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Factors Influencing Farmers' Attitude towards E-Governance in Agricultural Services in Dinajpur District, Bangladesh

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Abstract
The study determined the factors influencing the attitude of farmers towards e-governance. Data were collected using a structured interview schedule from one hundred and twenty-five (125) farmers from Phulbari upazila of Dinajpur district in Bangladesh. Forty-one statements were used to assess the attitude of the farmers using a Likert-type scale. Data were analysed using percentages, means, standard deviations, Pearson's correlation analysis, and multiple linear regression analysis. The findings revealed that a significant proportion (68.0%) of the respondents had moderately to highly favourable attitudes towards e-governance. The top-ranked attitude statement was 'e-governance programs help to disseminate emergency disaster forecasting' ($\bar{x}$ =3.784). The significant key factors influencing farmers' attitudes towards e-governance were knowledge of e-governance (β =0.770), educational qualification (β =0.151), age (β =-0.116), and organisational participation (β =0.084). Specialized training programs to improve farmers' familiarity with e-governance, customized extension services for different educational backgrounds and age groups, and promotion of organisational engagement through cooperatives could be essential to foster farmers' attitudes and thereby adopt e-governance.

Introduction

Electronic governance, also known as e-governance, refers to the use of information technology to provide government services, facilitate the exchange of information, and enable communication transactions (Grigalashvili, 2022). This includes interactions between the government and citizens, government and businesses, government and other government entities, government and employees, as well as internal processes and interactions within the entire governance framework. This facilitates efficiency, transparency, and accessibility in government services by leveraging technology to streamline interactions between citizens, businesses, and various government entities (Poloche et al., 2023).

The tremendous progress of information and communication technology (ICT) has dramatically altered governance structures globally. The utilisation of ICT to provide government services has become a crucial instrument for improving government operations' effectiveness, openness, and availability (Hao et al., 2021). Specifically, e-governance can significantly transform extension services, market access, and overall farm management in the agricultural sector (Turyahikayo et al., 2019). This, in turn, can lead to enhanced agricultural productivity and rural development. Nevertheless, the effectiveness of e-governance efforts mostly depends on the attitudes and level of acceptance demonstrated by the primary stakeholders - the farmers (Zejnullahu et al., 2023).

Prior research has investigated the determinants that impact farmers' attitudes toward e-governance in different countries. Research conducted in Malaysia identified perceived ease of use, usefulness, and trust in the government as crucial factors influencing farmers' attitudes towards e-governance, as stated by Kamarudin et al. (2021). On the other hand, research in India and Ethiopia highlighted the significance of digital literacy and trust in government as key factors influencing farmers' inclination to embrace e-governance services (Birke & Knierim, 2020; Sharma et al., 2021). Furthermore, research conducted in Pakistan emphasized the importance of infrastructure, education, and government assistance in shaping farmers' attitudes towards e-governance (Griffen et al., 2022). However, despite the agricultural industry in Bangladesh plays a vital role in the country's economy, and the government has implemented many e-governance initiatives intending to enhance agricultural extension services, market information systems, and rural development programs for farmers, there is a lack of research dedicated explicitly to farmers attitude towards e-governance in Bangladesh.

Thus, this study seeks to fill the research void by investigating the factors that impact farmers' attitudes towards e-governance in Bangladesh. By examining the key factors influencing farmers' attitudes towards using e-governance services, this research aims to give significant insights to policymakers and stakeholders in the agricultural sector. This will help gain a thorough understanding of the obstacles and facilitators of e-governance adoption among farmers in Bangladesh. This study aims explicitly to

i. ascertain the attitude of the farmers towards e-governance and
ii. identify the key factors Influencing farmers' attitudes towards e-governance.

Methodology

An explanatory cross-sectional research design was employed for this study, which was conducted in the Dinajpur district of northern Bangladesh. The sample was drawn from this district using a multi-stage random selection procedure. In the first stage, Phulbari was randomly selected out of thirteen upazilas (administrative units) of Dinajpur district. This upazila is located at 25.50° North latitude and 88.95° East longitude and covers an area of about 228.49 square kilometres. The maps of the study area are depicted in Figure 1.

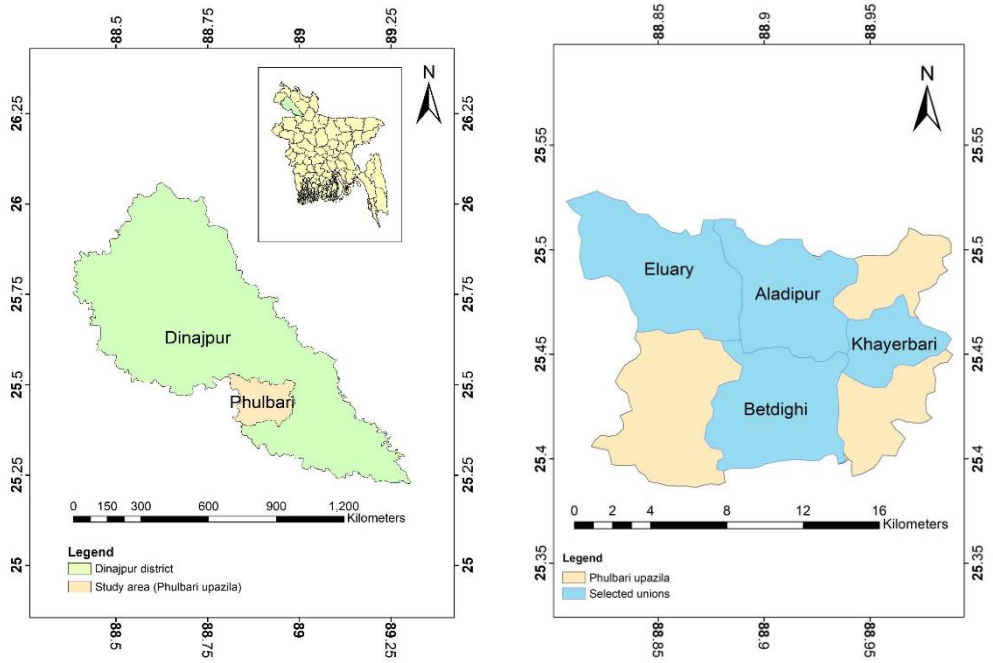

Figure 1: Maps showing the study area

In the second stage, four out of seven unions of Phulbari upazila were selected randomly for data collection. In the third stage, an updated list of all the farmers participating in the public agricultural extension programs in these four unions was collected from the Upazila Agriculture Office to draw out the sample from a frame of 1321 farmers. In the last stage, the sample size was determined using Cochran's (1977) sample size calculation formula for a finite population. The Cochran formula is:

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

Where n_0 is Cochran's sample size recommendation

For this study, the 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 the 95% confidence level is 1.96. Thus, the sample size for the study was 125. In addition, a reserve list containing 10% of the sample (13 farmers) was made to use in case the original sampled farmers were unavailable for an interview.

A structured interview schedule was administered to gather data from the respondents. The interview schedule was pretested with 24 farmers (other than the sampled farmers) in the study area. Before completing the interview schedule, required adjustments and amendments were made based on the pre-test results. The interviews

were individually conducted with the respondents at their residences from 15 September 2023 to 10 February 2024. Collected data were analysed using IBM-SPSS Statistical Packages.

The study considered ten independent variables- age, educational qualification, family size, farm size, farming experience, annual income, training experience, organizational participation, desirability, and knowledge of e-governance—to understand their influence on farmers' attitudes towards e-governance. Socio-demographic variables were measured using standard procedures. However, educational qualification was scored based on years of schooling, with 0 for illiteracy, 0.5 for only signing ability, and 1 for each year of education. Organizational participation scores were calculated based on involvement in six organizations considering the following equation:
Organisational participation score = $Pgm \times N_1Y_1 + Pem \times N_2Y_2 + Pce \times N_3Y_3$
The scores were assigned as 0 ('not involved'), 1('participation as a general member'), 2('participation as an executive member'), and 3('participation as a chief executive'), while N is the number of organizations involved and Y is the duration of participation.

Desirability was measured using a 3-point scale ('agree', 'undecided', 'disagree'), with cumulative scores ranging from 0 to 12 based on responses to six statements about interest in using government digital platforms. On the other hand, knowledge of e-governance was assessed using Bloom's Taxonomy of the Cognitive Domain (Bloom, 1956), with 24 questions across six levels. Scores were weighted by question level, and the total knowledge score was the sum of individual question scores.

The study's dependent variable was farmers' attitudes toward e-governance, measured using a Likert-type scale (Likert, 1932) with the 'equal-appearing interval' scaling technique (Thurstone & Chave, 1929). Initially, 65 statements on e-governance were developed from a literature review and screened per Edwards (1957). These were rated by 32 judges from related disciplines, with Average Appropriate Score (AAS), S (scale), and Q (inter-quartile range) values calculated following Edwards (1969). Statements meeting specific criteria (AAS ≥ 4.5, S-value ≥ 6.49, Q-value < 7.14) were selected following the methodology of Sayem (2023), resulting in 42 statements for pre-testing with 24 farmers. The respondents' top 25% and bottom 25% were used as criterion groups. Statements with 't' values < 1.75 were discarded, resulting in 41 statements for the final scale. This scale was evaluated for criterion validity, internal reliability (Cronbach's alpha), and split-half reliability, confirming its trustworthiness and high internal consistency (George & Mallery, 2003).

The final scale included 41 statements (23 positive and 18 negative) with response options ranging from 'strongly disagree' to 'strongly agree', scored 1 to 5, with negative statements reverse-scored. Farmers' cumulative attitude scores ranged from 41 to 205. Following Hasan et al. (2024); Sojib et al. (2023), and Sahoo et al. (2019), results were categorized into five groups for clear understanding and decision-making. The mid-value of the possible range (41-205) was considered neutral, with scores further categorized into highly unfavourable, moderately unfavourable, neutral, moderately favourable, and highly favourable. This approach provides a nuanced understanding of attitudes, commonly used in psychological and social science research, to capture detailed variations in respondents' feelings or perceptions.

Results and Discussion

Farmers' Attitude towards E-Governance

The observed attitude score of the farmers varied from 48 to 202. The distribution of the respondents in the five attitude categories, as mentioned before, is shown in Table 1.

Table 1: Distribution of the respondents according to their overall attitude score

Categories	Respondents percentage	Mean	SD
Highly unfavourable (41–81)	10.4	130.27	35.21
Moderately unfavourable (82-122)	21.6		
Neutral (123)	0		
Moderately favourable (124-164)	50.4		
Highly favourable (165-205)	17.6		

Source: Field survey, 2023; SD= Standard Deviation

The findings imply that the majority of the respondents (68.0%) clustered around the moderately to highly favourable attitude category. This finding is similar to the findings of Parikh and Chauhan (2020) and Nair and Singh (2019). This indicates that the farmers have a positive response and prospective willingness to accept e-governance initiatives. This could be attributed to a variety of reasons, including the potential for improved efficiency and access to resources that digital platforms offer. Additionally, the increasing familiarity and comfort with technology likely contribute to their willingness to embrace these modern systems as the Bangladesh government regularly releases reports and publications documenting the progress and impact of e-governance initiatives in various sectors, including agriculture. This might have also created a positive inclination towards digital interventions for farmers. However, about one-third (32.0%) of the respondents had an unfavourable (moderate to high) attitude towards e-governance. This indicates that substantial obstacles must be resolved, such as accessibility, trust, perceived benefits, and usability of e-governance services.

Although there are some unfavourable attitudes, the general perspective is optimistic, with a majority holding a favourable attitude. This can provide a solid basis for advancing and promoting e-governance activities. As previously mentioned, 41 statements were considered for the estimation of the overall attitude score of each respondent. The distribution of the top-ranked attitude statements is shown in Figure 2.

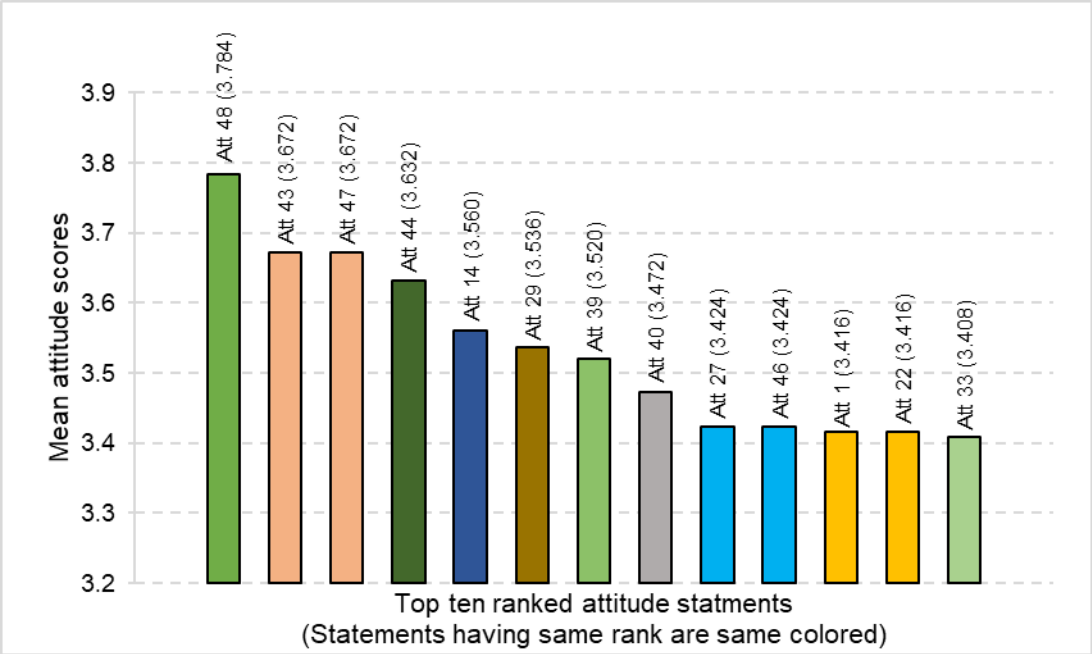

Figure 2: Top-ranked attitude statements

Among the 41 statements used for the estimation of the overall attitude score of each respondent, 'e-governance programs help to disseminate emergency disaster forecasting' ($\bar{x}$ =3.784) ranked top. As vulnerability to different disasters is a common phenomenon in Bangladesh (Hossain, 2020), people's attitude towards forecasting different disasters is very helpful for avoiding their risk. The second-ranked statements were 'most of the farm-e-governance services don't present complete information' ($\bar{x}$ =3.672) and 'the inadequacy of the e-governance leads to discouragement in the future' ($\bar{x}$ =3.672). Both statements are negative and scored reversely of positive statements, indicating that farm-e-governance services provide complete information regarding farming and that adequate information through e-governance services will encourage people to use the service again. The complete information is crucial for agricultural farming as it enables the farm people to make informed decisions, optimize resource use, increase productivity (Eta et al., 2023 and Hammad et al., 2024), and ensure the sustainability of their farming practices (Dhanaraju et al., 2022).

Again, providing adequate information through e-governance services encourages farmers to repeatedly engage with the e-governance platforms due to improved engagement and convenience, cost-efficiency and effectiveness, and transparency (Hoque & Kabir, 2024). The top third-ranked attitude statement was 'e-governance is the best means to collect the latest information regarding weather, production practices, market prices, etc.' ($\bar{x}$ =3.632). E-governance indeed is a leveraging technology to collect and disseminate real-time, accurate, and accessible information on different production technologies as well as metrological information, thus empowering farmers and other stakeholders in the agricultural sector (Arya et al., 2024).

Factors Influencing Farmers' Attitude towards E-Governance

Three steps were followed to determine the influence of different factors on farmers' attitudes towards e-governance: the correlation analysis, the multiple linear regression analysis, and the stepwise multiple regression analysis. According to correlation

analysis, seven out of ten variables are significantly correlated with farmers' attitude towards e-governance, namely, age (r =-0.570), educational qualification (r =0.528), annual income (r =-0.329), training experience (r =0.228), organisational participation (r =0.457), desirability (r =0.301), and knowledge of e-governance (r =0.911).

These seven variables were included in multiple regression analysis (enter method) to determine their influence on farmers' attitudes towards e-governance. All the independent variables explain 88.2% of the variance in farmers' attitude towards e-governance. The adjusted R^2 reveals that 80.4% of the variation in dependent variable is attributable to only the significant independent variables. The observed *t*-value for the regression coefficient was significant for four variables, namely, age (*t* =-3.097**), educational qualification (*t* =3.752***), organisational participation (*t* =2.453*) and knowledge of e-governance (*t* =19.235***). However, to reach an optimum prediction model, these four significant variables were included in the stepwise multiple regression analysis (Table 2).

Table 2: Factors influencing farmers' attitude towards e-governance

Model	Variable entered	B	β	R^2 Change	*t*-value	F statistics
Constant +X_7	Knowledge of e-governance	1.338	0.770	0.830	21.394***	600.318***
Constant+ X_7+X_2	Educational qualification	1.208	0.151	0.039	4.171***	36.547***
Constant+X_7+X_2+X_1	Age	-0.379	-0.116	0.012	-3.098**	12.014**
Constant+X_7+X_2+ X_1+X_5	Organisational participation	1.184	0.084	0.006	2.439*	5.951*

Unstandardized coefficient =B; Standardized coefficient =β; R^2 =0.888; Adjusted R^2 =0.882; F= 132.860***, *P≤0.05; **P≤0.01, and ***P≤0.001

The findings from the stepwise multiple regression analysis suggest that knowledge of e-governance is the most significant predictor of attitudes towards e-governance, contributing 83.0% to the prediction. The coefficient (*β* =0.770) is positive and significant at a 0.1% significance level. This finding aligns with the findings of Naik et al. (2021) and Kaiser et al. (2019). This implies that increasing individuals' understanding and awareness of e-governance can substantially enhance their attitudes. This might be because knowledge empowers farmers to understand their rights and responsibilities when interacting with e-governance systems and contributes to a more positive attitude. It also helps eliminate uncertainties and misunderstandings, enhancing the efficiency and acceptance of e-governance projects.

Educational qualification, although a distant second with a 3.9% contribution, also plays a role, and the coefficient (*β* =0.151) is positive and has a 0.1% significance level, indicating that higher levels of formal education may foster more favourable attitudes. This implies that educational qualifications can positively influence farmers' attitudes towards e-governance. The result agrees with studies by Alant and Bakare (2021), Bontsa et al. (2023), and Panda et al. (2019). Having a higher level of education among farmers could advance and improve attitudes towards certain aspects (Narmada & Jahromi, 2019). In addition, Individuals with higher educational attainment are more

likely to understand and appreciate the benefits and functionalities of e-governance, thereby developing a more positive outlook. They also feel more empowered, trusting, and confident in utilizing e-governance services when they believe education is pertinent.

Age and organisational participation have minimal contributions (1.2% and 0.6%, respectively), suggesting that while these factors influence attitudes, their impact is relatively minor compared to knowledge and education. However, age has a negative coefficient (β =-0.116), which is significant at a 1% significance level. Similar findings were obtained by Tham-Agyekum et al. (2024) and Bontsa et al. (2023). These findings imply that young farmers may have a more favourable attitude towards e-governance services than older farmers. This might be because younger individuals may have higher levels of digital literacy than older generations. They may feel more comfortable using technology and perceive e-governance platforms as more straightforward. The lack of familiarity of the older generations with digital tools can lead to resistance towards e-governance initiatives.

On the other hand, the coefficient (β =0.084) of organisational participation is positive and significant at a 5% significance level. This implies that involvement in organisations positively influences attitudes towards e-governance. The result agrees with the study of Wang et al. (2021). Even though its contribution is relatively small, the significance indicates that individuals actively participating in organisations are more likely to develop favourable attitudes towards e-governance. This may be because increased exposure to structured processes, decision-making, and information dissemination typical in organisational settings can enhance understanding and appreciation of e-governance initiatives.

Conclusions and Recommendations

A significant proportion of farmers held a moderate to highly favourable attitude towards e-governance, the majority expressing the belief that e-governance programs are beneficial in disseminating emergency disaster forecasts and providing comprehensive and sufficient farming information. The key factors influencing farmers' attitudes towards e-governance were knowledge of e-governance, educational qualification, age, and organisational participation.

Specialised training programs that enhance farmers' digital literacy and familiarity with e-governance platforms should be implemented. Extension services should be customized to cater for farmers' varied educational backgrounds and age groups so that the content is easily understandable and applicable. In addition, promoting organisational engagement, such as participation in cooperatives, can promote the exchange of knowledge, which can promote the adoption of e-governance.

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