quality (Q. Zhang et al., 2023).

Findings of seventh hypothesis of the study showed that product quality significantly mediates the relationship between availability of green technology and market prices of green agricultural products. These findings are consistent with previous studies. Availability of green technology lead to improvements in product quality, which in turn may increase market prices. Several studies have found that the availability of green technology can lead to improvements in product quality. For example, a study conducted in India found that the availability of organic farming inputs such as vermicompost and biofertilizers led to improvements in the quality of rice, which in turn increased market prices ((Zhang et al., 2020). Similarly, a study conducted by (Shen et al., 2022) found that the availability of irrigation technology led to improvements in the quality of maize, which in turn increased market prices. Furthermore, improved product quality lead to higher market prices for green agricultural products. Consumers are willing to pay a premium for high-quality, sustainable products, and improved product quality can increase the perceived value of these products (Deng et al., 2023).

Findings of eighth hypothesis of the study showed that environmental awareness significantly moderates the relationship between agri technology adoption and market prices of green agricultural products. These findings are consistent with previous studies. According to the findings of a study that was conducted by (Sarkar et al., 2022), customers are willing to pay a higher price for green agricultural products that are produced in an environmentally responsible manner. This suggests that environmental consciousness plays a significant impact in affecting the tastes of consumers as well as the demand for environmentally friendly agricultural products. Agricultural technology adoption help boost the production efficiency and quality of green agricultural goods, but the influence of technology adoption on market prices may rely on customer demand and environmental consciousness. As pointed out by (Fernando et al., 2019), customer demand for sustainable agricultural products is impacted by their awareness of environmental issues and their willingness to pay for environmentally friendly items. Therefore, the impact of agriculture technology adoption on market prices may be more pronounced among environmentally conscious consumers who are willing to pay a premium for green agricultural products. This is because environmentally conscious consumers are more likely to purchase products that are produced using environmentally friendly agricultural practices.

Findings of nineth hypothesis of the study showed that environmental awareness significantly moderates the relationship between availability of green products and market prices of green agricultural products. These findings are consistent with previous studies. Environmental awareness has the potential to moderate this link. As pointed out by (Kerber et al., 2023), consumer demand for environmentally friendly items is impacted by their understanding of environmental issues and their willingness to pay for sustainable products. Hence, the impact of availability of green technology on market prices may be more obvious among environmentally aware consumers who are willing to pay a premium for green agricultural products. According to the findings of a study carried out by (Sarkar et al., 2022), the influence of the availability of green technology on the market prices of environmentally friendly agricultural products was found to be stronger among consumers who had a greater awareness of the environment (Li, 2021). This shows that environmental consciousness can regulate the connection between the availability of green technology and the market prices of green agricultural products.

5. Conclusion

The purpose of this study was to look into the relationship between agri and green technology adoption, product quality, environmental awareness, and agricultural product market prices. According to the findings, both agricultural technology adoption and the availability of green technology have a beneficial impact on product quality and market prices for green agricultural products. Furthermore, it was discovered that product quality mediates the association between agricultural technology adoption and market prices, but environmental awareness moderates the relationship between agricultural technology adoption and market prices. The study's practical implications for policymakers and agricultural practitioners are considerable, as it emphasizes the importance of technological adoption and innovation in improving product quality and increasing market pricing. Furthermore, the study underlines the importance of environmental awareness and sustainable agricultural methods in order to improve market outcomes and reduce negative environmental impacts.

5.1. Implications

This research has a number of practical and theoretical implications. To begin, the study's findings imply that the use of agricultural technology and green technology can lead to an improvement in the quality of agricultural goods. This, in turn, can result in higher market pricing for green agricultural products. Farmers and agricultural producers can thus benefit from investing in agricultural and green technologies in order to improve the quality of their products and earn greater prices for their items. Second, the study's findings have theoretical implications for agriculture and environmental economics. The study, in particular, presents empirical evidence that product quality is a significant mediator in the relationship between agricultural technology adoption and market prices for green agricultural products. This underscores the necessity of addressing the quality of goods in agricultural research and policy-making, particularly in the context of sustainable agriculture. Ultimately, the outcomes of the study imply that environmental consciousness can act as a moderator in the relationship between technology adoption and market prices. This means that raising environmental awareness and supporting sustainable practices can have a favorable impact on the adoption of green technologies, resulting in better market prices for green agricultural products.

5.2. Limitations and future directions

The study focused on the interaction of agri and green technology

adoption on agricultural product market pricing but did not take into account other elements that may affect market prices, such as economic and political considerations. Further research could look at supply and demand dynamics, consumer preferences, and economic and political issues that affect market prices. Future research could look into the impact of agri and green technology adoption on agriculture production sustainability and the environment. The study focuses on a specific geographic region and may not be generalizable to other regions or nations. Future research should broaden the geographic scope of the analysis to investigate the impact of agri and green technology adoption on market prices in various regions or countries.

CRediT authorship contribution statement

Zhi Liu: Writing – review & editing, Writing – original draft, Supervision, Methodology.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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