Original Research Article

Influential factors that affect farmers' intention toward farming

Abstract

The service and manufacturing sectors grew as mainstream farming declined. Only mainstream farmers contributed to the economy. Agricultural specialties followed. Technology has enhanced grain output for human use, but farmers' satisfaction is crucial. A major goal of this research is to understand the farmer's intentions towards farming. The study is quantitative in nature and takes a deductive, positivist approach. Data were gathered from 350 participants through a structured questionnaire and nonprobability convenience sampling methods. SPSS version 25 and SEM-Amos version 24 were used to analyze the data. Theory of Planned Behavior (TPB) model was used to measure the farmer's intention, where price risk, biological risk, and climate risk were shown to have a significant negative effect on farmers' intentions toward farming. The calculated value supported the hypothesis. Marketing risk also has a negative impact, but it was found to be insignificant, and the hypothesis was not supported. This study provides valuable insight for policymakers looking to understand why farmers are discouraged from farming when a country must focus on farming to become self-sufficient in its supply of food. Besides, the study introduces some leads for the academicians to conduct further study to know why the abnormalities happen for such a controllable factor (price risk) and what strategic moves will be taken by the concern relevant to the farming of the country.

Keywords – Farmer's intention, Theory of Planned Behavior (TPB), Structured Equation Model (SEM).

1. Introduction

In the future, the whole global population will increase, and then nearly 7 out of 10 people will live in cities (Urban Development, 2022). More than 70% of the global population is projected to live in cities by 2050. Modifications to lifestyles and consumer habits are inevitable results of urbanization. In developing nations, rising incomes and a more varied diet may go hand in hand. Vegetables, fruits, meat, dairy products, and fish will increase in market share as wheat and other staple crops decrease (How to Feed the World in 2050, 2009). Bangladesh is known to everyone for its development in human resources. But the development in the agricultural sector after 2000 is really eye-catching, and it ultimately plays a great role in the reduction of poverty. Agriculture has played a key role in reducing Bangladesh's poverty from 48.9% in 2000 to 31.5% by 2010, with over 87% of rural people getting part of their income from agricultural activities. Bangladesh now needs to shift towards high-value agriculture, including horticulture, livestock, poultry, and fisheries, to foster future growth and further reduce poverty (Agriculture Growth Reduces Poverty in Bangladesh, 2016). The sector included in farming has a great contribution to GDP, about 40 percent. In the last two decades, from 1999 to 2019, the agricultural production value has increased by 3.54% per year. The sector remains the main source of employment, as we have mentioned earlier, providing a livelihood to 40 percent of the labor force. Thus, agriculture remains the largest sector in terms of employment (The Daily Star, 2022). But each year brings its own set of difficulties for Bangladesh's crop farmers. Loss of arable land, increased population, shifting weather patterns, inadequate management practices (fertilizer, water, pests, and diseases), insufficient quality seed supply, and inadequate credit support to farmers, unfair product pricing, and inadequate research funding are all major obstacles (Mondal, 2010). This sector of infinite potential has reached the brink of neglect. Those who work tirelessly day and night to produce golden crops in the land with storms and rain on their heads do not receive a fair price for their hard-earned crops every year and are subject to endless discrimination (Agriculture and Farmer Problems in Bangladesh, 2020).A transformed agricultural research system helps in achieving sustainable food and income security for all agricultural producers and consumers, especially for wealth-poor families, whether they are in rural or urban areas. Increasing agricultural productivity is a central concern in developing countries. Because it is a major factor in determining the level of income of the agricultural sector, meeting the food needs of the ever-growing population, and generating foreign exchange to finance domestic programmers, among others. Sustainable agricultural consolidation means producing more food and agricultural products from the same aggregate resources (such as land, labor, and water) while minimizing negative environmental impacts and at the same time increasing the contribution to natural capital and environmental services (Transforming Food and Agriculture to Achieve the SDGs, 2018). According to the researchers, a farmer's satisfaction is considered an important indicator of sustainability and has become a major goal of scientific research and policy (Flores and Sarandon, 2004). A country cannot become a developed country if it focuses only on industrialization; it must meet its regular food needs internally, which reduces food imports (balance of payments). So, if a country is self-sufficient in food sources and focuses on industrialization, it must accelerate its GDP and development process. Now is the time to take corrective action to identify all the challenges facing our farmers and motivate them to increase the production of their agricultural products. The entire farmer is the soul of agriculture (The Future of Food and Agriculture Trend and Challenges, 2017).

2. Literature Review

The main challenges a farmer faces during a season are production risk and price risk. The risk of production, or risk of return, concerns events of chance origin related to nature to which the producers are exposed (Sadoulet et al., 1996). In agriculture, prices are subject to strong fluctuations. The significant price fluctuation happens because of a lag between production decisions and time consumption, and the finishing of harvesting has a low elasticity of demand (Boussard, 2010). When the prices of agricultural commodities go up, price stability will become a major concern for the government. The government will often take steps to suppress this process. However, when the prices of agricultural commodities go down, the lack of policy support often hurts the interests of the farmers, severely damaging their enthusiasm (Ivanova and Peneva, 2011). Lu pointed out that food demand continues to rise while food supply is declining due to rising food prices; thus, imbalances in food supply and demand are major causes of food price instability (Lu, 1999).Due to climate variability and change, the complexity of biological processes, production seasons, the geographical isolation of production areas, and end-users of agricultural products (Arce, 2010), agricultural risks increase due to frequent natural disasters, yields, and prices. With limited product and risk mitigation tools such as credit and insurance design, including farm product variability, an incomplete input/output market, and a lack of financial benefits(Jain and Parshad, 2012), paddy cultivation faces constant risks and uncertainties such as high cost and low income, as well as disease, storms, and heavy wind damage. Bangladeshi farmers also face new and various adverse climatic conditions, including salinity, low soil fertility, drought, and extreme temperature pressures (Sarker et al., 2020). Both input price and output price volatility are important sources of market risk in the agriculture sector. The prices of agricultural commodities are very volatile. Variability in output prices arises from market shocks both internally and externally. Local supply and demand conditions will have the biggest impact on divided agricultural markets, whereas international production dynamics will have a big impact on more global, integrated markets. In integrated markets, price declines are generally not related to local supply conditions, and therefore price shocks can affect producers in a more significant way (Agricultural Price Volatility and Its Impact on Government and Farmers: A Few Observations, 2011).

Bangladesh is still an agricultural country. Most of its people are directly and indirectly dependent on agriculture. In recent years, the agricultural sector has suffered the most due to unexpected price volatility. It casts a huge shadow over the rural economy and reflects our GDP growth as well as per capita income, savings, and investment. It is also observed that agricultural land is converted to non-agricultural land (80,000 hectares per year), which hinders total agricultural production. Therefore, the per capita agricultural land (12.5 decimals) in Bangladesh is gradually decreasing (Quasem, 2011). Livestock is an important sub-sector of agriculture in Bangladesh, where poultry production and poultry-related industries contribute 20.65 percent of the total livestock contribution (Khan and Roy, 2003). Additionally, abnormal price movements in recent years have severely hurt the industry (Omar et al., 2013).

Every economy has struggled with inflation at some point in history, while emerging countries are particularly vulnerable due to the repercussions of uncontrolled inflation. Theoretically, it may be traced back to demand-pull, cost-push, import-induced, and temporary factors (World Economic Situation and Prospects, 2022), but these factors all vary among countries. In such economies, an inefficient domestic financial market, output shocks, income shortfalls, and the unnecessary expansion of the money supply to cover budget deficits are the main causes of food price inflation (Kuma andGata, 2023). The CPI-MB's breakout of food price inflation's primary drivers is particularly useful because food price volatility is somewhat isolated from overall inflation. It rose at a higher rate (almost 38 percent) than non-food costs did during the same time period (Demeke andTenaw, 2021). Furthermore, it appears that commodity price volatility also heightens domestic inflation volatility over the medium run. This can happen, for instance, if the price fluctuations of imported items have a higher impact on consumer inflation in the domestic market (Mohommad et al., 2023). Researchers found price fluctuation has an impact on farming at the points of government regulation, market supply, demand changes, seasonal production, unorganized market governance, and consumer preference (Xie and Wang, 2017; Assouto et al., 2020). Climatic variables involve flooding, heavy rain, pests and diseases, drought, and heavy wind. Market risk involves high input costs, low output prices, and low profit due to a long supply chain. Biological risks involve rice hopper attacks, rice blasts, weed infestations, and rodent attacks during the harvesting period(Ullah et al., 2015; Aziz et al., 2015; Islam et al., 2021; Assouto et al., 2020). Improved and sophisticated risk management techniques and tactics can help farmers recover from losses caused by a variety of risks, but they can only be effective if they are based on a thorough comprehension of farmers' risk perceptions and risk attitudes. A farmer's risk perceptions and risk attitude are essential factors in designing policies to increase both farm output and farmers' risk management capacity (Lucas and Pabuayon, 2011).

There hasn't been any research done to quantify the risk associated with farming from point of view of farmers, despite the fact that doing so is crucial for understanding their risk management decisions. This study aims to close that knowledge gap by investigating the ways in which farmers worry about and prepare for pricing risk, climate risk, marketing risk, and biological risk, and by identifying the single most important risk factor influencing their decision toward farming.

2.1 Conceptual Framework

Various management theories have been applied to study the behavior of farmers, such as: 1) Theory of Planned Behavior (TPB) Van Dijk et al. (2016), Lalani et al. (2016); 2) Protection Motivation Theory (PMT) Dang et al. (2014); and 3) Diffusion of Innovation Theory (DIT) Aubert et al. (2012). Lapple and Kelley (2013) have indicated that the TPB is appropriate for the study of farming behavior.

The Theory of Planned Behavior (TPB) offers a theoretical framework for looking into the mental influences on people's actions, as showed in Figure 1. Attitudes, subjective norms (social pressures), and a sense of control over the execution of behavioral tasks all play a role in shaping future behavior (Ajzen, 2011). Numerous TPB-based studies have been applied to agriculture in order to better comprehend how farmers choose to implement new soil conservation (Wauters et al., 2010)and improved grassland techniques (Borges et al., 2014; Martnez-Garca et al., 2013). These results show that the TPB is able to represent human behavior accurately. This article's goal is to investigate what factors influence farmers to become motivated or demotivated by farming. Hence, the study incorporates the TPB model into the consideration of the factors that affect the farmer’s intention towards farming. This study identified five factors as necessary for investigating farmers' intentions (FI): (i) marketing risk (MR), (ii) price risk (PR), biological risk (BR), and (ii) climate risk (CR).

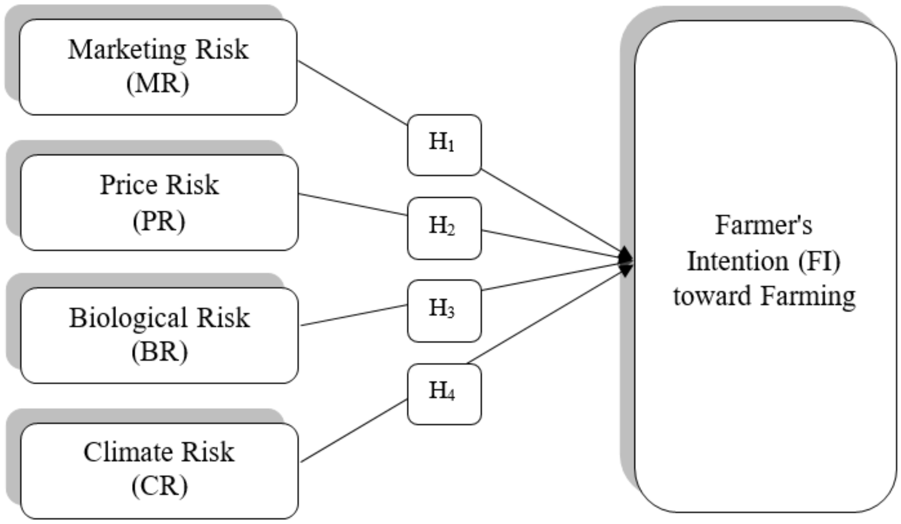

Figure 1: Conceptual Framework: Model of farmers intention towards farming (Applied from Theory of planned behavior, Ajzen, 1991)

H_1 Marketing risk has a negative impact on farmers' intentions toward farming.

H_2 Price risk has a negative impact on farmers' intentions toward farming.

H_3 Biological risk has a negative impact on farmers' intentions toward farming.

H_4 Climate risk has a negative impact on farmers' intentions toward farming.

3. Material and methods

3.1 Research Approach

The study is quantitative in nature and deductive in style, using positivist philosophy as its guiding philosophy. According to Creswell (2014), the quantitative approach is appropriate for research goals that look for factors influencing the result or the effectiveness of an intervention that might affect the outcome. In light of this and the nature of this investigation, the quantitative research method is considered appropriate.

3.2 Data Source

According to the researchers Hair et al. (2010), for a study like the one being conducted now, the sample size should be at least five times as large as the total number of questionnaire items. The appropriateness of sample size, that is, it should be higher than 200 samples Kline (2011). Data were collected from 350 respondents through a structured questionnaire, and Dinajpur district was chosen as a sample location. The farmers of paddy, wheat, and maize were considered participantsin the research.

3.3 Sample selection and analysis technique

Due to its simplicity, time efficiency and cost efficiency, the study uses non-probability and convenience sampling methods(Ary et al., 2009).The researcher followed a five-point Likert scale with multiple choice and multi-point scales. All responses were analyzed through SPSS version 25 and Amos version 24.

3.4 Demographic profile of the respondents

Table 1 shows a detailed review of the demographic profile of the respondents. We conducted a frequency analysis of the general characteristics of the respondents. There were slightly more males than females; 97.1 percent of participants are male and 2.90 percent are female, and 67.4 percent are more than 45 years old; 53 percent of the respondents have a secondary education level; and 47.7 percent are farmers whose type is small. Overall, 58.9 percent of farmers have experience spanning more than nine years.

Table 1: Demographic Presentation

Respondents characteristics		Frequency	Percent	Cumulative Percent
Gender	Male	340	97.1	97.1
	Female	10	2.90	100.0
Age (Years)	15-24	2	0.6	0.6
	25-34	12	3.4	4.0
	35-44	100	28.6	32.6
	More than 45	236	67.4	100.0
Education Level	Primary	109	31.1	31.1
	Secondary	183	52.3	83.4
	Higher Secondary	53	15.1	98.6
	Graduate or Above	5	1.4	100.0
Farmer's Type	Marginal farmers	79	22.6	22.6
	Small Farmers	167	47.7	70.3
	Medium Farmers	85	24.3	94.6
	Large Farmers	19	5.4	100.0
Experience	1-3 Years	2	0.6	0.6
	4-6 Years	31	8.9	9.4
	7-9 Years	111	31.7	41.1
	More than 9 Years	206	58.9	100.0

4. Result and Discussion

4.1Empirical Results

In order to analyze the data and test the hypotheses, this study used structural equation model (SEM). The test was conducted with the help of the Amos-24 data analysis tool because it allows for simultaneous evaluation of the measurement and structural models. Specifically, this method is useful for ensuring the measurement model's validity and reliability, as well as for clarifying the theoretical connections between the structural model's various constructs. It also measures some model fit indices, which confirms its effectiveness.

4.2Measurement Model Assessment

Evaluation of Measuring Instruments Convergent validity examines the degree to which the components of a notion are connected theoretically. The two most crucial indicators of convergent validity are the average variance extracted (AVE) and the confirmatory factor analysis (CFA). Table 2 clearly displays the convergent validity of all assessment items. The outcomes showed that the factor loadings were significantly higher than the recommended cutoff value of 0.70. AVE values also varied from 0.62 to 0.76. Utilizing construct reliability, it is possible to determine how accurately operationalization measures the intended variables. Composite reliability (CR) and Cronbach's alpha are two ways to quantify this dependability. The CR values were greater than the typical threshold of 0.70, ranging from 0.87 to 0.93. Cronbach's alpha values ranging from 0.87 to 0.93 confirmed the measurement model's dependability.

Table 2: Standardized estimates, and reliability statistics

Item	Standardized Factor Loading	ρ	Average Variance Extracted (AVE)	Composite Reliability (CR)	Cronbach's Alpha (α)
Marketing Risk			0.62	0.87	0.87
MR1	0.73	***			
MR2	0.80	***			
MR3	0.83	***			
MR4	0.79	***			
Price Risk			0.68	0.89	0.89
PR1	0.92	***			
PR2	0.61	***			
PR3	0.94	***			
PR4	0.78	***			
Biological Risk			0.75	0.92	0.93
BR1	0.75	***			
BR2	0.73	***			
BR3	0.95	***			
BR4	1.00	***			
Farmer's Intention			0.71	0.91	0.90
FI1	0.89	***			
FI2	0.83	***			
FI3	0.93	***			
FI4	0.70	***			
Climate Risk			0.76	0.93	0.92
CR1	0.96	***			
CR2	0.82	***			
CR3	0.74	***			
CR4	0.95	***			

Note: *** $\rho < 0.001$. Source: SEM-Amos output and reliability analysis

The results of the model fit statistics and the tests of discriminant validity are shown in Table 3. The concept of discriminant validity describes the absence of confounding variables in the measurement model. The comparison of the square root of AVE to correlation values among the constructs was used to test for discriminant validity. The results showed that the AVE square roots for the diagonal row of constructs are greater than the construct-to-construct correlations. The fact that the measuring model is reliable and valid in terms of discrimination is thus confirmed.

After ensuring the validity and reliability of the measurement model and its constituent components, the study moved on to verify the measurement model's overall fitness. AMOS-24's full standardized solutions, which included all 20 elements, were substantially loaded on the relevant constructions. The following studies were performed to provide an estimate of the measurement model's overall fit: the ratio of chi-square to degrees of freedom (CMIN/DF), the goodness-of-fit index (GFI), the adjusted GFI, the normalized fit index (NFI), the incremental fit index (IFI), the Tucker-Lewis index (TLI), and the root mean square error of approximation (RMSEA). The fact that these evaluations all met their value standards suggests that the model is generally well suited.

Table 3: Discriminant validity and model fit indices

Constructs	Mean	SD	1	2	3	4	5
1. Market Risk	4.07	0.54	**0.787**				
2. Price Risk	4.06	0.53	0.066	**0.823**			
3. Biological Risk	3.32	0.74	-0.060	-0.077	**0.868**		

4. Farmer’s Intention	4.04	0.70	-0.053	-0.061	-0.121	**0.840**	
5. Climate Risk	3.62	0.61	0.001	-0.005	0.032	-0.086	**0.872**

Indices	Model Fit Obtained Value	Recommended Value	Reference
CMIN/DF	1.641	<3	Hair at al., 2010
GFI	0.934	≥0.80	Doll et al., 1994
AGFI	0.914	≥0.80	Doll et al., 1994
NFI (Delta 1)	0.952	≥0.90	Hair at al., 2010
IFI (Delta 2)	0.981	≥0.90	Hair at al., 2010
TLI (rho2)	0.977	≥0.90	Hair at al., 2010
CFI	0.981	≥0.90	Hair at al., 2010
RMSEA	0.043	≤0.08	Browen &Cudeck, 1993

Note: Bold diagonal numbers are the square roots of AVE. Source: SEM-Amos and SPSS output

4.3Structural Model Assessment

Table 4 shows the hypothesized paths, parameter standardized β values, standardized errors (SE), ρ values, and acceptance or rejection of the hypotheses. The quality of association among constructs was assessed by inspecting their respective standardized path coefficients (β values) and significance values (ρ values). The results supported 3 of 4 hypotheses. The farmer’s intention is insignificantly predicted by marketing risk ($\beta = -0.399$, $\rho > 0.07$) and the H_1 was rejected. Price risk ($\beta = -0.458$, $\rho < 0.05$), biological risk ($\beta = -0.664$, $\rho < 0.05$), and climate risk ($\beta = -0.435$, $\rho < 0.05$) have a significant impact on farmers' intentions, indicating acceptance for hypotheses H_2, H_3, and H_4. Apart from marketing risk, all other factors have a negative impact on farmers' intentions towards farming.

Table 4: Summary of results

Hypothesized Paths			Estimate (β)	S.E.	ρ	Hypothesis
Marketing Risk	→	Farmer’s Intention	-0.399	0.064	0.07	H_1 Rejected
Price Risk	→	Farmer’s Intention	-0.458	0.051	**	H_2 Accepted
Biological Risk	→	Farmer’s Intention	-0.664	0.051	**	H_3 Accepted
Climate Risk	→	Farmer’s Intention	-0.435	0.042	**	H_4 Accepted

Note: *** $\rho < 0.001$, ** $\rho < 0.05$, Source: SEM-Amos output

4.4Discussion

It is estimated that there will be 9.7 billion people in the world by the year 2050, and one of the most effective ways to help them all get fed is through agricultural growth. Growth in the agricultural sector is more significant than growth in other sectors for increasing incomes for the poor by a factor of two to four. It is possible that the effects of climate change will continue to reduce crop yields, especially in already food-insecure parts of the world (Agriculture and Food, 2023). The vast majority of Bangladesh's agricultural output is classified as traditional subsistence farming. Agriculture in Bangladesh is quite diverse, yielding a wide range of products, and most farmers are small according to the volume of land they cultivate. The study found that more than 90% of farmers have more than 7 years of farming experience.

All of the independent variables were shown to have a negative effect on farmers' intentions towards farming, and all were found to be significant except marketing risk. This demonstrated that farmers are not overly concerned with the dangers of product promotion. All variables have a significant negative impact on the farmer's intention, except for the risk associated with marketing. Inflation and extreme price swings in the commodity market pose a significant threat to farmers, and farmers have no interest in stockpiling in anticipation of a price drop or raise. Farmers were not optimistic about farming for reasons besides price risk. Farmers begin each season full of optimism, but every year brings new devastating pests and diseases of the crop that threaten their efforts. The need to increase productivity through plant breeding and the creation of more effective and sustainable agricultural systems is growing as a result of the current rate of population expansion. It is necessary to introduce new germplasm to mitigate damage caused by diseases, pests, and unfavorable climate effects (Crespo-Herrera et al., 2017). The study found a negative impact of climate risk on farmers' intentions regarding farming. The world is currently experiencing a condition where the weather is unpredictable and changes frequently. Key food production industries, such as fisheries and agriculture, are predicted to be severely impacted by climate change. However, below national sizes, it is uncommon to assess the possible implications of climate change on various sectors together, which might hide enormous diversity in how different communities will be affected (Outhwaite et al., 2022).Farmers are discouraged from cultivating their land due to climate change since they cannot reliably predict the weather. Farming is getting increasingly difficult as farmers adapt to the increasingly unpredictable weather. Finally, climate risk discourages them from continuing and growing their farming.

5. Conclusion

The investigation from the study gave us a clear picture regarding the independent variables related to farming and how they impact farmers' intentions. The explanation was clear in the earlier result discussion that price risk, biological risk, and climate risk have a negative impact on farmer intention, but it was significant. The result clarified that farmers are really discouraged from farming just because of the diverse risks. Industrialization has a visible impact on the economies of the nations, but agriculture is still important to us. A contemporary economy expands its production and consumption in the industrial and service sectors. This trend is also slowly appearing in the agricultural industry. Integration with the international economy has also taken place. We've been making enormous strides towards self-sustained growth, setting an international standard in the process. As a major fact, a country couldn't become a pioneer until it became self-dependent in sourcing food, and the great source of generating food is farming.

This section is an outline of how to increase farming, especially for smallholder farmers, by establishing effective policies that support them. Conventional farmers continue to have a negative attitude towards farming. Thus, the government should implement a policy to increase understanding, promote the benefits of farming, and increase awareness of the risks associated with farming. In addition, the government should ensure a fair price and control over the price change so that it leads to a producer surplus and mitigates the price risk. Growing certified training and testing institutes to have accurate treatment and forecasts about biological and climate risks to help farmers with their perceived behavioral control, which would grow and promote their intention towards farming.

There can be several future studies to reveal why price risk is not under control when it is a controllable factor. At the same time, academicians and researchers can conduct a study on concerned persons and authorities who are taking care of biological risk and climate risk-relevant agriculture, though these two factors are natural and completely not under human control.

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