Employing Electronic Technology in the Organic Supply Chain to Boost Organic Business Growth

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Abstract

This research focused on examining the impact of electronic technology and the roles of different stakeholders within the organic supply chain, aiming to boost the development of organic businesses. Despite the global surge in organic farming, Bangladesh lags in this area, with minimal research on its organic supply chain. To address this gap, the study gathered primary data via self-administered surveys from 389 participants, including industry players, consumers, and transporters in the organic agriculture sector, using stratified random sampling. Techniques like Path Analysis and Structural Equation Modeling (SEM), facilitated by AMOS software, were employed to scrutinize and interpret the data. The study achieved its goals, validating the hypotheses that e-technology and stakeholder dynamics significantly affect the organic business's growth. This research not only provides valuable theoretical insights but also contributes data that can aid future investigations into the organic supply chain, particularly the effects of various factors and e-technology on it.

Keywords: E-technology, organic supply chain, organic agriculture, growth of organic business, SEM, AMOS

1. INTRODUCTION

Agriculture plays a vital role in densely populated countries such as Bangladesh, which ranks eighth in the world population and fifth in Asia. A significant portion of the country's population relies on agriculture for their livelihoods and the economy. However, the conventional agricultural practices in Bangladesh, which heavily rely on chemical fertilizers and pesticides after the Green Revolution, have led to various problems concerning human health and the environment [3]. This has raised concerns about food safety. Additionally, the cost of agriculture has skyrocketed due to declining yield levels and increased dependence on the market for chemical inputs. Therefore, it is crucial to urgently adopt bio-products to ensure a better and safer environment without compromising crop yields. Organic farming, which prioritizes natural processes...
and sustainability over industrial methods and synthetic chemicals, offers a solution. It employs techniques such as crop rotation, composting, and biological pest management to preserve soil fertility and ecosystem health. Technology and communication have played a pivotal role in advancing the organic farming industry globally, particularly in countries like Bangladesh. Organic farming provides numerous benefits for human health and the environment. It has gained immense popularity worldwide due to its positive impact on human health. Organically cultivated produce has lower levels of hazardous residues compared to conventionally grown produce, making it a safer choice for consumers. A meta-analysis published in the British Journal of Nutrition revealed that organic foods have significantly higher antioxidant concentrations, which can help prevent chronic illnesses like cardiovascular diseases and certain types of cancer. Furthermore, organic farming promotes sustainable agriculture. The combination of technology and communication has greatly contributed to the growth of the global organic agricultural industry. The advancement of social media and e-commerce platforms has facilitated direct communication between organic farmers and consumers, leading to a transparent supply chain and providing customers with access to healthier food options. As people in Bangladesh become more aware of environmental and health concerns, the organic farming industry is expanding. Given the country's long-standing agricultural history, organic farming aligns with its goals for sustainable agriculture. According to the Bangladesh Bureau of Statistics, over 1.5 million individuals are employed in the organic agricultural sector, which significantly contributes to employment opportunities in rural areas. Communication and technology have played a significant role in the growth of organic farming in Bangladesh.

1.1 Background Study

Numerous studies have been conducted both domestically and internationally on the topic of food security. In the modern marketing landscape, agricultural products must go through a series of transfers or exchanges between various parties before they ultimately reach the consumer [3]. However, the organic agricultural industry faces several supply chain management challenges. To address these difficulties, electronic technologies, commonly referred to as E-technology, have been increasingly integrated into the supply chain for organic agriculture [1]. Organic farming (OF) is a technology that has gained recognition since the 1960s as a means to mitigate the adverse effects of agrochemicals. Many scientists consider it to be the most favorable form of agriculture. Unlike synthetic fertilizers, organic fertilizers enhance the physical, chemical, and biological properties of soil. Their utilization is crucial for maintaining long-term soil productivity. Moreover, it is imperative in the current context of significant threats to our ecology and environment. Organic farming serves as the optimal approach to ensure that air, water, and soil remain uncontaminated, thereby creating a safe environment for both present and future generations [23]. In terms of securing a sustainable future, organic farming facilitates a dynamic interaction
between soils, plants, humans, ecosystems, and the environment [24].

1.2 Problem Statement

Regarding Bangladesh, the International Trade Centre (ITC) noted that in 2019, the country's organic food market was valued at approximately $5.5 million. This market has been experiencing steady growth over the past few years, with a Compound Annual Growth Rate (CAGR) of around 18%. This growth can be attributed to several factors such as heightened health consciousness, environmental concerns, and government support for organic farming practices.

Furthermore, organic farming in Bangladesh has remained a niche market in recent years. However, over the past decade, organic agriculture has transformed from a niche market into a market force on a global scale. This transformation highlights the fact that organic farming is a viable option for profitable enterprises. Notably, the organic food sector has experienced rapid growth, maintaining a consistent annual growth rate of 10% for more than ten years (FAO, Sustainable Agriculture and Rural Development 2012). The motivations behind farmers choosing organic practices have been extensively studied by researchers [17] and [26]. Additionally, reference [27] provides a comprehensive review of the evidence on the factors that drive organic farmers, with common factors including concerns for family health, husbandry practices (such as soil degradation and animal welfare), lifestyle choices (ideological, philosophical, religious), and financial considerations.

Several studies have shown that farmers’ attitudes are important determinants in their decision making, and willingness and ability to adopt new technologies, including organic farming methods (e.g., [28], [29], [30]). According to [25], attitudes can be assumed to be relatively stable in a length of time, although they may change due to new information received. Reference [15] revealed that, compared to conventional farmers, organic farmers show greater enthusiasm and desire to learn about organic methods. Nevertheless, farmers, customers, intermediaries, and retailers are unable to access the necessary learning materials or information regarding organic farming, health and environmental impact, sources of organic products, and more. Consequently, the stakeholders within the organic supply chain are unable to make informed decisions and transition to organic practices due to the absence of adequate information.

The market for organic products in Bangladesh is experiencing a significantly slower growth rate compared to the overall expansion of the agricultural sector. The lack of a consistent demand and supply pattern for organic products is a major contributing factor. Intermediaries and retailers are unaware of the locations of organic farmers, and consumers have limited knowledge about when and where to purchase organic products. The communication and information flow between customers, farmers, intermediaries, and retailers is poorly established. Furthermore, there are no signs of industrialization in this sector. Only a small fraction of farmers are knowledgeable about the economic and environmental advantages of organic farming in comparison to industrial farming. Similarly, consumer awareness regarding organic agricultural products is still in its early stages. The price of organic vegetables or fruits is very high compared to the vegetables or fruits produced through industrial agriculture due to the very low production of organic vegetables and fruits against the demand [33]. It is clear that despite experiencing a positive growth trajectory, the organic
Agricultural food market in Bangladesh remains relatively small when compared to other countries. The growth of Bangladesh's organic agricultural food industry is hindered by significant obstacles, primarily due to a lack of knowledge and understanding. The prevalent use of chemical fertilizers in traditional farming methods makes it challenging for farmers to transition to organic practices without proper training and support [1]. The scarcity of accessible training programs and data sources further compounds this issue. Additionally, the lack of consumer awareness about the benefits of organic food results in low demand, providing farmers with fewer incentives to adopt organic methods and hindering the industry's growth [16].

Many customers are not fully aware of the benefits of organic products, which leads them to assume that they are more expensive. This lack of understanding about the importance of organic agricultural methods and their potential long-term advantages for human health and the environment is a contributing factor. As a result, consumers are hesitant to pay higher prices for organic goods, which in turn discourages farmers from adopting organic farming practices [2].

In summary, due to the scarcity of information on the development of the organic supply chain and the identification of research gaps, this study anticipates significant potential in adopting technology within the organic supply chain by addressing these identified gaps.

- Current studies on agricultural supply chains primarily concentrate on conventional methods, neglecting the significant role that e-technology plays in the organic supply chain.

After careful observation and thorough review of the literature, it becomes evident that numerous factors are taken into account when examining the organic supply chain and the expansion of organic business. In order to effectively convey the purpose of the research and its objectives, it is imperative to narrow down the study area by formulating research questions. The subsequent research questions have been formulated to concentrate on the research objectives.

- Do the factors of the actors of the organic business influence the organic supply chain?
- What is the impact of using e-technology on the organic supply chain?

1.3 RESEARCH OBJECTIVES

It is crucial to have well-crafted research questions in order to effectively guide a research paper. The study has outlined the following objectives to delve into the research questions:

1. To examine the impact of factors of the actors of organic business on the organic supply chain.
2. To explore the relationship between e-technology and the organic supply chain.

2. LITERATURE REVIEW

Organic farming (OF) is an agricultural system that employs environmentally friendly techniques to control weeds, pests,
and diseases. The principles and practices of organic farming are outlined by the International Federation of Organic Agriculture Movements (IFOAM) and revolve around health, ecology, fairness, and care.

Consumers are frequently regarded as the constraining element in the shift towards organic practices. Research indicates that consumers in the majority of countries possess extensive knowledge about organic agriculture and hold a favourable view of it as the optimal choice for both agriculture and food [32]. However, despite this positive perception, the consumption of organic food remains below 10% even in nations with well-established organic markets.

2.1 Organic Agriculture

Organic production methods involve the use of ingredients that are at least 95% organic and of agricultural origin. It is important to note that products with less than 70% organic content cannot be labeled as organic [31]. To ensure consumer awareness, all countries have implemented specific logos to indicate that products are produced using organic methods. Presently, over 120 countries globally engage in certified organic farming. Recent data shows that more than 31 million hectares of land are organically farmed by around 623,174 farms. Organic agriculture is not only beneficial for resource and nature conservation but also adheres to a sustainable farming system. It is based on traditional farming knowledge, fueled by consumer beliefs in the principle of "nature knows best," and steered by a cautious approach. Consequently, there is often a hesitancy within organic farming towards adopting new technologies.

Nowadays, there is an increasing demand for organic agricultural goods [1]. When compared to conventionally farmed crops, organic crops generally have a higher nutritional value. Organic fruits and vegetables are often richer in antioxidants, vitamins, and minerals, which are essential for a strong immune system and the prevention of chronic diseases [18]. By purchasing organic agricultural goods, customers can reduce their exposure to harmful compounds and promote a healthier lifestyle [5]. Organic agriculture also benefits the environment. Conventional farming often relies on artificial pesticides and fertilizers, which can have detrimental effects on ecosystems. These substances can contaminate water sources and harm aquatic life as they seep into rivers, lakes, and groundwater [19]. Moreover, pesticide residues can persist in the soil for extended periods, disrupting the natural balance of microorganisms and reducing soil fertility [3]. Organic farming emphasizes natural pest management techniques such as crop rotation, beneficial insects, and physical barriers. Additionally, organic farmers prioritize soil conservation practices like using cover crops and organic matter to prevent soil erosion and maintain soil health [16].

The transition to organic agriculture is often hindered by consumers, who are seen as the main obstacle. However, it is actually agricultural production that poses the biggest challenge in bringing organic farming into the mainstream. Technical issues result in high expenses, inadequate market supply, and farmers' reluctance to take on the increased risks and labor demands. By investing in research for organic farming, there is a promising opportunity for a significant return, especially when compared to conventional farming. The value of organic research remains high, making it a worthwhile
investment. Unfortunately, funding for research in organic agriculture is insufficient in many parts of the world. To effectively address the issues faced by organic farmers, it is crucial to establish a critical mass of research teams dedicated to this field.

2.2 Factors Encouraging the Development of Organic Agriculture

The expansion of the organic agriculture sector is largely due to the widespread adoption of organic farming practices, the achievements of organic businesses, and the growing consumer base for organic products. Globally, organic farming has seen significant advancement, as evidenced by various trustworthy sources. Notably, studies show that from 2000 to 2017, the amount of organic agricultural land globally increased by over 127%, marking a considerable rise in the application of organic farming methods. While Bangladesh is experiencing growth in organic farming, the pace is more modest compared to the global trend. The Bangladesh Organic Products Manufacturers Association (BOPMA) reports that the country's organic farmland increased by more than 40% from 2010 to 2020. Though this progression is encouraging, it's important to recognize that the rate of growth in Bangladesh remains below the global average, which can be attributed to a range of unique challenges within the country.

From 2000 to 2017, the organic market globally saw an average yearly growth rate of 6.1%, as noted by the Research Institute of Organic Agriculture (FiBL) and IFOAM Organics International. In contrast, Bangladesh's organic sector has expanded at a comparatively slower pace, with recent studies suggesting an annual growth rate of about 2 to 3 percent for its organic agriculture. This growth rate is modest compared to the global average, indicating that the organic sector in Bangladesh has not achieved the same extent of growth and acceptance found in other parts of the world.

This disparity in growth rates can be attributed to several factors. Firstly, a significant portion of the Bangladeshi population remains unaware of the benefits of organic farming, as highlighted in a study by [21]. This lack of knowledge among consumers and farmers contributes to a smaller market for organic products, thereby impeding industry expansion. Secondly, challenges such as limited technical expertise and training, restricted access to organic inputs, and concerns about the initial costs associated with transitioning to organic farming can be held responsible for the relatively low adoption of organic practices among Bangladeshi farmers [22].

The growth of organic agriculture is influenced by various factors, and the decisions and active involvement of major players in the supply chain are particularly important. This section discusses the elements that contribute to the expansion of organic agriculture, highlighting the roles of participation, advantages, decision-making in agriculture and business, the mechanics of demand and supply, understanding of health and environmental benefits, transport, and the proficiency of the participants. The participants encompass everyone from suppliers, cultivators, go-betweens, shop owners, bulk distributors, to end-users, both on a global scale and particularly in Bangladesh. The engagement of key participants in the organic supply chain, including growers, intermediaries, retailers, bulk sellers, and buyers, is vital to the growth of the organic farming sector.

Numerous factors can sway an individual's choice to take part in organic farming or associated economic ventures. Influential
factors encompass economic factors, consumer demand, ecological consciousness, and policy support. In developed countries, the transition to organic agriculture is frequently encouraged by policy frameworks that offer financial incentives and benefits to organic cultivators. Moreover, the readiness of farmers to embrace eco-friendly methods and broaden their income streams is also influential in their decision-making strategies.

2.3 Market of Organic Agricultural Products

Australia, Argentina, and the United States possess the largest organic land area among all countries. Currently, organic agricultural land accounts for 0.9 percent of the total global agricultural land. The region experiencing the highest growth in organic farming is Europe, with an increase of nearly one million hectares. Argentina, Turkey, and Spain are the countries that have witnessed the greatest expansion in organic land [10]. Figure 1 illustrates the distribution of organic land worldwide. For example, the global coffee market was valued at more than USD 102.15 billion in 2020, highlighting the significant demand for this popular beverage across the globe [1]. The majority of this organic land is dedicated to cereal production, particularly rice, followed by green fodder from arable land and vegetables. Stable crops, comprising approximately six percent (2.4 million hectares) of the organic agricultural land, play a crucial role. Coffee takes the lead among these crops, followed by olives, cocoa, nuts, and grapes [10].
2.4 Impact of Organic Farming

Compared to conventional agricultural products, organic agricultural products offer numerous advantages. Opting for organic food is a significant step towards a brighter future for both individuals and the environment. This is due to sustainable farming practices, reduced chemical exposure, increased nutritional value, and support for ecosystems. By embracing organic agricultural products, we can witness remarkable changes [19]. One of the key distinctions between conventional and organic agriculture lies in farming practices. Organic farmers employ techniques such as crop rotation, cover crops, and composting to enhance soil fertility and structure [18]. Moreover, organic farming methods strictly regulate or prohibit the use of potentially harmful substances, thereby minimizing consumers' exposure to such chemicals [1]. By purchasing organic products, individuals can safeguard their health and that of their families by reducing their intake of these hazardous substances [3]. Research indicates that organically grown vegetables, grains, and fruits are richer in essential vitamins, minerals, amino acids, antioxidants, and phytochemicals [16]. By opting for organic items, people can maximize their nutrient intake and enhance their overall well-being [11].

2.5 Role of E-Technology in the Organic Supply Chain

The incorporation of electronic technology (e-technology) into the organic supply chain has completely transformed the handling, distribution, and promotion of agricultural goods on an international scale. E-technology encompasses a range of digital tools, platforms, and systems that enhance communication, information flow, and overall efficiency within the organic agricultural supply chain. In the modern organic agriculture industry, access to information is vital for effective decision-making. E-technology enables real-time access to various sources of information, such as market trends, customer preferences, climatic data, and best agricultural practices. Farmers, suppliers, and distributors can utilize these sources to make well-informed choices. Moreover, e-technology provides multiple communication channels, including email, online discussion boards, social media, and video conferencing, facilitating seamless collaboration among stakeholders. The advent of e-technology has revolutionized the gathering and sharing of information. According to a 2020 research conducted by McKinsey & Company, the digitalization of agricultural operations has significantly increased information exchange, resulting in a notable 20–30% boost in productivity across global agricultural supply chains.

Numerous countries have made notable advancements in incorporating e-technology into their organic agriculture supply chains. The Netherlands stands out as a country that has heavily invested in e-technology infrastructure, facilitating data analytics, automated monitoring, and precision farming. Through government initiatives and collaboration with the private sector, the Netherlands has emerged as a leader in utilizing e-technology within the agricultural sector (European Commission, 2021). According to the United States Department of Agriculture (2019), the adoption of e-technology in the organic agricultural industry has resulted in a 50% reduction in supply chain costs and a 30% decrease in inventories. Consequently, American organic agricultural products have gained a competitive edge in the global market. However, Bangladesh has not witnessed a similar level of progress in integrating e-technology into its organic agriculture.
supply chain. This disparity can be attributed to various factors, with digital inequality being a significant contributor. As of 2019, the World Bank reports that only 21.8% of Bangladesh's population has internet access. The limited internet penetration within the agricultural industry hampers the widespread adoption of e-technology by farmers and other stakeholders. To fully harness the potential of e-technology and enhance the competitiveness of its organic agricultural products on the international stage, Bangladesh must address these challenges (World Bank, 2021).

Furthermore, Information and Communication Technology in Agriculture (ICT in agriculture), often referred to as e-agriculture, is dedicated to enhancing agricultural and rural development by improving information and communication processes. E-agriculture specifically entails the creation, design, development, evaluation, and implementation of innovative methods for using information and communication technologies (ICTs) in rural settings, primarily targeting the agricultural sector. ICT encompasses a range of elements including devices, mobiles, networks, services, and applications.

![Figure 3: Organic Information Flow](image)

Valuable resources for grasping the practical application of e-agriculture encompass the World Bank's e-sourcebook "ICT in Agriculture – Connecting Smallholder Farmers to Knowledge, Networks, and Institutions," released in 2011. Furthermore, publications such as "ICT Uses for Inclusive Value Chains" and "Success Stories on Information and Communication Technologies for Agriculture and Rural Development" have documented a variety of cases where ICT has been utilized in agriculture.

ICTs have the capability to collect and distribute accurate and timely information on various aspects such as weather, inputs, markets, and prices. This information can be utilized in research and development initiatives, as well as shared with farmers to enhance their knowledge. Additionally, ICTs facilitate the connection between producers and consumers through various means [16]. In numerous instances, ICTs are not only involved in the flow of information but also in the actual farming processes and food processing. This can range from analyzing soil conditions on the farm to utilizing 3D printers for food processing [18]. ICTs can play a vital role in bridging the information and knowledge gap that exists in the agricultural sector. Transaction costs are a contributing factor to the absence or inefficiency of markets. Smallholders face challenges in accessing markets due to high transportation costs and their inability to consistently deliver high-quality produce in large volumes [18]. However, ICTs have the potential to reduce these costs. For instance, in India, the e-Choupal trading platform connects buyers with farmers through Internet kiosks, thereby reducing transaction costs. Moreover, eChoupal provides farmers with additional resources through its ICT-kiosk platform, offering knowledge sharing to boost productivity and price benchmarking to help elevate their selling prices. E-technology is also instrumental in setting the prices that consumers pay for agricultural goods [33].

In the context of developing countries, about 70 percent of the people in the lowest
income quintile have access to a mobile phone. The number of individuals using the internet has seen a dramatic increase, tripling over ten years from 1 billion in 2005 to an estimated 3.2 billion by the end of 2015 [20].

2.6 Research Hypotheses

Studying literature and considering theories the following hypotheses were adopted.

H1 There is a significant relationship between the factors of the actors and the organic supply chain.

H2 E-Technology significantly influences the performance of the organic supply chain.

3. METHODOLOGY

The objective of this research study is to examine how various factors related to actors and e-technology impact the supply chain of organic agricultural products. The research methodology employed both secondary and primary quantitative data. The primary data consisted of survey responses from key stakeholders involved in the organic supply chain, including farmers, intermediaries, retailers, and consumers. A comprehensive survey instrument was developed to collect data on e-technology adoption, factors influencing the supply chain, information availability, farming and consumption trends, and supply chain changes. The surveys were conducted through face-to-face interviews using printed questionnaires in English and Bangla languages, as well as online surveys using Google Forms. The collected survey data were stored in an SPSS database and analyzed using SPSS and AMOS software. Representative participation was ensured through stratified sampling techniques. Descriptive statistics and inferential techniques such as chi-square testing, path analysis, and structural equation modeling were utilized to statistically evaluate the impact of the factors and the role of e-technology.

3.1 Target Population and Population Size

The target population of this study includes a wide range of participants in the organic agricultural supply chain. The study focused particularly on the following significant groups:

- Farmers
- Intermediaries
- Retailers
- Consumers

The researcher conducted a comprehensive study by examining various sources such as journals, books, articles, and the country's statistical data in order to gather secondary data. Based on this secondary data, it was found that there are approximately 16.5 million farmers in the country. Out of these, only 2.2% (around 363 thousand) are fully or partially involved in organic farming. Additionally, there are around 204 thousand intermediaries operating in the agricultural products business, with approximately 43 thousand (around 21%) of them being engaged in organic business. In the country, agricultural products are sold by both seasonal and full-time retailers. There are approximately 700 thousand retailers of all types of agricultural products, and 12% of them (around 84 thousand) sell organic products alongside traditional agricultural products. Furthermore, there are approximately 42.3 million households in the country, all of which consume agricultural products. However, only around
2% (846 thousand) of these households are organic consumers in addition to consuming traditional agricultural products. Consequently, the total targeted population for this study was approximately 1.336 million (363 + 43 + 84 + 846 thousand), and the data was collected from various locations across the country.

3.2 Data Collection Method

In this research, both primary and secondary data sources were utilized to analyze and respond to the research questions. Primary data was gathered through both hard copy and online self-administered questionnaires. For secondary data, a range of sources such as national statistical reports, academic journals, articles, books, and conference proceedings were employed.

3.4 Sample Size

Selecting the appropriate sample size is a critical aspect of this research. The study employed a probabilistic, stratified sampling method. Four distinct groups were identified to represent the primary stakeholders effectively: farmers, intermediaries, retailers, and consumers.

To determine the total sample size, the researcher used a 95% confidence level with the corresponding Z-value of 1.96, assumed the standard deviation as 0.5 due to the unknown variability in the proportion, and set the margin of error at 5% (0.05); thus, calculating the required sample size. 

\[ n_0 = \frac{(1.96)^2(0.5)(1-0.5)}{(0.05)^2} = 384.16 \approx 385. \]

The population of the four strata Farmers, intermediaries, retailers, and consumers are 363,000; 43,000; 84,000; and 846,000 thousands respectively.

Therefore, sample size for farmer, intermediaries, retailers, and consumers were determined 105, 13, 24, and 243 samples respectively.

But, a total of 389 responses were collected from the four strata with 102, 21, 25, and 241 samples respectively.

4. Analysis and Findings

The initial analysis of the information generated by SPSS Version 23.0 will be explained in detail. This includes the analysis of data editing and coding, data screening for missing data, normalcy, assessment of outliers, as well as common method bias. Additionally, frequency analysis will be conducted to examine demographic profiles and respondents' knowledge of the environment.

Descriptive analysis and reliability testing, specifically Cronbach's alpha, have also been carried out. The Structural Equation Modeling (SEM) analysis was performed using AMOS GRAPHICS. The analysis incorporates the examination of collinearity assessment and part coefficient analysis.

The data collection procedures were conducted using questionnaires over a period of eight months. A total of 525 questionnaires were sent out during this time. Out of these, only 389 were genuine copies, and 437 of those copies were returned. Therefore, a total of 389 data points can be used for further research. The figures indicate that 78% of respondents provided responses.

4.1 Demographic and Business Factors of the Respondents

Table 4.2 displays the demographic characteristics of the participants, encompassing seven categories: type of stakeholder, gender, level of education, age,
marital status, residential area, and preferred production system. Of the 389 individuals surveyed, 41.3% are consumers, 21.56% are farmers, 11.56% are retailers or shopkeepers, with intermediaries making up the rest.

In terms of gender distribution, 52.60% of participants are male, while 47.4% are female.

Looking at their living areas, the majority reside in upazela towns, accounting for 30.64%, with 23.7% from large cities, 20.23% from rural areas, 13.29% from cities, and the remainder, 12.14%, from district towns.

Age-wise, the largest group of respondents (45.09%) falls within the 40 to 60 years bracket. The next significant age group is 25 to 40 years, making up 41.04% of respondents, followed by those aged 18 to 25 years at 9.25%, and finally, participants over 60 years old constitute 4.62%.

### 4.2 Technology Adaptation

Out of 389 participants, 63.02% prefer to receive information and communicate through electronic technology. This is followed by 21.79% who favor direct, face-to-face interactions, 11.88% who rely on electronic media, with the remainder choosing print media.

Figure 4 illustrates the mediums preferred for information and communication. In terms of adopting electronic tools, a prominent 89.1% of the respondents utilize mobile phones, 56.4% access the internet, 40.6% operate computers, 18.5% visit information centers, and 4.9% use various other methods.

A large majority of participants (86.4%) are keen on receiving information and communicating via social media platforms, 55.56% through websites, 54.43% by phone calls, 43.38% via text messaging (SMS), 33.33% through YouTube, 17.28% by email, with 7.4% utilizing other methods.

### 4.3 Reliability Test

This research employed internal consistency measures to evaluate the reliability of the instrument used. Generally, a scale is considered reliable if its Cronbach's alpha exceeds the threshold of 0.7, as suggested by Nunnally in 2017. Hair et al., 2018 indicated that a Cronbach's alpha above 0.6 is acceptable for early-stage research and scale development. The Cronbach’s alpha in this study was found to be 0.852.

### 4.4 Hypothesis Testing

Hypothesis H1 is tested by Structural Equation Modeling (SEM) analysis using AMOS 23. Figure 8 showing exogenous variables of factors of the actors influencing the Organic Supply Chain.

Results: Maximum Likelihood Estimates.

Chi-square = 256.970 Degrees of freedom = 35, Probability level = .000
The findings demonstrate significant regression weights, suggesting a strong correlation between the dynamics of the stakeholders and the organic supply chain. A large proportion of the variance is accounted for by the high Squared Multiple Correlation for the organic supply chain (OSC), which is 0.629. This underscores the substantial influence that the dynamics of the actors have on the supply chain of organic agricultural goods.

The fit indices present a CMIN/DF ratio of 7.342, falling within an acceptable range, which implies a fairly accurate model fit. The Root Mean Square Error of Approximation (RMSEA) stands at 0.070, indicating a reasonable fit, albeit slightly above the preferred threshold. The Goodness of Fit Index (GFI) is at 0.961 and the Comparative Fit Index (CFI) at 0.957, both of which further affirm the model's suitability.

Hypothesis H2 Testing: Hypothesis H2 was also evaluated using Structural Equation Modeling (SEM) analysis via AMOS23. Figure 9 depicts the relationship between E-Technology and the Organic Supply Chain. The result is derived from Generalized Least Squares Estimates, with a Chi-square value of 29.403, 9 degrees of freedom, and a probability level of .000.
sites nationwide and subsequently examined using AMOS sequential equation modeling. The findings verified both of the proposed hypotheses, thus academically confirming a positive link between the stakeholder dynamics and the organic supply chain. Moreover, the study found that e-technology plays a role in enhancing the supply chain's performance. The results underscore the considerable influence of stakeholder interactions and e-technology on the supply chain’s functionality, with farmer engagement, synergistic partnerships between wholesalers and producers, marketing initiatives by traders, and customer support and demand for organic items all boosting the efficiency of the organic supply chain.

6. Conclusion
The study effectively addressed its research questions and achieved its set goals by confirming its hypotheses. It highlighted numerous implications for stakeholders, underlining the importance of actor factors and information as key drivers in the organic agriculture supply chain. The research also acknowledged certain limitations and concluded by proposing directions for future studies. These suggestions aim to deepen the understanding of how the dynamics of actors and information influence the organic supply chain, thereby promoting the growth of organic businesses. A significant challenge encountered in this research was the scarcity of comprehensive, up-to-date, and reliable data on the effects of these dynamics and information on the supply chain, particularly concerning the use of electronic technology and its performance metrics in the context of organic agricultural products. Furthermore, the data may lack consistency and homogeneity across various sources, thereby compromising the validity of the analysis. Additionally, the estimated sample size of intermediaries and retailers is relatively smaller compared to that of farmers and consumers.

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