Factors Influencing Farmers' Entrepreneurial Behavior in Panchagarh, Bangladesh: An Integration of Semantic Differential Scale

ABSTRACT

The succession of activities to the exploitation of a new entrepreneurial opportunity is important for income diversification. The objective of this study was to determine the extent of entrepreneurial behaviour of the farmers as well as to determine its influential factors. The dependent variable was measured using one-to-seven-point semantic differential scale. In addition, seven levels of entrepreneurial behaviour were used in the scale. One hundred thirty-three (133) farmers were selected for data collection using a multi-stage random sampling procedure from selected six unions of Sadar upazila in Panchagarh district of Bangladesh. Descriptive statistics like percentages, means, standard deviations, indices, and rank order were employed to summarise the data gathered during the interviews. The inferential statistical investigation involved using correlation analysis, multiple regression analysis, stepwise regression analysis and path analysis using PLS-SEM (Partial Least Square-Structural Equation Model). The findings revealed that a significant proportion (85.7 percent) of the respondents held a repressive to optimistic entrepreneurial behaviour. The key factors influencing farmers' entrepreneurial behaviour were educational qualification, extension contact, farm size, and age altogether accounting for 89.0% variance in the dependent variable. However, path analysis indicates that farmers' educational qualification has the highest contribution on their entrepreneurial behaviour followed by farm size, extension media contact, and age. The farm size has substantial indirect effect through educational qualification and extension media contact on entrepreneurial behaviour. Well-designed interventions, particularly through educational activities and extension services are crucial for fostering farmers' entrepreneurial engagement in agriculture and enhancing their success.

Keywords: Entrepreneurial behaviour, EBI, PLS-SEM, Semantic differential scale.

1. INTRODUCTION

Entrepreneurship is a mindset that is marked by inventiveness, fortitude, and a proactive approach to solving problems [1]. In addition, entrepreneurship is the process of finding, developing, and seizing chances to add value with novel concepts, goods, or services. Entrepreneurship also refers to the capacity to innovate inside already-existing businesses, promoting expansion and adaptability in changing circumstances [2]. Entrepreneurs frequently display characteristics like vision, enthusiasm, tenacity, and a willingness to question the current status. In order to pursue business endeavours, entrepreneurs must be prepared to assume risks, gather resources, and negotiate uncertainty [3].

Since entrepreneurship acts as a catalyst for economic growth, job creation, and poverty reduction, it is essential to the development of nations, especially those in the developing world. Entrepreneurship produces money, boosts productivity, and encourages investment in local communities through promoting innovation, starting new firms, and growing already established ones [4]. In addition, entrepreneurship frequently fills gaps in the market, advances technology, and helps underprivileged groups become more integrated into the formal economy. Developing nations may realise their full potential through entrepreneurship, utilising the inventiveness and creativity of their citizens to create societies that are more resilient, inclusive, and affluent [5].

As a developing country, the significance of entrepreneurship in Bangladesh, specifically among farmers, cannot be overstated, given its capacity to tackle urgent issues and create prospects within the agricultural industry. Given the substantial proportion of the population involved in agricultural activities, entrepreneurship presents a viable avenue for mitigating poverty, bolstering food security, and advancing rural development [6]. Farmers may expand their market reach, enhance productivity, and diversify their revenue streams through the promotion of entrepreneurial abilities and assistance for novel agricultural methodologies. In addition, entrepreneurship empowers farmers to adjust to changing circumstances, embrace sustainable farming methods, and develop resilience in the face of climate change and environmental degradation [7]. Moreover, agricultural entrepreneurial endeavours have the potential to stimulate economic expansion, generate employment prospects, and diminish reliance on conventional subsistence farming techniques. As a result, it is critical to promote entrepreneurship among farmers in Bangladesh in order to advance agricultural modernization, enhance livelihoods, and contribute to the nation's overarching development objectives [8].

In the agricultural industry, farmers play a more important role than just cultivators. They are becoming more and more acknowledged as entrepreneurs guiding the agri-business landscape. Farmers themselves are at the center of agricultural entrepreneurship; they make decisions and take actions based on a combination of external and internal factors. Internal determinants include personal traits, life experiences, and goals that influence farmers' willingness to take risks, be creative, and be resilient [9]. Their entrepreneurial mindset and approach to risk and opportunity are shaped in part by their educational background, age, gender, and family history. In addition, farmers work in a dynamic environment that is shaped by institutional, cultural, and socioeconomic elements on the outside [10]. The entrepreneurial landscape of farmers is shaped by a combination of factors such as government laws, socio-cultural norms, technological breakthroughs, market conditions, and financing availability. For example, market volatility can have a big impact on farmers' risk tolerance and investment choices, yet loan availability and supporting regulations might spur entrepreneurs to start their own businesses [11].

Moreover, the sociocultural context in which farmers function has a significant impact on their entrepreneurial behaviour. Cultural conventions, customs, and social networks influence how they view creativity, collaboration, and taking calculated risks. These sociocultural factors have a significant impact on individual decision-making as well as the spread of entrepreneurial activities among farming communities [12]. With agriculture changing constantly due to technological innovation, globalisation, and climate change, it is more important than ever to comprehend the complex network of factors influencing farmers' entrepreneurial behaviour. Through deciphering these complexities, policymakers, scholars, and professionals can formulate focused interventions aimed at fostering an entrepreneurial mindset, augmenting agricultural output, and advancing equitable rural development.

A plethora of studies have been conducted on farmers' entrepreneurial behavior in various regions around the world, e.g., Agbolosoo and Anaman [13]; Ashilina et al. [14]; Gurjar et al. [15]; Patel et al. [16]; Boruah et al. [17]; Chaurasiya et al. [18]; Paudel et al. [19]; Rahmawati et al. [20]; Porchezhiyan et al. [21]; Anthony et al. [22]; Astuti et al. [23]; Wakhidati et al. [24]; Shivacharan et al. [25]; Prasad et al. [26]; Chaurasiya et al. [27]; Nandhini et al. [28]; Mandala et al. [29]; Sherkhane [30]. However, relatively few studies have focused on farmers' entrepreneurial behavior in Bangladesh, e.g., Polas et al. [31]; Akhter and Sumi [32]. Moreover, none of these studies examined farmers' entrepreneurial behavior and its influential factors using a semantic differential scale in Bangladesh. Considering these facts and their practical usefulness, the present study was undertaken to determine the extent of the entrepreneurial behaviour of the farmers and to identify the influential socioeconomic factors of the farmers on their entrepreneurial behaviour.

2. MATERIALS AND METHODS

An explanatory cross-sectional research design was followed in this study. The detailed methodology is presented in the following subsections:

2.1 Study Area

The study was carried out in Panchagarh district of Bangladesh. This district is located on the northern extremity of Bangladesh with a population of 9.86 lac (approximately). The total area of Panchagarh district is 1404.62 sq km and it is located in between 26°00' and 26°38' north latitudes, and 88°19' and 88°49' east longitudes [33]. There are five upazilas (administrative unit) in Panchagarh, namely, Atwari, Tentulia, Debiganj, Sadar, and Boda. The study was carried out in the Sadar upazila. The total area of the Sadar upazila is 347.09 sq. km. About 2.71 lac people live in this upazila [33]. This upazila covers three agro-ecological zones i.e., AEZ 1 (Old Himalayan Piedmont Plain), AEZ 3 (Tista Meander Floodplain), and AEZ 25 (Level Barind Tract). The livelihood of the people in this upazila is basically dependent on agriculture. The maps of the study area have been presented in Figure 1.

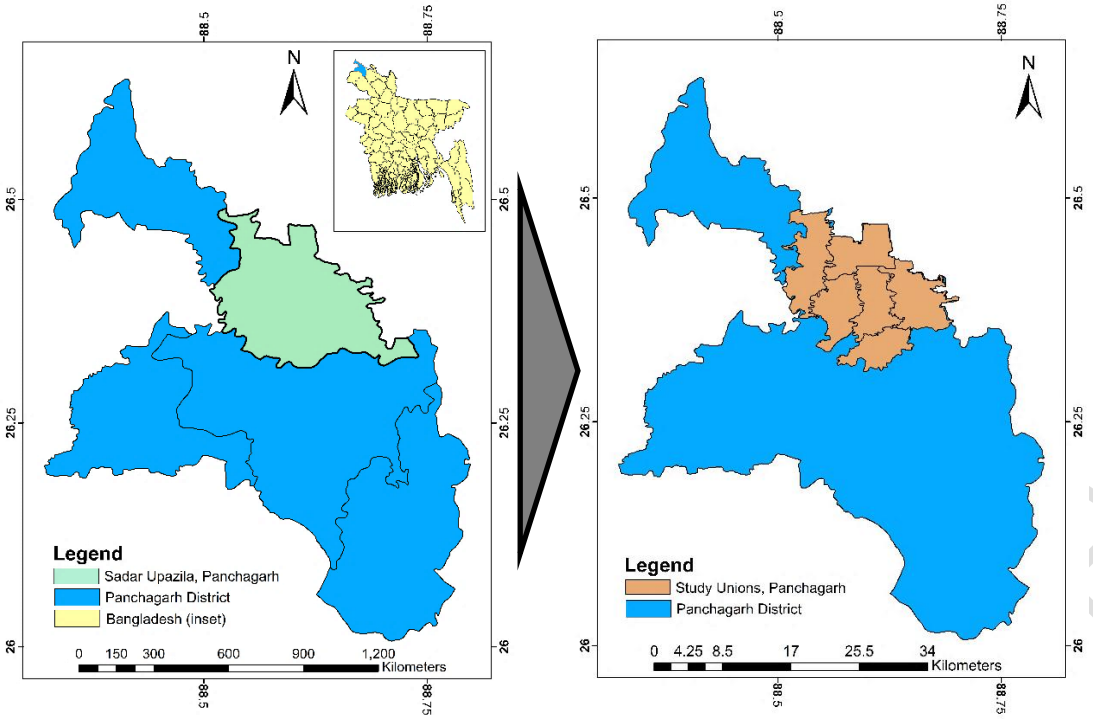


Fig. 1. Maps of Panchagarh district showing Sadar upazila and the selected unions (Bangladesh inset) (Source: Authors estimation using ArcMap10.8)

2.2 Sampling Design

For sample selection, a multi-stage random sample selection technique was used. Out of five upazilas of Panchagarh district, Sadar upazila was selected randomly. There are 10 unions in the Sadar upazila, six were selected for data collection in the second stage. An updated list of all the farmers participating in these six unions was collected from the Upazila Agriculture Office. There were 3159 enlisted farmers of these six unions receiving agricultural extension services from Upazila Agriculture Office, which constituted the population of the study. Cochran's sample size calculating formula was employed to pick the sample of farmers [34]. The Cochran formula is:

$$n_0 = \frac{Z^2 pq}{e^2}$$

Where, n_0 is Cochran's sample size recommendation.
For this study, Confidence level = 95%, e (the margin of error) = 5%, p (proportion of the population) = 10%, q = (1 - p) = (1 - 0.1) = 0.9, the Z-value for 95% confidence level is 1.96
Thus,

$$n_0 = \frac{Z^2 pq}{e^2} = \frac{1.96^2 \times 0.1 \times 0.9}{0.05^2} = 138.3$$

Thus, the sample size for this study is

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}}$$

Here, n is the new adjusted sample size, and N is the population size, and here it is 3159.

$$\boldsymbol{n = \frac{n_0}{1+\frac{(n_0-1)}{N}} = \frac{138.3}{1+0.0435} \cong 133}$$

So, the sample size is 133. In addition, a reserve list of 15 farmers was made to use in case the original sampled farmers were unavailable for interview. The detailed population and sample distribution are shown in Table 1.

Table 1: Distribution of the population and sample

Unions	Population	Sample farmers	Reserve list

Unions	Population	Sample farmers	Reserve list
Amarkhana	515	22	2
Kamat Kajal Dighi	375	16	2
Panchagarh Sadar	591	25	3
Satmara	633	27	3
Haribhasa	603	25	3
Hafizabad	442	18	2
Total=	3159	133	15

2.3 Research Instrument and Data Collection

For collecting data, an interview schedule was prepared using both open and closed-form questions and scales where they were needed. The questionnaire focused on assembling data on different profile characteristics of the farmers. In addition, the inclination or feeling of the farmers towards entrepreneurial endeavors was determined to capture their behaviour towards entrepreneurship. The interview schedule was pretested with 12 farmers (other than the sample farmers) in the study area. Prior to completing the interview schedule, required adjustments and amendments were made based on the pre-test. The interviews were individually conducted with the respondents at their respective residences from November 2023 to February 2024.

2.4 Measurement of Independent Variables

Nine variables were estimated to describe the profile characteristics of the respondent farmers. The measuring techniques and scales for these variables as well as their descriptive statistics are shown in Table 2.

Table 2: Measurement techniques for different independent variables

Characteristics	Scale or scoring method	Possible range (Observed range)	Mean	SD
Age	Number of years since the birth	Unknown (23-60)	41.44	10.54
Educational qualification	Year of schooling	Unknown (0.00-16)	8.74	4.94
Family size	Number of members in the family	Unknown (2-14)	5.24	2.08
Farm size	Hectare	Unknown (0.20-363)	29.39	81.54

Annual income	Thousand BDT*	Unknown (18000-471000)	103179.30	87503.54
Credit received	Thousand BDT*	Unknown (9015-235510.25)	51639.44	43747.16
Organizational participation	The score calculated by multiplying the extent of participation by the duration of participation	Unknown (0.00-9)	1.42	2.13
Extension media contact	Four-point rating scale was used, and the score was computed based on respondent's extent of contact with 10 selected extension media	0-30 (1-30)	10.03	7.39
Attitude towards entrepreneurship	Construct contained 12 statements, Likert scale having 5 responses was used	12-60 (20-59)	41.45	8.51

** Thousand BDT = Approximately $8.55*

2.5 Measurement of the Dependent Variable

Entrepreneurial behaviour was the dependent variable of the study which was measured by a systematic technique to perform the process of ascertaining the respondents' opinions and feelings and the intensities of those respective opinions by assigning relative values to the statements. Seven levels of entrepreneurship as suggested by Owusu-Kodua [35] were used for measuring entrepreneurial behaviour of the farmers. One-to-seven-point semantic differential scale was used to derive the respondent's behaviour towards the given level by asking him/her to select an appropriate position on the between two bipolar positions. It is a measurement scale used to measure a respondent's subjective perception of, and affective reactions to, the properties of concepts, objects, events, and ideas by making use of a set of bipolar scales [36]. A score of one for the extreme pessimist behaviour, at one end, and seven for the extreme optimist behaviour to the opposite end were assigned. Thus, the overall entrepreneurial behaviour score of an individual could range from 7 to 49, where low score indicates the pessimistic behaviour, moderate score indicates repressive behaviour, and high scores indicates the optimistic behaviour. Pessimistic behaviour reflects a skeptical perspective towards entrepreneurial behaviour, as well as a resistance to changes or innovations due to fear of failure or loss. Repressive behaviour actively discourages entrepreneurial initiatives and adheres strictly to conventional methods. Conversely, optimistic behaviour views entrepreneurial behaviour as an opportunity for growth and improvement. In addition, entrepreneurial behaviour index (EBI) and Rank Order (RO) based on EBI for the seven levels was calculated using the following formula:

$$\text{Entrepreneurial Behaviour Index (EBI)} = N_7\times7+N_6\times6+N_5\times5+N_4\times4+N_3\times3+N_2\times2+N_1\times1$$

Where, N_7= Number of farmers responding to the scale as '7', N_6= Number of farmers responding to the scale as '6', N_5= Number of farmers responding to the scale as '5', N_4= Number of farmers responding to the scale as '4', N_3= Number of farmers responding to the scale as '3', N_2= Number of farmers responding to the scale as '2', N_1= Number of farmers responding to the scale as '1', for the specific level of entrepreneurial behaviour.

The EBI scores for each of the seven levels could range from 133 to 931, where 133 indicates most pessimist entrepreneurial behaviour and 931 indicates most optimistic entrepreneurial behaviour.

2.6 Data Analysis

Different descriptive statistics like frequency, percentage, mean, standard deviation, indices, rank order, and inferential statistics such as correlation, multiple linear regression (enter and stepwise method), and path analysis through PLS-SEM (Partial Least Square Structural Equation Model) were employed in this study. The statistical Packages for the Social Sciences (SPSS) (version 25) and SmartPLS 4 were used to analyse the data.

3. RESULTS

3.1 Farmers' Entrepreneurial Behaviour

Farmers' entrepreneurial behaviour was the dependent variable of the study. The entrepreneurial behaviour score varied from 7 to 49, against the same possible range. The mean score of farmers' entrepreneurial behaviour was 28.33 with a standard deviation of 8.63. The respondents were divided into three categories, using equal distributions of the possible range of entrepreneurial behaviour response score as shown in Table 3.

Table 3: Distribution of the farmers according to their entrepreneurial behaviour score

Categories	Respondents (n=133)		Mean	SD
	Frequency	Percentage		
Pessimistic (7-21)	19	14.3	28.33	8.63
Repressive (22-35)	88	66.2		
Optimistic (36-49)	26	19.5		
Total =	133	100.0		

SD= Standard Deviation

The findings implied that the vast majority (85.7 percent) of the respondents were clustered under the repressive to optimistic entrepreneurial behaviour category. In addition, farmers' entrepreneurial behaviour was evaluated according to the selected seven levels by calculating their indices and ranking based on indices. Table 4 corresponds the rank order for each level of farmers' entrepreneurial behaviour.

Table 4: Rank order of the levels of the entrepreneurial behaviour

Sl.	Levels of entrepreneurial behaviour	Extent of response (frequency)							EBI	Mean	RO
		1	2	3	4	5	6	7			
1	Innovation alignment	8	12	6	14	31	36	26	659	4.96	1st
2	Entrepreneurial pro-activeness	21	13	26	47	3	11	12	478	3.59	6th
3	Entrepreneurial competitiveness	13	29	45	12	13	9	12	457	3.44	7th

4	Entrepreneurial aggressiveness	14	34	20	23	12	14	16	490	3.68	5th
5	Entrepreneurial risk orientation	11	9	10	24	40	18	21	610	4.59	2nd
6	Entrepreneurial autonomy	21	13	18	33	20	12	16	517	3.89	4th
7	Entrepreneurial confidence	19	9	24	20	11	37	13	557	4.19	3rd

According to the findings of Table 4, the top-ranked level of entrepreneurial behaviour was 'Innovation alignment', followed by 'Entrepreneurial risk orientation', and 'Entrepreneurial confidence'. Conversely, the least-ranked level was 'Entrepreneurial competitiveness'. However, the mean value of each level also supports the rank order based on the EBI.

3.2 Factors influencing Farmers' Entrepreneurial Behaviour

Three steps were followed to determine the influence of different factors on farmers' entrepreneurial behaviour: first, the correlation analysis; second, the multiple linear regression (both enter and stepwise method); and finally, the path analysis based on (Partial Least Square Structural Equation Modelling). The steps are given in the following subsections:

3.3 Result of Correlation Analysis

The correlation analysis (Table 5) shows that six out of nine variables are significantly related to the farmers' entrepreneurial behaviour. Among the six significant independent variables, five, namely, educational qualification, farm size, organizational participation, extension media contact and attitude towards entrepreneurship had a significant positive relationship. In contrast, age had a significant negative relationship with the dependent variable.

Table 5: Correlation coefficients of the selected characteristics of the farmers with their entrepreneurial behaviour (n=133)

Selected characteristics	Correlation coefficients with entrepreneurial behaviour (131 d.f.)
Age	-0.783**
Educational qualification	0.876**
Family size	-0.031
Farm size	0.698**
Annual income	0.065
Credit received	0.065
Organizational participation	0.825**
Extension media contact	0.912**
Attitude towards entrepreneurship	0.811**

*** Correlation is significant at the 0.01 level*

3.4 Result of Multiple Regression Analysis

Multiple regression analysis (both enter and stepwise methods) was done to determine the influence of the explanatory variables on farmers' entrepreneurial behaviour. Out of nine independent variables, six were included in regression analysis due to their significant relationships found in correlation analysis (Table 6). The coefficient of determination (R^2) indicates that all the independent variables entered in the model explain 89.2 percent of the variance in farmers' entrepreneurial behaviour. The adjusted R^2, calculated by only including the significant independent variables, reveals that 88.6 percent of the dependent variable's variation is attributable to these independent variables. The F-statistics is 172.641 which is significant at $p<0.01$, indicating that the multiple regression model significantly influences the dependent variable in this investigation. Therefore, this model is a perfect fit to predict the significant contributions of independent variables.

Table 6: Contributing variables to explain farmers' entrepreneurial behaviour (n =133)

Variables entered	Unstandardized coefficient (B)	Standardised coefficient (β)	t value
Constant	5.883		1.517
Age (X_1)	0.226	0.276	3.691***
Educational qualification (X_2)	1.130	0.647	7.524***
Farm size (X_3)	0.013	0.125	2.085*
Organizational participation (X_4)	0.436	0.108	1.097
Extension media contact (X_5)	0.548	0.470	3.000**
Attitude towards entrepreneurship (X_6)	-0.079	-0.078	-1.173

*R^2 = 0.892; Adjusted R^2 = 0.886; F= 172.641***, * = Significant at 5% level of significance; ** = Significant at 1% level of significance, *** = Significant at 0.1% level of significance*

The t-values of the regression coefficients were found significant for four variables (Table 6) namely: age (X_1), educational qualification (X_2), farm size (X_3), and extension media contact (X_5). All these variables have a significant positive influence on farmers' entrepreneurial behaviour. For an optimum model prediction, these four significant variables were entered in the stepwise multiple regression analysis (Table 7).

Table 7: Overview of the stepwise multiple regression analysis illustrating the variables contributing to the dependent variable (n =133)

Model	Variable entered	B	β	R^2 Change	t value	F statistics
Constant +X_5	Extension media contact	0.628	0.538	0.832	4.839***	646.560***
Constant+ X_5+X_2	Educational qualification	1.009	0.578	0.035	8.163***	34.572***
Constant+X_5+X_2+X_1	Age	0.212	0.259	0.018	3.508**	20.503***

Constant+X_5+X_2+ X_1+X_3	Farm size	0.014	0.137	0.005	2.321*	5.387*

** = Significant at 5% level of significance; *** = Significant at 0.1% level of significance*

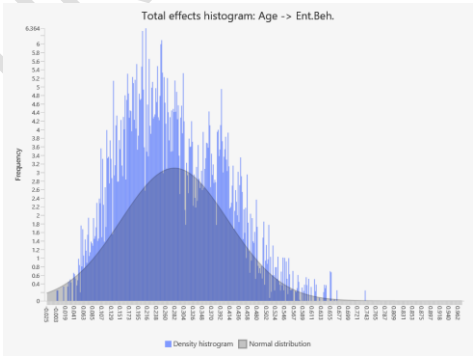
Results of stepwise multiple regression analysis (Table 7) shows that farmers' extension media contact had the highest contribution (83.2 percent) in predicting their entrepreneurial behaviour. On the other hand, educational qualification had the second highest contribution (3.5 percent) in prediction. Age, and farm size had 1.8 percent, and 0.5 percent contribution, respectively.

3.5 Results of Path Analysis – PLS-SEM (Partial Least Square – Structural Equation Model)

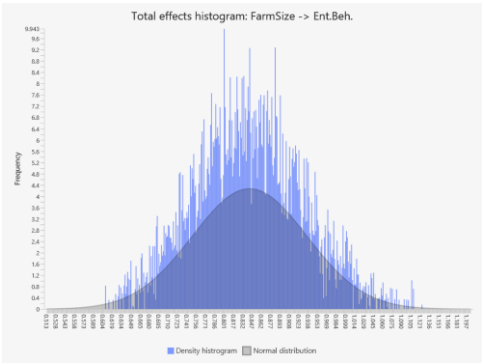
To measure and analyze the relationships of observed and latent variables a set of statistical techniques is used in Structural equation modeling (SEM). It is similar but more powerful than regression analyses for examining linear causal relationships among variables, while simultaneously accounting for measurement error [37]. To estimate structural equation models, two main approaches can be applied: covariance-based structural equation modeling (CB-SEM), and partial least squares-based structural equation modeling (PLS-SEM). Contrasting with CB-SEM, the PLS-SEM can reliably estimate very complex models using only a few observations without imposing distributional assumptions on the data [38]. The PLS-SEM method is a composite-based approach that uses total variance (common, specific, and error variance) and represents the construct as a linear combination of its indicators, and the PLS estimator does not assume the normality of the data by default [39]. As the PLS–SEM easily handles formative constructs (referred to as composite variable – entrepreneurial behaviour)– constructs with arrows pointing from the observable variables without posing specific constraints on the model. However, here the outer loadings are the estimated relationships in reflective measurement models (i.e., arrows from the latent variable to its indicators). They determine an item's absolute contribution to its assigned construct. Eight outer loading (factors) are considered for describing entrepreneurial behaviour and all significantly qualify for the construction at one percent level of significance. The influence of four significant variables sorted from stepwise regression analysis on entrepreneurial behaviour as well as the outer loading of the constructs of entrepreneurial behaviour is analysed considering three approaches: total effect, direct effect, and indirect effect, are discussed below.

3.5.1 Total effect

In PLS-SEM two variables considered as exogenous (age and farm size) as these variables are determined outside the model and are imposed on the model. But educational qualification and extension media contact are considered as endogenous variables as these variables changed or determined by their relationship with other variables within the model. For example, farm size could be considered as a proxy of socio-economic status of farm families. Farm families with large farm size might try to gain more educational qualifications due to their high socio-economic status. Thus, educational qualification might be influenced by farm size. Again, highly educated farmers as well as more farm size ownership of the farmers might influence them to contact more with extension media. Thus, these two variables might be endogenous in nature. So, there might be indirect effect of farm size channeled to entrepreneurial behaviour through educational qualification and extension media contact. Similarly, the indirect effect of educational qualification can be channeled to entrepreneurial behaviour through extension media contact. The histogram of the total effects of the two exogenous and two endogenous variables showed somewhat similarities to normal curve (Figure 2). Deviations from normality may affect the validity of these tests. Thus, the results can be explained as consistent and valid.



(a)



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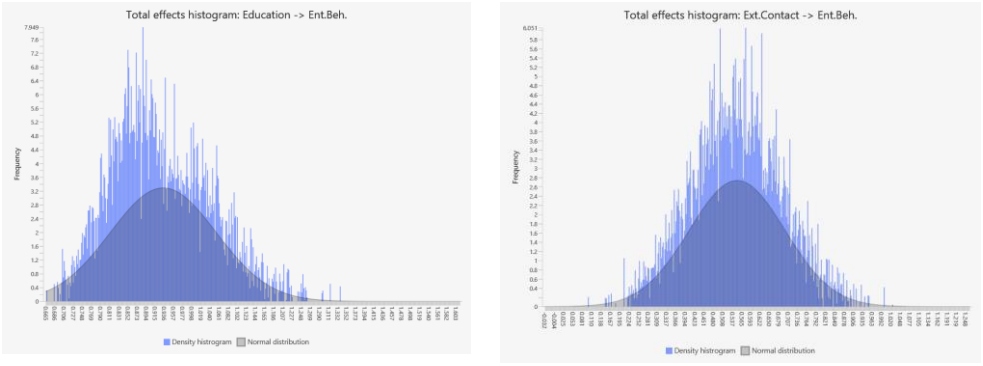

(c) (d)

Fig. 2. Histogram of total effects of different variables to entrepreneurial behaviour – (a) age, (b) farm size, (c) educational qualification, and (d) extension contact

The total effects of the variables have been presented in Figure 3. Depiction from Figure 3 indicates that the outer loadings ranged from 0.4 to 0.7 should be evaluated for elimination from the scale if the composite reliability (CR) and average variance extracted (AVE) scores increase as a result of their removal [40]. The majority of the outer indicator loadings, which are presented in Figure 3, are around the threshold level but not above 0.7. However, the composite reliability (CR) and average variance extracted (AVE) scores were above the threshold and removal of any items with lower loadings didn't change the CR and AVE score significantly so all the items were included in the final model.

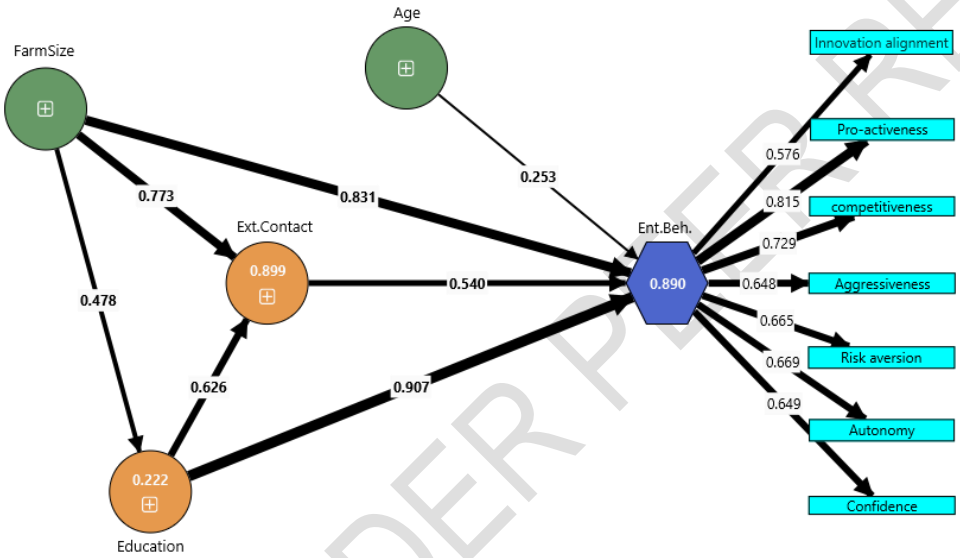

Fig. 3. Path diagram showing the total effects of different variables to entrepreneurial behaviour and the outer loading of the construct levels of entrepreneurial behaviour

The specific direct and indirect effects of the variables of the model are presented in Figure 4 and Figure 5, respectively. The direct effects of all the variables of the model showed significant influence to determine entrepreneurial behaviour (Figure 4). All of the findings of Figure 3, Figure 4 and Figure 5 indicate that farmers' educational qualification has the highest total effect (0.907) on their entrepreneurial behaviour followed by their farm size (0.831). The total effect of educational qualification on the dependent variable was an aggregation of its direct effect (0.569) and partial mediation effect/indirect effect through the variable extension media contact (0.338).

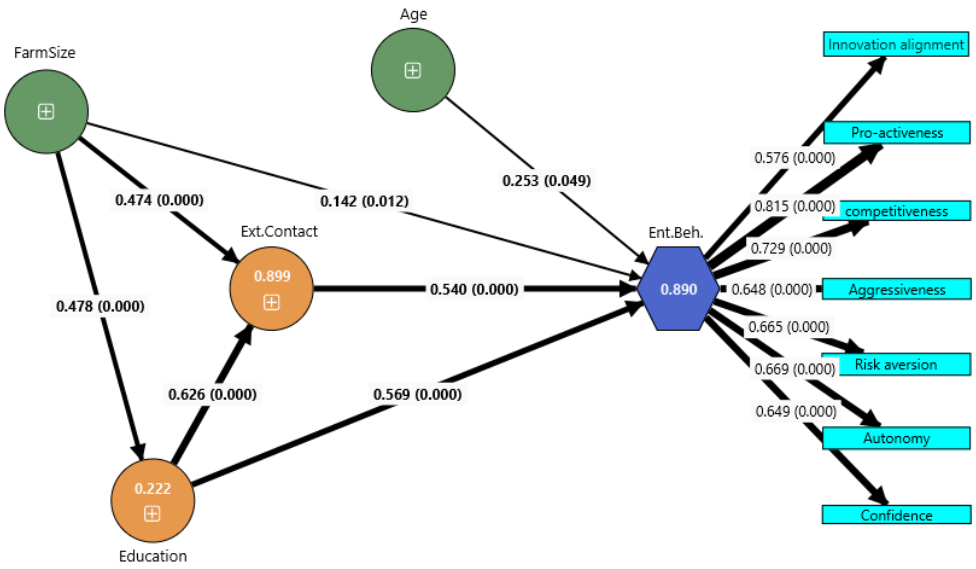

Fig. 4: Path diagram showing the direct effects of different variables to entrepreneurial behaviour and the outer loading of the construct levels of entrepreneurial behaviour along with their significance levels

Although the total effect of farm size was second highest among the variables, its direct effect on the dependent variable was not very commendable (0.142). This indicates that all of its influence on the dependent variable has been channeled through educational qualification and extension media contact indirectly. Where extension media contact has a sole influence of 0.540 on the dependent variable itself.

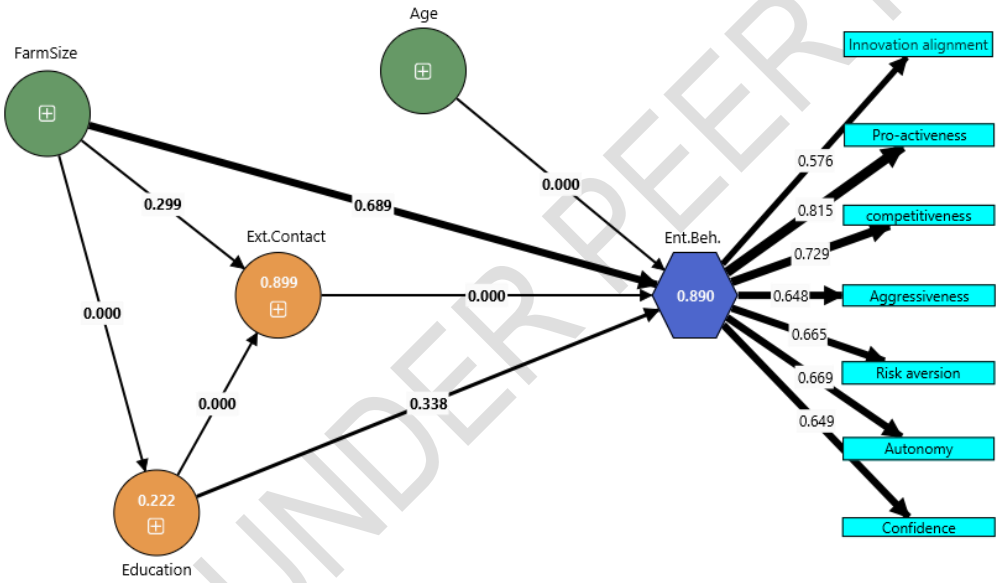

Fig. 5. Path diagram showing the indirect effects of different variables to entrepreneurial behaviour

These findings imply that farmers' educational qualification is the most influential factor on farmers' entrepreneurial behavior, followed by farm size and extension media contact. While farm size has a substantial indirect effect mediated through educational qualification and extension media contact, extension media contact has a significant direct influence on entrepreneurial behavior, making it more significant to predict the dependent variable.

4. DISCUSSIONS

The findings offer useful insights into the entrepreneurial behaviour of the participants, specifically in relation to the highest-level entrepreneurial behaviour of innovation alignment and risk orientation, which received the most responses. These findings indicate that the participants had a strong inclination towards innovation and a willingness to take risks, both of which are crucial characteristics for achieving success as an entrepreneur. Interestingly, entrepreneurial

competitiveness and entrepreneurial pro-activeness were found to be the most commonly reported lowest-level entrepreneurial behaviour. This suggests that the participants may not place as much importance on competitiveness or proactive behaviour compared to innovation and risk-taking. The concentration of the overwhelming majority of participants (85.7 percent) within the category of oppressive to optimistic entrepreneurial behaviour suggests a largely favourable perspective on entrepreneurship. This indicates that the respondents have a broad inclination to participate in entrepreneurial activities, however their level of excitement or approach may differ. Quantifying farmers' entrepreneurial tendencies can be achieved by evaluating their overall scores and ranking them, which serves as a quantitative indicator of their entrepreneurial behaviour. This facilitates a more intricate comprehension of the variations in entrepreneurial conduct among the participants. These findings provide useful insights into the entrepreneurial landscape among the studied population. It can be used to develop strategies for promoting entrepreneurship and innovation in farming or similar industries.

According to the findings of regression analysis and structural equation modelling (PLS-SEM), educational qualifications of the farmers is a significant predictor of their entrepreneurial behaviour. Education plays a pivotal role in nurturing entrepreneurs with the knowledge, skills, and mindset needed to thrive in the competitive entrepreneurial world. It ensures that individuals remain updated on the latest technological advancements and how they can be leveraged to enhance their businesses [41]. Nyonkuru [42] regards education as an important means to create a more entrepreneurial mindset among young people and asserts that promoting entrepreneurial skills and attitudes provides benefits to society even beyond their application to new business ventures. It also plays a pivotal role in risk aversion of entrepreneurs and prepares them to navigate the challenges.

It was also found that farmers' extension media contact was one of the most significant factors in tailoring their entrepreneurial behaviour. When farmers have direct and individualized contact with extension services, it enhances the relevance and effectiveness of the information provided [43]. Extension media contact often employs behavior change communication strategies to promote desirable farming behaviors among farmers. Extension media can feature demonstrations and visual aids to illustrate proper farming techniques and technologies. Visual learning is often more effective than text-based learning, especially for farmers with low literacy levels or those who prefer learning through observation. Extension media contact can empower farmers by providing them with relevant information and resources to make informed decisions about their farming practices.

On the other hand, farmers' age showed a significant positive influence on their entrepreneurial behaviour. Similar findings were obtained by Rogoff [44], Singh and DeNoble [45] and Weber and Schaper [46]. According to their findings, older entrepreneurs may have larger professional networks and access to resources such as capital, mentorship, and industry connections. They may bring years of industry experience and along with life experiences, they can shape resilience in the face of challenges. They may have greater resilience over time, which enables them to endure setbacks and navigate obstacles more effectively. Thus, age can influence entrepreneurship by shaping individuals' experiences, networks, risk tolerance, motivations, adaptability, resilience, and perceptions.

In addition, the farm size of the farmers also has a significant positive contribution in predicting farmers' entrepreneurial behaviour. Larger farm holders may have greater socio-economic status, easy access to capital, which enables them to invest more in modern equipment, technologies, infrastructure, and inputs. Again, larger farm holders may have more resources. Resource utilization and diversification can help to cope with the risk and stabilize income streams, reducing the vulnerability of the farms to external shocks. Moreover, managing a large farm requires strong leadership, management, and organizational skills which are essential for driving entrepreneurial initiatives such as strategic planning, market analysis, and business development.

5. CONCLUSIONS AND RECOMMENDATIONS

In conclusion, the comprehensive analysis of this study reveals that farmers exhibit diverse entrepreneurial behaviors, with the majority falling within the repressive to optimistic spectrum. This suggests a diverse landscape of entrepreneurial engagement among farmers. The factors influencing farmers' entrepreneurial behavior were identified through inferential analyses indicating significant predictors include educational qualification, extension media contact, farm size, and age. Among these four contributing variables, educational qualification and extension media contact stood out as the most influential factors. The findings underscored the significant impact of education on entrepreneurial behavior, emphasizing the need for ongoing education initiatives to equip farmers with relevant skills and knowledge. Extension media emerges as a key influencer, enhancing farmers' decision-making and entrepreneurial capabilities. It highlighted the importance of tailored interventions, particularly emphasizing the role of extension media contact in shaping farmers' entrepreneurial behavior. Overall, the study provides valuable insights into the complex dynamics of farmers' entrepreneurial behavior, emphasizing the critical role of education and extension services in fostering a conducive environment for entrepreneurial engagement in agriculture. These findings highlight the importance of tailored interventions, particularly through extension

services by Department of Agricultural Extension of the Government of Bangladesh, to engage farmers in entrepreneurship and enhance farmers' prospects for success through income diversification.

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