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Digitalization on Agricultural Business in Bangladesh

SEINÄJOKI UNIVERSITY OF APPLIED SCIENCES

Thesis abstract

Degree Programme: Bachelor of Business Administration

Specialisation: International Business

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Title of thesis: Digitalization on Business in Agriculture Bangladesh

Supervisor: Okuogume Harrison

Year: 2023	Number of pages: 83	Number of appendices: 2

The objective of this thesis is to explore the digitalization of agricultural businesses in Bangladesh and identify the potential impact of digitalization on the agricultural sector. The research methodology used in this study is a mixed-methods approach, comprising both quantitative and qualitative data collection methods.

The theoretical framework of this study is based on the digitalization of agricultural business, and the literature review provides an overview of the various digitalization tools used in agriculture, their applications, and the current scenario of digitalization in the agricultural sector in Bangladesh. It provides an analysis and discussion of the e-platform as well as various challenges and opportunities related to digitalization in agriculture.

The empirical analysis and data collection method involves a survey of agribusiness firms in Bangladesh, including BRAC Seed and Agro Enterprise related to digitalization adoption, utilization of digitalization tools, and the impact of digitalization on agribusiness performance. The SWOT analysis of digitalization in agriculture is also conducted to identify the strengths, weaknesses, opportunities, and threats associated with agribusiness.

The study concludes with an analysis of the research question and provides recommendations for future studies to improve the efficiency and effectiveness of agribusiness operations as well as recommends policymakers, government organizations, and private sector players to work together to promote digitalization in agriculture.

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Terms and Abbreviations

AEZs: Agro-Ecological Zones

AIS: Agriculture Information Service

BARI: Bangladesh Agricultural Research Institute

DAF: Digital Agriculture Foundation

DSSAT: Decision Support System in AGRO Technology Transfer

GDP: Gross Domestic Product

GNI: Gross National Income

HAI: Human Assets Index

ICT: Information and Communication Technology

IMF: International Monetary Fund

ITC: International Trade Centre

NGO: Non-Governmental Organization

SMS: Short Message Service

1 INTRODUCTION

Bangladesh is primarily an agricultural nation, and both formally and informally, a sizable section of the populace relies on this industry. In addition to reported unemployment, covert unemployment causes serious issues for the nation. Food is becoming scarcer in the global community, and agribusiness prospects are progressively improving. Agribusiness is described as any commercial activity involving agricultural goods that adds value, fosters production process synergy, imports and exports agricultural products, and redistributes items from wholesalers to retailers and eventually to consumers. In order to build core competencies, appropriate supply chain management, vertical and horizontal coordination, and organizational strategy of agribusiness are thus necessary.

Agribusiness encompasses seed production and capacity and knowledge, drying paddy, dairy, commercial fishing, poultry, vegetables, mushroom cultivation, fruits, jute, cattle, teas, gingers, potatoes, oilseeds, pulses, sugarcane, and other products that are lawfully transferred to the consumers. According to Beierlein and Woolverton (1991), the concept of agribusiness helps to understand how the following three sectors such as agricultural inputs, production, as well as processing and manufacturing interconnected parts of a system are where each component's performance is highly dependent on the efficiency of the other two. However, Kohls and Uhl (2002) showed that markets bring together different parts of the food business, agricultural sector, farm supply sector, food market structure, and regional economies. Agribusiness is a term that is frequently used to describe farm markets and input supplies. It is necessary to manufacture items for the agriculture industry that are based on consumer demand. This agricultural enterprise may help close the trade deficit, contribute to the national economy, and promote economic growth.

If Bangladesh can seize the chance and get over the obstacles, agribusiness there may have a brighter future. It is possible to manage natural resources well, particularly in the agricultural sector. The demand for agriculture has become increasingly important due to ecological imbalances and global warming. Orr (1993) opined that the issue of global warming has been considerably exacerbated by historical increases in agricultural output. Actually, Bangladesh has been dealing with the issue of global warming, which might be dangerous for agriculture. For the development of agricultural goods as a whole, issues with salinity, coastal areas, flooding, water logging, river erosion, water resource surface runoff, drought, etc. are posing challenges. Along with this, population growth has been rapid. As a result, effective

methodologies, innovations, adaptability, automation, and legislative framework and policy execution are needed for Bangladesh's agribusiness management.

The three fundamental components of a business are a legal entity, social responsibility, and profit maximization. As a result, business, particularly agriculture, has become more significant in the twenty-first century. Yunus (2009), In the US, industrial-style agriculture has proven quite successful in increasing crop yields. But it cannot be sustained over the long term. According to Yunus, social business is actually ingrained in the conventional system; otherwise, businesses that don't meet the aforementioned three essential criteria would never be able to continue operating in the interests of human welfare in society. Profit, though, shouldn't be too normal; instead, it should be typical. Normal profit-making will enable the company to develop distinctive competencies and long-term sustainability.

Sabur and Rahman (2004) stated that the markets for poultry inputs like chicks, feed, and medications are oligopolistic in character, where prices are set individually taking into account other people's likely reactions. By integrating multiple aspects of productivity, experimentation, creativity, risk-taking, performance, effectiveness, and synergy, agribusiness demands, and markets entrepreneurship activity. It is necessary to separate agricultural products as part of the agribusiness process. Following the initial decade of the twenty-first century ended the relevance of agribusiness increased due to the global warming issue. Bangladesh is now attempting to manage the effects of climate change, but this won't be possible without international and regional collaboration.

1.1 Research Background

Dinar et al. (1989) found that technology development and dissemination are influenced by climate and that climatic influences on productivity in India are influenced by technology development and diffusion. Climate and technological diffusion have an impact on agricultural net revenue in India.

Khan and Hossain (1989) explained that land is grown in very tiny businesses owing to heavy population pressure and a lack of chances for jobs outside of agriculture.

Sekhar (2004) commented that because the agriculture industry is so heavily reliant on the whims of nature, agricultural prices are more volatile than those for manufactured commodities.

According to Meenakshi and Poleman (1994), the spectacular rates of agricultural development combined with excellent infrastructure facilities are the only factors that have allowed for an increase in employment, a decrease in seasonality, and a segmentation into rural non-agricultural jobs.

Erickson et al. (2002), a sustainable agri-business manager must understand what the company did (or did not do) that affected the bottom line in order to improve it going forward.

Vylder (2002) showed that Bangladesh experienced a variety of interrelated distortions and limitations that are caused by the country's economic, political, and social order and the corresponding policy choices.

Ali et al., (2011) observed that the livestock sector in Bangladesh, which consists of cows, buffalo, goats, and sheep, expanded at a very slow rate, but the poultry sector, which consists of fowl and duck, increased at a noticeable rate, albeit this is still insufficient to fulfill their need.

Drummond and Goodwin (2004) showed, how many of these tasks are carried out by highly developed corporate organizations that focus on accomplishing certain tasks or on the marketing of goods in the modern American agriculture system. Agribusiness is the term used to refer to all these specialized businesses. A particular area of agricultural production that examines the economics of Galbraith's corporate sector is the study of the administration, marketing, finance, and marketing choices made by agribusinesses.

Rahman et al. (2004) contended that the components that contribute to an increase in Boro rice output are the extension office, human labor, seed, fertilizer, age, and experience. Bullock power and area have a favorable impact on Australia's output. Like this, bullock power, area, and extension service all increase Aman production. It is observed that distributors in Bangladesh's shrimp industry get the same criticism levied at middlemen in other sectors across the world when the worth of the services supplied by intermediaries is not easily evident to everyone else in the supply chain. Junaid and Mohammed (2005) opined that proper

management of the various agricultural marketing activities will encourage vendors to increase prices outside of peak seasons. Ahmed (2008) proposed that the nation would need to get accustomed to communal life if it were to save the arable land. He also suggested that, for the time being, when it's not possible to build multi-story buildings in rural regions, we could instead choose to build two-story mud homes using indigenous methods. This would help conserve a significant amount of land.

Quasem (2008), crop productivity of land is low, due to the slow adoption of innovative technology, particularly in non-rice crops. The strategy should be carefully executed in order to prioritize comparative benefit and scale advantages in the production of certain agricultural goods in order to succeed in the highly competitive business climate. In the agricultural industry, speculative motivation is still effective. As a result, farmers can miss out on receiving their fair share for their significant contribution to production. Mellor (2008) commented that as food costs fall, the real cost of labor tends to go down, increasing employment, and when food prices go up, the opposite is true. As a result, reduced food prices help the poor directly by lowering their living expenses or indirectly by creating more jobs, whereas higher food costs hurt them.

Ali and Nupur (2009) suggested using resources such as uncomplicated field instruction, media programs, brochures, mobile phones, online websites, and extensive campaigns to increase awareness of organic farming among farmers and consumers to order to increase the volume and accuracy of information.

Mollah et al. (2019), insufficient cold storage facilities and the present-day lackluster marketing assistance have long barred access for farmers of perishable goods, such as fruits and vegetables.

Lokman and Majumder (2011) argued that although there are numerous disagreements over the extent of the effects of climate change, Bangladesh is extremely sensitive to climate-induced hazards.

Objectives of Study

The objectives of the thesis are the following:

- To investigate the current state of digitalization in the agricultural sector of Bangladesh and identify the factors that are driving or hindering its adoption.

- To assess the impact of digitalization on agricultural productivity, income, and sustainability in Bangladesh and compare the performance of digital and non-digital farmers.

- To explore the potential of emerging digital technologies (e.g., precision agriculture, blockchain, AI, IoT) to transform the value chain of agricultural products in Bangladesh and create new business opportunities for farmers and entrepreneurs.

- To examine the challenges and opportunities of integrating digitalization into the policy and regulatory framework of agricultural development in Bangladesh and propose recommendations for a more effective and inclusive digital transformation.

- To investigate the role of digital platforms (e.g., e-commerce, social media, mobile apps) in connecting farmers with buyers, investors, and other stakeholders in the agricultural ecosystem of Bangladesh and assess their impact on market efficiency, transparency, and inclusivity.

- To develop a framework for measuring the digital readiness and maturity of the agricultural sector in Bangladesh and use it to benchmark the performance of different regions, crops, and types of farmers in terms of their adoption and use of digital technologies.

1.2   Research Problems and Questions

Digitalization has revolutionized the way business is conducted around the world, and the agricultural industry in Bangladesh is no exception. As the sector continues to expand, it is important to understand the impact of digital technologies on agricultural businesses and the challenges they face in adopting and utilizing these technologies.

The research problem for this thesis is to investigate the role of digitalization in agricultural businesses in Bangladesh and the challenges that hinder their adoption and utilization. While there has been a growing interest in the use of digital technologies in the agricultural sector, there is still a lack of understanding about the extent to which digitalization has been

implemented, and the factors that influence its adoption and use by agricultural businesses in Bangladesh. Moreover, the potential benefits of digitalization, such as increased productivity, efficiency, and profitability, have yet to be fully realized in the country's agricultural industry.

To address this research problem, the following questions will guide this study:

- What is the current state of digitalization in agricultural businesses in Bangladesh?

- What are the key factors that influence the adoption and use of digital technologies in the agricultural sector in Bangladesh?

- What are the benefits and challenges associated with digitalization in agricultural businesses in Bangladesh?

- How can agricultural businesses in Bangladesh overcome the challenges of adopting and utilizing digital technologies to maximize their benefits?

- What are the policy implications of digitalization in the agricultural sector in Bangladesh?

By answering these research questions, this thesis aims to provide a comprehensive understanding of the role of digitalization in the agricultural sector in Bangladesh and the challenges and opportunities it presents. The findings of this study can help policymakers, agricultural businesses, and other stakeholders to make informed decisions about the adoption and use of digital technologies in the sector, and ultimately contribute to the development of a more productive, efficient, and sustainable agricultural industry in Bangladesh.

1.3 Definition and Limitations

The definition of agribusiness should be used in a broader aspect as defined by Kohls and Uhl (2002). It is necessary to transform agriculture from a subsistence-level industry to one with a commercial focus in order to provide a surplus for the manufacturing industry and exports. The industrial sector, on the other hand, may effectively assist the agricultural sector. According to the Japanese agricultural production system, the agricultural industry has to be mechanized. The agriculture industry needs to create strategic leadership. Together with changing the nation's eating habits, it's important to keep population growth under greater control. Moreover, those who are unemployed in the agricultural sector but are hiding it will

find work in the industrial sector. Anything other than farming should take precedence. Agribusiness requires strategic leadership, as well as the design and execution of strategies.

Bangladesh is likewise in a highly peculiar predicament as a result of climate change. There is no other option than to use the right tactics to deal with these issues. Regrettably, adequate relationships between producers, retailers, and wholesalers have still not been established throughout the nation. This is a challenge when exporting goods to other markets.

As it will uphold the three pillars of business, namely legality, social responsibility, and profit maximization, agriculture should operate as a social enterprise. This profit, however, ought to be average but not excessive. It would be beneficial to the company process to acquire distinctive competencies and long-term sustainability. Yunnus (2009) commented that long-run sustainability is important. The role of middlemen in the business should be reduced so that both producers and consumers can gain. Hossain's and Bayes' (2009) examination should be seriously considered by the policymakers so that agribusiness can be developed and create employment opportunities. Because of this, finance for agriculture must be organized from the public and private sectors, but it should come from the official sector. Using agribusiness effectively is the only way to ensure that it can work to support national economic growth. Because cultivable land is scarce and the country's population is expanding quickly, natural resources in the agricultural sector should be utilized wisely.

In the process of GDP accounting, women who are directly or indirectly involved in the agriculture sector's production should be taken into consideration. It is advisable to avoid draining a crop, especially from the phases of production through commercialization. Agriculture shouldn't be disregarded because it will be a global industry and may demonstrate that the terms of trade for agricultural products are expected to increase over the next ten years. Deb and Zaman (2007) commented that the amount of food produced has increased, but we need to exercise greater caution to lessen our reliance on foreign firms for seeds, insecticides, fertilizers, and other agricultural supplies. We need to export completed goods more eagerly in the jute sector.

Finance is necessary for agriculture. To address the credit demands of marginal and small-scale agricultural producers, distressed women, landless workers, etc., a new system may be implemented since planned bank loan programs are expensive, anti-rural prejudiced, and unwillingness of the financial institutions to operate in rural regions. Rural bank branches may

set up unique cells for the diffusion of information and technology to properly promote agriculture. As a result, there will be a larger chance of small-scale initiatives creating jobs. Small and medium-sized businesses with an agricultural focus should be given priority in their growth. A syndicate of financial institutions, participatory commercial banks, cooperatives, and different NGOs may be formed to construct rural branches and their subsidiary institutions in each community throughout the nation. There shouldn't be any hidden fees or interest rates, only a lesser rate of charge for the principal.

Continuous development and research should receive more attention so that industrial agriculture can be managed effectively, starting with the production companies of agricultural products who will then be incentivized to produce not only for the domestic market but also for the global market as well as other facilities. It is important to set up transportation infrastructure both domestically and abroad. For a cooperative business climate, strategic relationships should be formed with overseas agriculture firms. Agricultural operations should consider rivals' behavior, the environment, and long-term sustainability. Yet, this country's agricultural marketing techniques still need to be enhanced.

It is necessary to improve public-private partnerships to create various agricultural inputs, such as seeds, fertilizer, and agro-machinery, as well as to improve the environment for agricultural businesses. Agricultural and rural development are also emphasized as essential areas for reducing poverty and promoting economic growth that benefits the poor in the strategy for poverty reduction. However, the commoditization of the agricultural industry and the creation of long-term income for those who rely on the agricultural sector for employment opportunities should be given more priority in the country's plan, along with a strong commitment to putting the plan into action.

Agricultural reform is necessary to boost agricultural production, support agribusiness, and lessen Bangladesh's enormous deficit in the international market. With the trend of global warming, environmental protection in the agricultural industry must adapt. The production of agricultural products needed for the international market should be prioritized together with the diversification of exportable commodities. The government and the business sector should simultaneously look for new exportable markets. Bangladesh importing agricultural goods between Bangladesh and those who do not live in that country can serve as a center for the import of agricultural goods between Bangladesh to the country where they are citizens. Dinar et al. (1989) as found that climate has an impact on the spread of technology in

India, which also applies to Bangladesh. Bangladesh should thus place greater attention on the spread and development of technology that considers climate change.

More emphasis should be given to developing managerial skills as well as improving marketing skills in Bangladesh. In this regard, Erickson et al. (2002) and Junaid (2004) commented should be considered by the policymakers. In order to promote innovation, creativity, and preparation for the difficulties of agriculture, managers need proper training. The agriculture industry cannot be turned into commercialization and farmers will not receive their fair share of profits without good strategy design and implementation.

Vylder (2002) commented is still applicable in Bangladesh. A comprehensive strategy is required to be supported by a strong political will and effective plan implementation. The government and private efforts can create job possibilities for excess employees in the agricultural industry in non-farm activities. A good training program should be provided for agricultural scientists assigned at each village level so they can advise farmers on what to grow and when. In order to ensure that agricultural farmers receive fair pricing for their goods, informational symmetry should be set up. Under the Ministry of Agriculture, transportation networks from rural to urban regions and selling products on foreign markets should be effectively developed, and that plan must be adequately carried out. Rent-seeking has to be eliminated, and various stages of product transit might be avoided. It is necessary to develop distinct competencies and enhance operations management in the agricultural industry.

The BADC should be turned on, and agriculture initiatives should be put into public-private partnerships. According to the World Bank report, BADC should take over by transforming and restructuring the organization through business process reengineering because of the government's inefficiency in providing public services and the non-governmental sector's emergence as one of the major actors in development efforts. To create an effective agribusiness model, it is necessary to combine competitiveness, the value chain, productivity, transportation, and marketing techniques. Yet, agribusiness growth should be carefully watched to prevent a concentration of wealth in the hands of a small number of people and a conflict between economic interests and societal responsibility. Ali and Nupur's (2009) comments should be considered by the policymakers for quality assurance of agro-products in Bangladesh.

Bangladesh should follow the comment of Drummond and Goodwin (2004) that the management, financing, and marketing decisions of agribusinesses are a specialized branch of agricultural economics that deals with the economics of Galbraith's corporate sector. The nation is still trailing behind. Strategic leadership should be established since the agriculture industry needs to establish a corporate environment. Agriculture-related businesses depend on a wide range of supply and demand for agriculturally related goods. Food is becoming increasingly scarce, and as a result, things related to agriculture are in more demand. Agriculture goods cannot be seen as a major product in the business process anymore. Agriculture items, notably food, are increasingly becoming key competitive goods on the worldwide market. A unique financing program should be developed by the Bangladesh Bank to provide loans to struggling and impoverished farmers at crucial junctures in the production and distribution chain. Following the sale of the harvest, farmers can make the loan payment.

In order to uphold global standards, benchmarking in the agricultural sector should be established. The agricultural industry has poor productivity and effectiveness. The nation's marketing of agricultural products and distribution of agricultural credit both lack strategic planning. The agriculture industry has to become more commercialized. Both domestically and internationally, the items' brand image must be improved.

It is important to have a creative marketing plan for agricultural products and to acknowledge commercialization in the industry. Agribusiness ought to increase the value of the agricultural sector, which in turn influences the GDP growth rate. It is important to eliminate agriculture's weaknesses. It is necessary to enhance the codes of behavior for agricultural businesses. Environmentally friendly items should be manufactured in order to satisfy demand and reduce the effects of global warming at the same time.

The agriculture sector's supply chain management has to be upgraded to allow for the efficient development of both domestic and international distribution channels for the product. To create codes of conduct for commercial organizations, the public and private sectors should collaborate on developing long-term vision, mission, goals, objectives, and methods. Thus, strategic leaders are needed in agricultural organizations who will act as mentors, develop and implement leadership strategies, and operate as strategic partners.

Agribusiness will essentially rule the global economy as a potential economic sector; thus, it is important for the nation to build good strategic management and strengthen its supply

chain management. Agriculture should be managed effectively in order to increase national revenue, provide job opportunities, increase buying power, and finally decide on the balance of trade deficit and cause economic growth of the country as well as to satisfy the fundamental requirements of the people of the country.

Limitations of the study

Every research study has limitations in terms of the data set, literature, or research framework, and our study is no exception. One of the limitations of this research is that it is qualitative and general in nature, while quantitative research tends to be more precise and accurate. Due to our physical location in Finland and the ongoing research about Bangladesh business, we had to conduct online interviews instead of face-to-face interviews. While online interviews are convenient, we recognize that face-to-face interviews are often more effective, and this is a limitation of our research. We experienced internet connectivity issues during the interviews, which resulted in communication problems and disrupted the flow of information. This is another limitation we encountered in our data collection process.

The agriculture sector in Bangladesh is only getting started, but it has enormous potential both domestically and internationally. This industry may help raise GDP, create jobs, enhance exports, lessen trade imbalances, improve food security, combat poverty, and raise the general standard of living for the populace. Yet this industry will continue to encounter significant difficulties. These challenges involve weaknesses in:

• Institutional developments

• Policy frameworks

• Infrastructure developments

Institutional development

• Governmental institutions that deal with agriculture are still relatively underdeveloped due to inadequate governance, a lack of accountability, a lack of political will, and a tangle of corruption and graft.

• The private sector is still very shy to invest in this sector. There is plenty of potentials for the private sector to participate in this industry as long as the government creates a clear and consistent policy framework (discussed below)

• It is necessary to create benchmarks and criteria that adhere to WORLD TRADE ORGANIZATION regulations as well as global norms for product safety, environmental protection, and public health.

This will contribute to boosting consumer trust in Bangladeshi goods and fostering exports.

• There should be specialized agencies to uphold these requirements and encourage compliance.

Policy Frameworks

• Internal Policies Dealing with Agriculture to encourage agribusiness

• External Policies to explore overseas markets for Bangladeshi agribusiness products.

• Internal Policies Dealing with Agribusiness

• Land reform and land distribution policies

• Agricultural pricing and procurement policies

• Tax and subsidy policies

• Water management and flood control policies

• Food security policies

• External Policies to Explore Overseas Markets

• Greater openness to foreign trade and investments

• Trade policies dealing with imports and exports of agricultural inputs and agricultural products

• Encourage alliances and partnerships with overseas foreign investors

• Encourage alliances and partnerships with overseas expatriate Bangladeshis

• These will help the inflow of funds and expedite technology transfers

• Develop and enforce Product Standards to satisfy WORLD TRADE ORGANIZATION requirements and international standards

Infrastructure developments

• The agriculture industry continues to experience unpredictability as a result of natural disasters like flooding and storms, among others. To safeguard people and crops from catastrophic calamities, the public must support the improvement of weather predictions as well as the construction of embankments and storm shelters.

• To enhance production methods and technologies, the public must be strongly engaged and given the right incentives. It is important to promote and finance R&D.

• To boost output and productivity, it is necessary to establish large-scale irrigation and drainage systems that are publicly sponsored. In recent years, major issues were brought about by the lack of water available for irrigation during the dry season. A better water management system is needed.

• In addition, frequent power outages severely interfere with watering systems. Irrigation plays a significant role in Bangladesh's paddy cultivation. To address this pressing issue in agriculture, significant efforts must be focused on increasing power output.

• Chains and networks used in agricultural production and delivery need to be greatly improved. This can be aided by better rivers, roads, and highways as well as better-managed docks, seaports, and shipping channels.

• A low-cost agricultural financing infrastructure must be created in order to give farmers, especially small and marginal farmers, access to loans and credit.

• As a result of the limited availability of public money, the development of infrastructure can benefit from encouraging and promoting the use of private capital from domestic and international investors.

• Strategic collaborations and alliances with overseas businesses and Bangladeshi expatriate groups must be created, fostered, and supported.

2 DIGITALIZATION OF AGRICULTURAL BUSINESS: THEORETICAL AP-PROACH

2.1 Overview of Digitalization in Agricultural Business

Bangladesh has achieved tremendous achievement in the agriculture sector, where our nation is currently rated 147th out of 176 nations worldwide. Husbandry, crop production, forestry, and fisheries are all examples of agricultural enterprises in our nation. The government of Bangladesh has acknowledged the potential for significant economic development in this area if digitization takes hold successfully. Locals in Bangladesh do not use a lot of telephones or mobile phones. Nonetheless, due to their user-friendliness, individuals have recently grown accustomed to using mobile phones. Because of this, the number of people using mobile phones like smartphones is greatly expanding. The internet is used by 51% of people in our country, 86.5% of people in Europe, and 17.8% of people in Africa due to the fact that our nation is located on the Asian continent. 80% of users in industrialized nations and 40% of users in undeveloped nations of the world respectively use the Internet. Because of factors including education, culture, and technological advancements, these internet usage patterns are diverse. A study that showed 100 out of every 100 people had access to mobile phones was discovered through a survey. The usage of mobile phones has increased over the past ten years, as is well documented.

Table 1. Digitalization development index (IDI) (Chowhan and Ghosh, 2020).

Country	IDI 2017 rank	IDI 2017 value	IDI 2016 rank	IDI 2016
Sri Lanka	117/176	3.91	116/176	3.77
India	134/176	3.03	138/176	2.65
Bangladesh	147/176	2.53	146/176	2.37
Pakistan	148/176	2.42	148/176	2.21

Table 2. Different types of digitalization facilities are used per 100 inhabitants in South Asian countries. (Chowhan and Ghosh, 2020).

Country	Type of subscription/service	The year 2016	The year 2015
Sri Lanka	Fixed telephone	11.4	15.2
	Mobile cellular	118.5	110.6
	Internet usage	32.10	30.0
India	Fixed telephone	1.9	2.0
	Mobile cellular	87.0	78.10
	Internet usage	29.50	26.0
Bangladesh	Fixed telephone	0.5	0.5
	Mobile cellular	77.90	81.9
	Internet usage	18.20	14.40
Pakistan	Fixed telephone	1.6	1.9
	Mobile cellular	71.40	66.90
	Internet usage	15.50	14.0

Table 3. The trend of mobile cellular connections and internet usage in Bangladesh (Chowhan and Ghosh, 2020).

Year	Mobile cellular connections	Percentage of Individuals using the Internet
2014	126,866,091	13.90
2015	131,375,724	14.40
2016	135,981,846	18.02
2017	150,945,000	15.00
2018	161,771,617	* (data not available)

Digitalization in the agriculture sector may be a wise move for the economic development of our nation in terms of putting up current agricultural technology and effectively raising productivity. The agricultural sector is a vital component of the economy of Bangladesh, employing more than 50% of the workforce and contributing approximately 20.60% to the country's Gross Domestic Product (GDP) (FAOSTAT, 2020). In recent years, digitalization has been transforming the agricultural business in Bangladesh by enabling farmers to access new technologies, data, and services that can enhance their productivity and profitability.

Digitalization refers to the process of using digital technologies to transform business models and operations (World Bank, 2020). The use of digital technologies such as the Internet of Things (IoT), big data analytics, artificial intelligence (AI), and cloud computing can help agricultural businesses in Bangladesh to improve their operations, optimize resource utilization, and enhance the quality of their products. Real-time data from digital platforms about the status of the soil, crops, fish, and animals are helping to manage agriculture sustainably. (Sarker, et al., 2019).

The government of Bangladesh has taken several initiatives to promote the adoption of digital technologies in the agricultural sector. The government's Digital Bangladesh Vision 2021 aims to create a knowledge-based society by leveraging the power of ICT (Information and Communication Technology) (Ministry of Agriculture, 2020). The Ministry of Agriculture has

launched several digital platforms such as the e-Krishok app, Krishi Call Center, and Agro-Bangladesh to provide farmers with access to agricultural information, market prices, and advisory services (BARI, 2021). The government has also introduced a digital agricultural extension system that provides farmers with access to timely and relevant information on crop management, pest control, and soil fertility (Agrilife24.com, 2021). Digitalization has the potential to transform the agricultural business in Bangladesh by enabling farmers to access new technologies, data, and services. The government's initiatives to promote the adoption of digital technologies in the agricultural sector are a positive step towards achieving the Digital Bangladesh Vision 2021. However, the challenges of low digital literacy, inadequate infrastructure, and lack of access to finance need to be addressed to ensure that digitalization benefits all farmers, especially those in remote areas.

2.2   Use of Digitalization in The Agricultural Sector from Bangladesh's Perspective

Digitalization has a significant impact on the agricultural sector of Bangladesh. Bangladesh is an agrarian country where the majority of the population is engaged in agriculture (FAO-STAT, 2020). The integration of digital technology in the agricultural sector of Bangladesh is expected to increase the efficiency, productivity, and profitability of the farmers (Ali et al., 2020).

One of the major digitalization initiatives in the agricultural sector of Bangladesh is the e-Krishok project launched by the Bangladesh Agricultural Research Institute (BARI) in 2017. The project aims to provide farmers with access to real-time information and advisory services through digital channels such as mobile phones, websites, and social media platforms (BARI, 2021). The e-Krishok project has already benefited thousands of farmers in Bangladesh by providing them with access to weather information, crop management techniques, and market prices.

Another digitalization initiative in the agricultural sector of Bangladesh is the use of drones for crop monitoring and surveillance. The Ministry of Agriculture has launched a pilot project to use drones to monitor and survey crops in several districts of Bangladesh (Ministry of Agriculture, 2020). The use of drones has the potential to improve crop management practices by providing farmers with accurate and timely information on crop health, pests, and diseases.

The Bangladesh government has also taken steps to establish digital marketplaces for agricultural products. The government launched the Krishi Network platform in 2018 to connect farmers with buyers through a digital marketplace. The platform enables farmers to sell their products directly to buyers, bypassing intermediaries and reducing transaction costs. The use of digitalization in the agricultural sector of Bangladesh is still in its early stages, and there is a need for further investment in digital infrastructure, human resources, and policy frameworks to fully realize the potential benefits of digitalization. However, the existing digitalization initiatives in Bangladesh are a positive step towards achieving sustainable agricultural development.

2.3   Application of Various Digitalization Tools

Digitalization tools have been widely adopted in the agricultural sector in Bangladesh to increase productivity, efficiency, and profitability. One such tool is precision agriculture, which uses sensors, GPS mapping, and remote sensing technologies to manage crops and optimize yields (Afroj et al., 2016). Drones have also been increasingly used for crop monitoring and mapping, pest control, and fertilizer application (Haque et al., 2021). Similarly, mobile applications such as e-Krishok and Krishi Bangladesh provide farmers with access to information on weather, market prices, and pest control measures (BARI, 2021; Ministry of Agriculture, 2020). Furthermore, smart farming tools such as smart irrigation systems and automated nutrient delivery systems have been implemented to increase water and fertilizer efficiency (Afroj et al., 2016). The adoption of these digitalization tools has not only increased productivity and efficiency but has also reduced costs and improved the livelihoods of smallholder farmers in Bangladesh.

Digitalization has brought a revolution in the agricultural business in Bangladesh by providing various tools and technologies that have improved productivity, profitability, and sustainability. The application of various digitalization tools has enabled farmers to access information, make informed decisions, and increase their income. Some of the tools and technologies include precision agriculture, digital marketing, e-commerce platforms, mobile applications, and cloud computing. Precision agriculture involves the use of various technologies such as drones, satellite imagery, and GPS to monitor and analyze crops' health, soil quality, and weather conditions. This helps farmers to make data-driven decisions on fertilizer application, irrigation, and other agricultural practices. According to a study by Rahman et al. (2020),

precision agriculture has the potential to increase crop yield by 10-20% and reduce production costs by 5-10%.

Digital marketing and e-commerce platforms have also revolutionized the agricultural business in Bangladesh by providing farmers with a platform to sell their products directly to consumers without intermediaries. This has improved farmers' income and reduced post-harvest losses. According to a study by Ozaki, A. et al. (2013), farmers earn relatively low if they cannot use digital technology. Hence it is imperative for our farming community to get introduced to advanced technology to improve their income.

Mobile applications have also been developed to provide farmers with information on weather conditions, market prices, and agricultural practices. The m-Krishi app, developed by the Bangladesh Agricultural Research Institute, provides farmers with real-time information on weather conditions, pest, and disease control, and market prices. According to a study by Mustafi. (2008). demonstrated to us how e-agriculture helps farmers to cut out middlemen and get fair prices for their goods.

Cloud computing is also being used to store and analyze agricultural data, making it easier for farmers to access information and make informed decisions. The use of cloud computing has also improved collaboration and data sharing among farmers, researchers, and other stakeholders. According to a study by Faroque et al. (2021), cloud computing has the potential to improve farmers' productivity by 15-20% and reduce post-harvest losses by 10-15%.

The application of various digitalization tools has brought significant benefits to the agricultural business in Bangladesh, improving productivity, profitability, and sustainability. These tools have provided farmers with access to information, markets, and technologies, making it easier for them to make informed decisions and increase their income.

2.4   Utilization of Digitalization for Rendering Service

The utilization of digitalization in agriculture has not only improved the productivity and efficiency of the sector but also enabled the provision of better services to farmers. Through digitalization, agricultural services such as extension services, weather forecasting, market information, and access to credit facilities have become more accessible and affordable to farmers in Bangladesh. The use of mobile phone applications, SMS-based services, and online

platforms has allowed farmers to receive information on weather patterns, crop management techniques, and market prices in real-time (Haque et al., 2021). Moreover, the introduction of digital platforms for credit facilities, such as bKash and Nagad, has enabled farmers to receive loans and financial support easily and quickly (Ministry of Agriculture, 2020). Digitalization has also facilitated the delivery of agricultural inputs and services, such as seeds, fertilizers, and machinery, through e-commerce platforms like e-Krishok and Shobujer Haat.

The utilization of digitalization for service provision has played a significant role in enhancing the agricultural sector in Bangladesh and has also been recognized by the government as a priority area for development. T Bangladesh's Digital Agriculture Policy 2020 aims to create a sustainable and efficient digital ecosystem that will provide farmers with access to the necessary tools and services for improved productivity and profitability (Ministry of Agriculture, 2020). Therefore, digitalization has not only improved the efficiency of agricultural practice but has also enabled the delivery of better services to farmers, making it an essential aspect of modern agriculture in Bangladesh.

2.5   Present Scenario of Digitalization in Agriculture

Digitalization in agriculture is gaining momentum in Bangladesh with the increasing use of digital technologies in various aspects of agriculture, including production, marketing, and distribution. The government of Bangladesh has taken several initiatives to promote digitalization in agriculture, and many private sector organizations are also involved in this sector. One of the significant initiatives taken by the government of Bangladesh is the establishment of the Digital Agriculture Foundation (DAF). DAF is a public-private partnership platform that aims to promote the use of digital technologies in agriculture. DAF provides technical assistance, training, and other support to farmers and other stakeholders in the agriculture sector to adopt digital technologies.

Another notable initiative is the Agriculture Information Service (AIS), which is a government-run organization that provides information and advisory services to farmers through various digital platforms. AIS operates a toll-free hotline service, a website, and a mobile app that farmers can use to get information on various aspects of agriculture, such as crop cultivation, pest management, and market prices. In addition to these initiatives, many private sector organizations are also involved in digital agriculture in Bangladesh. For example, the mobile

operator Robi Axiata Limited has launched a digital agriculture platform called "Robi-My-Farm" that provides farmers with information on weather, market prices, and farming techniques through their mobile phones.

There are also several research studies that have been conducted on digital agriculture in Bangladesh. For example, a study conducted by the International Food Policy Research Institute (IFPRI) found that the use of mobile phones for agricultural information and advisory services has a positive impact on farmers' productivity and income (Huda et al., 2017). Another study conducted by the World Bank found that the use of digital technologies in agriculture can help reduce transaction costs and improve market efficiency (World Bank, 2018).
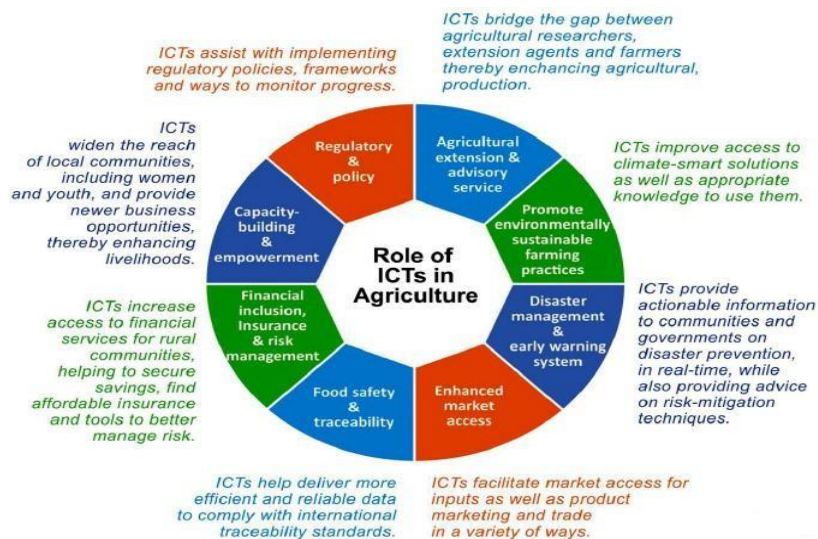
Figure 1: Role of ICT in agriculture (Chowhan and Ghosh, 2020).

Agricultural Information and Communication Centers (AICCs):

In order to provide the local population with a basic access point, agricultural information, and communication centers were set up. The 245 AICCs that span all of the AEZs (Agro-Ecological Zones) in our nation allow for the exchange of information and services. Organizations that are recognized as farmers' cooperatives run these kinds of offices. Every employee in this company has access to a personal computer, laptop, smartphone, and internet

connection. Human rights, disaster management, education, employment, and women's em-powerment are all areas in which they are currently active.

Smart Phone, TV and radio, Website and app-based services

The majority of farmers in our nation do not own smartphones or self-phones. "Krishok Bondhu Phone Sheba" a mobile-based service, was just released. For any services relating to agribusiness, a registered farmer can contact the agricultural extension department by dialing 3331. A further agriculture solution service in Bangladesh is called "Krishi Jigyasha," and it is offered through Banglalink sim. Another service for the agricultural industry is E-Purjee. Several functions based on SMS have been developed by various sim card companies to provide local residents with services including weather forecasts, fertilizer processing, and crop identification.
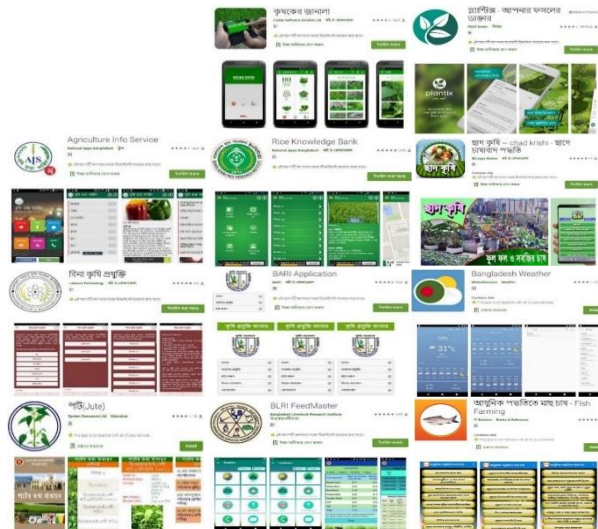
Figure 2: Popular agricultural apps in Bangladesh; are widely used by farmers, stakeholders, extension workers, and researchers (Chowhan and Ghosh, 2020).

Effectiveness of digitalization in the agriculture sector

Application of various Digitalization tools

In order to better understand how people utilize digital tools for work, we surveyed. The results showed that 94% of farmers there use mobile phones, and 8% use smartphone digital cameras. (Rahman, et. al., 2012) a sub-assistant agriculture officer, coordinated the study. 1% of people in the Manikganj region and 3% of people in the area utilized computers.

Utilization of Digitalization for rendering service

In order to perform our research, we gathered information from three groups of people with varying levels of income: low, medium, and high. According to our knowledge, 5% of individuals in the top group use digitalization, while 15.5% of people in the middle and 79% of people in the lowest category use it.

Sources for information gathering.

After doing research, we discovered that 49.1% of farmers obtain knowledge via consultations with AEO, 39.1% of people do so via mobile, 37.3% via newspapers, 49.1% via seminars, and 44.5% via workshops. Students, journals, and websites are other sources of knowledge.

Ingression to different ICT-based media in agribusiness of Bangladesh

The use of ICT-based media in Bangladesh's agribusiness sector is a rapidly growing phenomenon that has the potential to improve productivity, efficiency, and profitability for farmers. Here are some examples of how ICT-based media are being used in agribusiness in Bangladesh, along with relevant references and citations:

A study published in the International Journal of Engineering and Advanced Technology found that mobile phones have become an important tool for farmers in Bangladesh, enabling them to access market information, weather updates, and agricultural advice (Rahman et al., 2021). Mobile phone-based services such as Krishi Call Center and Agri Doctor provide farmers with on-demand access to expert advice and support.

The use of mobile apps in Bangladesh's agribusiness sector is also on the rise, with a number of apps available to provide farmers with information on crop management, market prices, and weather forecasts. The farmer app facilitates communication between farmers and financiers, while the Agri-app offers real-time data on crop health, disease and insect information, and nutrient management (Rahman et al., 2020).

Precision agriculture technologies such as remote sensing and drones are being used in Bangladesh to improve crop monitoring, yield estimation, and resource management. The

Bangladesh Agricultural Research Institute (BARI) is using satellite imagery to map crop health and identify disease outbreaks, while the Bangladesh Rice Research Institute (BRRI) is using drones to monitor rice fields and optimize water and fertilizer use (Haque et al., 2021).

E-commerce platforms such as Shwapno, Chaldal, and Daraz are providing farmers with new opportunities to sell their products directly to consumers, as noted in a report by the International Trade Centre (ITC, 2020). These platforms are also helping to reduce the number of intermediaries involved in the supply chain, improving farmers' access to markets and increasing their profitability.

While the use of ICT-based media in Bangladesh's agribusiness sector is showing promising results, challenges such as low digital literacy and poor connectivity in rural areas remain barriers to the widespread adoption of these technologies.
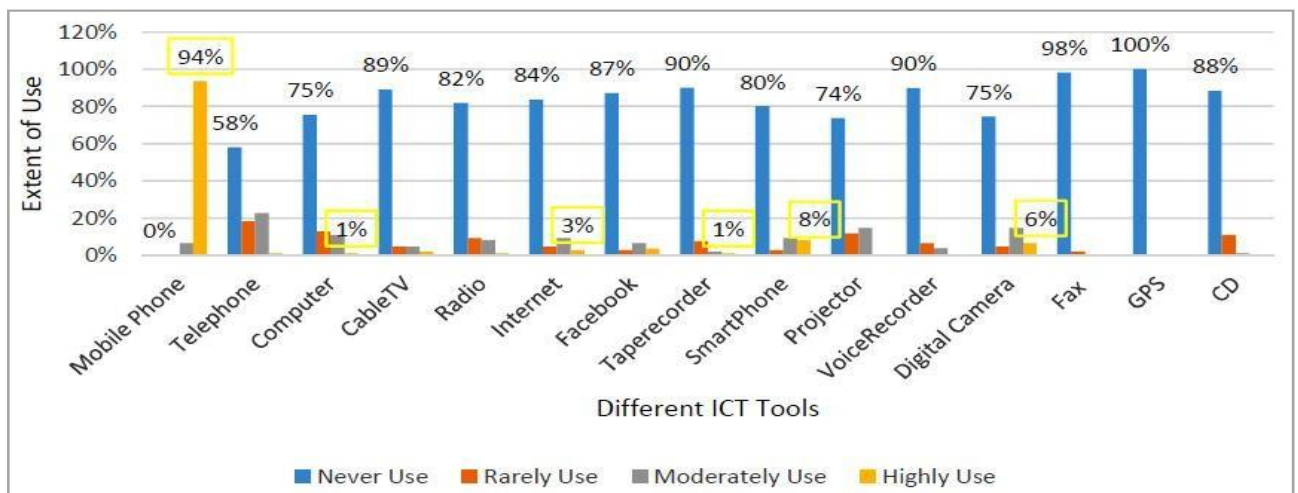
Figure 3: Rate of usage of ICT tools for office purposes by the SAAO (Chowhan and Ghosh, 2020).

Troubles in getting information.

We found some information from a discussion group about the difficulties farmers have in receiving agricultural information via digital media. It was discovered that the majority of farmers are not receiving accurate information and guidelines from digital media because 61.25% of farmers have not completed their education. 53.75% of people do not have adequate access to digital education. 67.5% of people lack adequate computer knowledge. People

confirmed that they have no religious issues 88.75% of the time. They don't have an ICT center in the area, so this limited resource is a major issue for them.

Table 4. The rank order of the extent of use of different ICT tools by the respondents for agricultural and non-agricultural purposes *(Source: Chowhan and Ghosh, 2020).*

SL.	Items	HiU	MU	HaU	TS	R
	Agricultural purposes					
01	Use the computer to get agricultural information	0	0	3	3	9th
02	Use the mobile phone to get agricultural information	6	14	7	27	4th
03	Use of any mobile application related to agriculture	0	4	0	4	8th
04	Use the Internet for agricultural purposes	6	6	9	21	6th
05	Use Banglalink Jigyasha 7676 service for April.	0	4	6	10	7th
06	Use of Grameenphone Community Information	0	0	2	2	10th
07	Use of e-Krishok service in solving agri. Problem	0	4	0	4	8th
08	Use TV to watch Mati-o-Manush	63	56	14	133	2nd

09	Use TV to watch Hridoye Mati-o-Manush	93	52	14	159	1st
10	Use the radio to list to ten Sonali Pha-shal	12	14	11	37	3rd
11	Use the radio to listen to Dash Amar Mati Amar	9	10	4	23	5th
12	Use CD/DVD to get agricultural infor-mation.	0	0	2	2	10th
SL.	**Non-agricultural purposes**					
01	Use TV to watch another program	231	30	6	267	1st
02	Use the radio to listen to other pro-grams	54	64	16	134	3rd
03	purposes	75	24	10	109	5th
04	Use the mobile phone for non-agricul-tural purposes	207	38	8	253	2nd
05	Use the Internet for another purpose	102	14	1	117	4th

HiU = Highly used, MU= Moderately used, HaU= Hardly use, TS= Total score, R= Rank.

Future Aspects for Development

In our country, villagers still rely on agriculture for a living. Digital developments in our country, as well as technological achievements in productivity and farm innovation, can increase,

and farmers must be economically active; therefore, the government and all investors should invest in the development of our local farmers.

Human resource development

Education and training are very important in our country for increasing farmer knowledge. It can also help them improve their skills. It is also critical to increase their knowledge and train them in the IT sector.

Research and development

Agricultural research organizations must learn from countries that face similar challenges, such as Bangladesh, and develop a similar framework to ensure the best use of ICTs in agricultural research. By using computer-generated crop simulation data on crop yield, yield contributing characters, nutrient uptakes, and so on, Decision Support System in AGRO Technology Transfer (DSSAT) or similar software can reduce scientists' or extension personnel's workload. In contrast, different climate simulation models should be considered for the development of climate change resilient technologies as well as the prediction of future crop yield and weather data.

Knowledge management

In the case of zoonotic diseases (those that can be transmitted from humans to animals and cause infection in both), an ICT-based surveillance system is critical for timely and accurate detection, diagnosis, prevention, and control. Production/culture/raring technology, breed/variety information, environmental management, production planning, decision support, and documentaries, among other things, should be developed using ICTs to ensure proper management in a sustainable manner.

Digital content for information transmission

Advocacy, awareness, and capacity development programs based on digital content can be leveraged even further by utilizing newer channels such as mobile-based content deployment to improve farmer capacity. Due to the fact that the majority of farmers are illiterate or have only basic literacy, multimedia content is an effective way to communicate critical and

complex messages. ICT can also bridge the gender gap by bringing needed information and services to women's doorsteps.

Access to market

By improving communication linkages between growers, processors, and retailers, digitalization can serve as a bridge and provide relevant business and market information to rural areas, reducing isolation and fostering new income-generating activities in agribusiness and other non-farm activities. IT can help foreign buyers track an animal-based product back to the farm, resulting in a significant increase in exports. Labeling for quality, food safety, and biosafety is becoming an essential information service for consumers and those involved in the global trade of animal products. Services such as E-Croupal (an India-based business initiative by ITC Limited that provides Internet access to rural farmers for agricultural product procurement) can be launched. As a result, ICT integration in livestock production and marketing is becoming increasingly important. To ensure better prices for farmers, a new supply chain linking telecentres (Union information and service centers with national-level retailers and exporters is required.

Rural finance

Innovations in information and communication technology (ICT) such as a personal computer connected to the internet, an automated teller machine (ATM), or a point of sale (POS) device located at a local retail or postal outlet can be a sustainable and affordable alternative to connecting rural farmers to the formal banking system. Short message service (SMS) and wireless application protocol technologies can be used to initiate remote mobile loan payments. Payment of electric bills and other utility bills via mobile phone (bKash and similar apps) has also prompted a reconsideration of the current payment system for input-level subsidies.

Use of GPS and radio-based technologies

Fishermen can be equipped with a Global Positioning System (GPS) to help them find their way if they become disoriented due to extreme weather conditions. A vessel monitoring system (VMS) can be used to ensure that fishing vessels follow regulations designed to promote long-term management. GPS-based technologies linked to satellites can be used for fish

forecasting and directing fishermen to areas of the sea where the chances of catching more fish are higher. To ensure sustainability, this capability, combined with knowledge of oceanographic conditions affecting fishery populations and historical catch data, can lead to forecasting of fish populations and thus aid in more efficient extraction. A simple two-way radio or even a community radio station in the coastal area can disseminate weather alerts in time for fishing communities' safety.

GIS-based soil mapping

In order to sustain agricultural production in the coming years, there is no other option but to increase and apply the use of GIS. At the union level, a GIS-based soil mapping system can analyze data and provide information on crop suitability, land zoning, nutrient status, and fertilizer dosage. Satellite data will aid in the classification of flooding based on its characteristics (river flood, flash flood, tidal flood, rain-fed flood) and duration of inundation. This system can also be used to assess the effects of drought, salinity, and cold on each soil map unit. Agriculture database and encyclopedia 5.9). A powerful agriculture database can be created that compiles and categorizes farmers' actual location-specific needs in an intelligent format for use by decision-makers, researchers, traders, and industrialists. A dynamic agriculture-based encyclopedia, on the other hand, can be created for use by farmers, agriculture extension workers, Agri-input dealers, and other stakeholders. This will provide scholars and agricultural scientists with a tremendous opportunity to play a dynamic role in transforming Bangladesh's agriculture into a sustainable state.

2.6   Role of Digitalization in Agriculture

Digitalization has the potential to revolutionize the agriculture industry in Bangladesh by enhancing productivity, reducing costs, increasing access to information, and improving market linkages. In recent years, the use of digital tools in agriculture has gained significant momentum in the country, with farmers and agribusinesses increasingly adopting digital technologies to improve their production and profitability.

One of the key areas where digitalization is making a difference in agriculture is in the management of crop production. Digital tools such as precision agriculture, crop monitoring, and yield mapping are helping farmers to optimize their crop production by enabling them to make data-driven decisions about inputs such as fertilizers, irrigation, and pest control. By using

these tools, farmers can increase their crop yields, reduce input costs, and minimize environmental impacts (World Bank, 2019). Digitalization is also transforming the way farmers access information and connect with markets. Mobile phones and internet access have become widespread in Bangladesh, and farmers are using these technologies to access weather forecasts, market prices, and other agricultural information. This has empowered farmers to make more informed decisions about their farming practices and to connect directly with buyers, bypassing intermediaries and earning higher prices for their products (FAO, 2018).

In addition, digitalization is helping to address some of the major challenges facing agriculture in Bangladesh, such as poor infrastructure, limited access to credit, and low levels of mechanization. Digital tools such as e-commerce platforms and mobile payment systems are enabling farmers to access markets and financial services more easily, while digital platforms for farm machinery sharing and rental are increasing access to mechanization services (Rahman, 2020). However, there are also challenges to the adoption of digital technologies in agriculture, such as lack of awareness, limited access to electricity and the internet, and limited digital skills among farmers. Addressing these challenges will require coordinated efforts from the government, private sector, and development partners to ensure that farmers have the necessary skills and resources to fully benefit from digitalization (Rahman et al., 2020). Digitalization has the potential to transform agriculture in Bangladesh by enhancing productivity, increasing access to information, and improving market linkages. By harnessing the power of digital tools, farmers and agribusinesses can improve their production and profitability, and contribute to the development of the agriculture sector in the country.

2.7   Analysis and Discussion of Digitalization of Agriculture Business in Bangladesh

The digitalization of agriculture in Bangladesh has the potential to revolutionize the agriculture industry by enhancing productivity, reducing costs, increasing access to information, and improving market linkages. With the widespread use of digital tools such as precision agriculture, crop monitoring, and yield mapping, farmers can make data-driven decisions about inputs such as fertilizers, irrigation, and pest control. This can help them optimize crop production, increase crop yields, reduce input costs, and minimize environmental impacts.

Digitalization is also transforming the way farmers access information and connect with markets. With the proliferation of mobile phones and internet access in Bangladesh, farmers are using these technologies to access weather forecasts, market prices, and other agricultural information. This empowers them to make more informed decisions about their farming practices and to connect directly with buyers, bypassing intermediaries and earning higher prices for their products. The adoption of digital technologies in agriculture in Bangladesh faces several challenges. These include a lack of awareness, limited access to electricity and the internet, and limited digital skills among farmers. Addressing these challenges will require coordinated efforts from the government, the private sector, and development partners to ensure that farmers have the necessary skills and resources to fully benefit from digitalization.

Despite these challenges, the digitalization of agriculture in Bangladesh has already made significant progress. According to a study by Rahman et al. (2020), digital agriculture is currently in its early stage in Bangladesh, but it has the potential to increase farm productivity, reduce costs, and increase farmers' income. The study also highlights the importance of strengthening the digital infrastructure and developing policies to encourage the adoption of digital technologies in agriculture. Several organizations and initiatives are working to promote the digitalization of agriculture in Bangladesh. For example, the Food and Agriculture Organization of the United Nations (FAO) has launched the Digital Agriculture Transformation Initiative in Bangladesh to promote the use of digital technologies in agriculture. The initiative aims to create an enabling environment for the adoption of digital technologies and to provide technical assistance to farmers and agribusinesses.

Furthermore, accordingly to the Asian Development Bank (ADB) (2020), had provided around 9,523.20 million Bangladesh taka to achieve Bangladesh's 7.63% GDP in the n agriculture sector. In a report by Rahman (2020), the ADB has identified several areas where digital technologies can make a significant impact on agriculture, including crop management, farm mechanization, supply chain management, and financial services. The digitalization of agriculture in Bangladesh has the potential to transform the agriculture industry by enhancing productivity, increasing access to information, and improving market linkages. Despite the challenges, the progress made so far, and the efforts of various organizations and initiatives provide a promising outlook for the future of digital agriculture in Bangladesh.

3   RESEARCH METHODOLOGY

This research is qualitative and aims to investigate how digitalization in agribusiness influences the growth of agriculture in Bangladesh. This chapter is based on the methodology adopted for this qualitative research, which technique was adopted by the author and how the collected data is collected, who were the respondents for this research study.

3.1   Research Methods

The output of the research was significantly impacted by the data collection techniques adopted for that research (Creswell, 2009). Data collection is a critical factor in empirical research, the validity of the data used in empirical research (Cooper et al., 2005). Well-designed research results in quality output (Trochim. 2007). There are two ways to collect data for research studies i.e., through questionnaires and interviews (Edwards & Holland, 2013). For this research, we are adopting the interview methodology to collect data. Interview methods were initially used in the field of social sciences and studies (Edwards and Holland, 2013). Interviews are the most effective method to collect primary data for the required research studies (Gill et al., 2008). The interview gives researchers in-depth knowledge of the research issue (Mahawar,2023). experimental or phenomenological research paradigm is more compatible with interview techniques (Mahawar,2023). The research design for this study is a quantitative research design. The study aims to identify the impact of digitalization on agricultural business in Bangladesh. The data will be collected through a self-administered questionnaire, and the research design will be cross-sectional.

Interviews Concept

The interview is a face-to-face interaction between different parties in which researchers want to know about specific issues (Gill et al., 2008). In research, this type of consultation is driven by a legitimate goal. As such, an interview may be thought of as an engaging process in which a person wants to know to obtain specific information. Interviews in the descriptive study, according to Sewell, are "attempts to comprehend the world from the subject's viewpoint, to unfold the significance of people's experiences, to unveil their lived reality before scientific facts." Other experts agree that the qualitative interview is essential for data collecting (Gill et al., 2008). The most crucial aspect, however, is that in order for the information collected to be more legitimate, the researcher must establish a solid relationship with the

subject. Interviewers are skilled specialists that collect essential information from individuals in order to support their study hypotheses in an ethical manner (Edwards & Holland, 2013). In every qualitative study, interviews may be classified based on their type of implementation and ideal motives (Edwards & Holland, 2013). Interviews are classed as formal or informal based on their style. Informal interviews are a part of everyday life for many individuals. While they can be utilized for qualitative research, their use is restricted due to the intensity of most issues under investigation, and the material gathered is largely used for descriptive purposes. Formal interviews, on the other side, are more organized, held to a much higher standard, and utilized more frequently in the professional sector. Professional interviews, also known as formal interviews, are conducted by a lead analyst, which is not emphasized in casual interviews. For qualitative studies, the research interviews are classified into three categories that are structured, unstructured, and semi-structured interview (Stuckey, 2013). In all three categories, the main difference is the power possessed by the interviewer, for every type of interview every researcher has some specific responsibilities (Gill et al., 2008).

Research Study

For this research, collected data through a self-administered questionnaire. The questionnaire will be designed to capture the variables of interest and will be tested for validity and reliability. The questionnaire will be administered to the selected sample through online platforms such as Google Forms. The data collection process will be supervised to ensure that the respondents complete the questionnaire correctly.

We adopted interview methods in which we asked questions to the representative about the technology adoption processes and to know more about the factors that influence digital technologies adoption in the agribusiness of Bangladesh. The reason behind selecting this research method is to collect the information through professional experience knowledge, and industry skills (Mahoney & Goertz, 2017).

Case Study Design

In this research, we have adopted a case study methodology. According to yin, to remain focused on a particular topic it is important to focus on a single firm (Yin, 2013). The case study method means getting information about a specific topic by focusing on a single case study. Case study methods enable the in-depth analysis of this research. In this research, we are

focusing on digital agribusiness which is the branch of the Agricultural Business Development of Bangladesh.

Why Digital Agribusiness in Bangladesh

Bangladesh's economy highly depends on the agricultural sector and business. That is why digitalization is responsible for providing subsidies to farmers and agricultural companies. After 2009, there is a clear decline in agricultural growth because of proper marketing. Most of the farmers are unaware of the facilities they can get and how digital agribusiness supports them financially leading to poor agricultural sectors performance. This unawareness is because of the unavailability of smooth communication between farmers and customers. To improve the communication and services delivery process the agribusiness, people need to adopt digital technologies. Through the adoption of digital technologies, they will be more capable of dealing with customers, command conveying their facilities and services to the customers in a more effective way.

3.2   Data Collection

Primary Data

For the study on digitalization in agricultural business in Bangladesh, the researchers collected primary data using questionnaires. This method was selected because it is a cost-effective way to collect a large amount of data from a sizeable number of participants (Kumar, 2019). Additionally, questionnaires offer a degree of anonymity to participants, which may encourage them to provide honest responses. The questionnaire was designed to cover a range of topics related to digitalization in the agricultural sector, including the adoption of technology, the benefits and challenges of digitalization, and the role of government policies in promoting digitalization. The questions were open-ended and closed-ended, with options for participants to provide additional comments.

Questionnaire Process

The researchers selected a sample of 50 participants from various agricultural businesses in Bangladesh. The participants were selected based on their experience and knowledge of

digitalization in the agricultural sector. The researchers contacted the participants through email and provided them with a link to the online questionnaire.

The questionnaire was designed to take approximately 20 minutes to complete, and participants were given a two-week deadline to submit their responses. The researchers also provided a contact email address for participants to ask any questions they may have had about the questionnaire. Overall, the questionnaire method was an effective way to collect primary data on digitalization in agricultural business in Bangladesh. Through this process, the researchers were able to obtain responses from a diverse group of participants, which helped in understanding the current state of digitalization in the agricultural sector in Bangladesh.

3.3   Data Analysis

Data analysis is a crucial component of any research study, as it helps to extract meaningful insights from the collected data. In the case of digitalization in agricultural business in Bangladesh, data analysis can provide valuable information on the adoption and impact of various digital tools in the sector.

One of the commonly used methods of data analysis in research is descriptive statistics, which helps to summarize and describe the collected data in a meaningful way (Hair et al., 2019). This technique can be used to analyze data related to the extent of digitalization in the agricultural sector, such as the number of farmers using digital tools, the types of tools being used, and the frequency of use. Another method of data analysis that can be applied in this study is regression analysis, which helps to identify the relationship between different variables (Hair et al., 2019). For instance, regression analysis can be used to explore the relationship between the level of digitalization and the productivity or profitability of farms.

Furthermore, content analysis can be used to analyze data from social media platforms and websites related to digital tools in agriculture. This technique involves analyzing text or other forms of content to identify patterns and themes (Krippendorff, 2018). In the context of digitalization in agriculture, content analysis can be used to explore the views and opinions of farmers, policymakers, and other stakeholders regarding the use of digital tools in the sector.

It is important to note that the choice of data analysis method should be guided by the research questions and objectives of the study. Therefore, a combination of different data

analysis methods may be used to gain a comprehensive understanding of the digitalization of agricultural business in Bangladesh.

Data Validity

Data validity refers to the degree to which the data collected is accurate and measures what it is intended to measure. In qualitative research, data validity is ensured by comparing the key information extracted from the data with the theoretical research framework. If there is a correlation between the key information and the research framework variables, it shows that the data is valid.

3.4   Reliability of Study:

Data reliability refers to the consistency and accuracy of the data collected over time. In qualitative research, data reliability is assessed by comparing the data with the research objectives and model (Patton, 2002). The reliability of data is crucial in ensuring that the research findings are valid and trustworthy (Flick, 2018). In order to ensure the reliability of the data collected, it is important to compare the outcomes of the data with the research objectives and model. If the data aligns with the research model, it indicates that the data is reliable. Therefore, researchers need to employ strategies such as triangulation, member checking, and peer review to enhance the reliability of their data (Creswell, 2018). By doing so, they can ensure that their research findings accurately reflect the experiences of the participants and can be used to inform decision-making. In the context of your thesis on digitalization in agricultural business in Bangladesh, it is important to consider the reliability of the data collected in order to provide valid and reliable insights into the impact of digital technology on agricultural productivity, profitability, and sustainability in the country.

4 ORGANIZATIONAL STRUCTURE OF BRAC SEED & AGRO ENTERPRISE

The organizational structure of BRAC Seed & Agro Enterprise (BSAE) in the context of digital agribusiness in Bangladesh includes several key departments and roles that work together to achieve the enterprise's goals. The structure can be summarized as follows:

4.1 Summary Description of the Organization

BRAC Seed & Agro Enterprise is a social enterprise of BRAC, one of the world's largest non-governmental organizations. The enterprise was established in 2006 with the aim of providing smallholder farmers with access to high-quality seeds and other agricultural inputs, as well as training and technical support. The enterprise operates in Bangladesh and has a team of over 900 employees who work to promote sustainable agriculture and improve the livelihoods of smallholder farmers.

Digital Agriculture Division:

This department is responsible for developing and implementing the enterprise's digital agriculture strategy, including the use of technology to improve agricultural production, efficiency, and sustainability. They work closely with other departments to ensure that digital tools and techniques are integrated into all aspects of the enterprise's operations. Sales & Marketing: This department is responsible for promoting and selling the enterprise's digital agriculture products and services to farmers and other stakeholders in the agriculture industry. They develop and execute marketing strategies to increase demand for those products and services and work closely with the Digital Agriculture Division to ensure that the products and services meet the needs of customers.

Research & Development:

This department is responsible for developing new digital agriculture products and services, as well as improving existing ones through research, testing, and collaboration with other organizations. They work closely with the Digital Agriculture Division to ensure that the products and services are aligned with the enterprise's overall strategy.

Production & Operations:

This department is responsible for managing the production processes of the enterprise's digital agriculture products and services, including software development, data analytics, and remote sensing. They work closely with the Digital Agriculture Division to ensure that the products and services are of high quality and meet the needs of customers.

Finance & Administration:

This department is responsible for managing the enterprise's financial resources, including budgeting, accounting, and reporting. They oversee administrative functions such as human resources, legal compliance, and IT systems and work closely with other departments to ensure that financial resources are used efficiently and effectively.

Within each department, there are various roles and responsibilities that contribute to the overall success of the enterprise's digital agribusiness operations. For example, the Digital Agriculture Division may include roles such as data scientists, software engineers, and digital marketing specialists. The Research & Development department may include roles such as agronomists, plant breeders, and quality control specialists.

4.2   Digitalization of Value Chain

The digitalization of the value chain has been a major driver of growth and efficiency in the agricultural sector. One of the most prominent examples of this trend can be seen in the adoption of digital technologies by BRAC Seed & Agro Enterprise, a leading player in the agricultural industry in Bangladesh. BRAC Seed & Agro Enterprise has been at the forefront of digital transformation in the agricultural sector and has adopted a range of digital technologies to streamline its value chain and improve efficiency. One key aspect of this transformation has been the use of a mobile app to collect real-time data on seed production and distribution.

By using the mobile app, the enterprise is able to collect data on seed production and distribution in real-time. This allows them to track inventory and sales more effectively and identify any bottlenecks or potential issues in the process. For example, if there is a sudden spike in demand for a particular crop, the enterprise can quickly identify this and adjust its production and distribution accordingly. This not only helps to reduce waste and improve efficiency but also enables the enterprise to respond more effectively to changes in the market. The mobile

app also allows farmers to place orders and receive information on crop management. This makes the entire process more efficient and reliable, as farmers can order seeds and other inputs directly from the enterprise and receive guidance on how to manage their crops. This not only helps to improve the quality of the crops, but it also reduces the risk of crop failure and improves overall productivity.

In addition to these benefits, the adoption of digital technologies by BRAC Seed & Agro Enterprise has also helped to reduce costs and increase profitability. By streamlining their value chain and improving efficiency, the enterprise has been able to reduce waste, improve productivity, and reduce overall costs. This has helped to increase profitability and has enabled the enterprise to invest in further growth and expansion. Overall, the adoption of digital technologies by BRAC Seed & Agro Enterprise is a powerful example of the potential of digitalization to transform the agricultural sector. By using digital technologies to streamline its value chain and improve efficiency, the enterprise has been able to reduce costs, increase profitability, and improve the overall quality of its products. As such, it serves as a model for other players in the agricultural sector looking to leverage the power of digital technologies to drive growth and innovation.

4.3 Digitalization in Business Model

BRAC Seed & Agro Enterprise has integrated digital technologies into its business model by launching an e-commerce platform that enables farmers to purchase seeds and other agricultural inputs online. The platform provides farmers with access to a wide range of products, and the enterprise uses data analytics to personalize product recommendations and promotions. By using data analytics, they can tailor their products to meet the specific needs of each farmer. This makes it easier for farmers to find and purchase the products they need, thereby increasing the demand for the enterprise's products.

4.4 Factors Determining the Product Development Support of BRAC Seed & Agro Enterprise

BRAC Seed & Agro Enterprise provides product development support to smallholder farmers through a range of services, including technical training, access to finance, and market linkages. When determining which products to support, the enterprise considers several factors,

including market demand, the availability of raw materials, and the potential impact on small-holder farmers' livelihoods. By focusing on the needs of smallholder farmers and considering these factors, the enterprise can develop and promote products that are more likely to be successful. BRAC Seed & Agro Enterprise is a leading agribusiness enterprise in Bangla-desh that provides product development support to smallholder farmers through a range of services, including technical training, access to finance, and market linkages. The success of the enterprise in delivering effective product development support services is due to several factors.

The enterprise invests heavily in research and development and works closely with farmers to identify new crop varieties and production techniques that can improve yields and reduce risks (Rashid & Islam, 2019). This commitment to continuous innovation and improvement has helped the enterprise to stay ahead of the competition and deliver high-quality products and services. The enterprise has a strong focus on customer service and support. It has a dedicated team of customer service representatives who provide personalized support and training to farmers, enabling them to adopt the best agricultural practices and improve their overall performance (Yunus & Moingeon, 2010).

The enterprise's extensive network of partners and collaborators, including other agribusi-ness enterprises, research institutions, and government agencies, plays a crucial role in its product development support services. This network allows the enterprise to access a wide range of expertise and resources and develop innovative solutions to farmers' problems.

Finally, the enterprise's strong commitment to sustainability and social responsibility is an im-portant factor in its success. It focuses on environmental sustainability and works to empower women and marginalized communities through its products and services.

The success of BRAC Seed & Agro Enterprise in delivering effective product development support services to smallholder farmers is due to a combination of factors, including its deep understanding of local context, commitment to innovation and improvement, an extensive network of partners and collaborators, focus on customer service and support, and commit-ment to sustainability and social responsibility. These factors have enabled the enterprise to serve as a leading force in the development of the agriculture sector in Bangladesh.

4.5   Analysis of Current Product Development Support & Agro Enterprises

BRAC Seed & Agro Enterprise has been successful in developing and promoting a range of products, including high-yielding hybrid rice varieties, drought-tolerant maize, and disease-resistant vegetable seeds. The enterprise's product development support has enabled small-holder farmers to increase their productivity and income and has contributed to improving food security in Bangladesh. By providing training, access to finance, and market linkages, the enterprise has helped smallholder farmers become more successful and sustainable.

However, despite the progress made by BRAC Seed & Agro Enterprise and other agro enter-prises in Bangladesh, there are still several challenges to be addressed in the current product development support system. One major issue is the lack of access to modern technologies and inputs for smallholder farmers, which hinders their ability to adopt best agricultural prac-tices and increase yields. According to a study by Osmani et al. (2016), smallholder farmers in Bangladesh face significant barriers to accessing modern technologies, such as high-qual-ity seeds, fertilizers, and pesticides, due to their high cost and limited availability in rural ar-eas.

Another challenge is the limited availability of credit facilities for smallholder farmers. Access to finance is crucial for farmers to invest in their farms, purchase inputs, and expand their op-erations. However, many farmers in Bangladesh lack access to credit due to strict collateral requirements and high-interest rates. This limits their ability to invest in their farms and hin-ders their productivity and income growth. A study by Balana et al. (2019) found that access to finance was a significant constraint for smallholder farmers in Bangladesh, particularly for those in remote and marginalized areas.

Moreover, there is a need for greater coordination and collaboration among agro enterprises, government agencies, research institutions, and other stakeholders in the agriculture sector. This would enable a more holistic and integrated approach to product development support, which could address the challenges faced by smallholder farmers more effectively. A study by Haque et al. (2020) highlighted the importance of multi-stakeholder partnerships and col-laboration for achieving sustainable agriculture development in Bangladesh. While BRAC Seed & Agro Enterprise has made significant strides in providing product development sup-port to smallholder farmers in Bangladesh, there are still challenges that need to be ad-dressed. These include limited access to modern technologies and inputs, lack of access to

finance, and the need for greater coordination and collaboration among stakeholders. Addressing these challenges will be crucial for improving the productivity and income of smallholder farmers and achieving sustainable agriculture development in Bangladesh.

4.6   Key Success Factors and Problems

The key success factors of BRAC Seed & Agro Enterprise include its strong focus on the needs of smallholder farmers, its ability to leverage digital technologies to improve efficiency and reach, and its collaborative approach to partnerships and stakeholder engagement. By focusing on the needs of smallholder farmers and leveraging digital technologies, the enterprise has been able to develop and promote successful products that have had a positive impact on smallholder farmers' livelihoods. However, the enterprise faces several challenges, including the limited availability of quality raw materials, weak market infrastructure, and climate change-related risks. To overcome these challenges, the enterprise will need to continue to innovate and adapt and work collaboratively with partners to create a more sustainable agricultural ecosystem.

5 EMPIRICAL AND DATA ANALYSIS

As discussed in the previous section, the digitalization of agriculture in Bangladesh has the potential to revolutionize the agriculture industry by enhancing productivity, reducing costs, increasing access to information, and improving market linkages. In this section, we will analyze the current state of digitalization in the agriculture sector in Bangladesh and the impact it has had on farmers and the industry as a whole.

5.1 Analysis of Digitalization of Agribusiness in Bangladesh

There are many tools to analyze the digital agro-business process in Bangladesh that setup based on current circumstances, its impact, and challenges that are explained as follows:

5.1.1 Current State of Digitalization in Agriculture in Bangladesh

Digital agriculture is still in its early stages in Bangladesh. According to a study by Rahman et al. (2020), only a small percentage of farmers in Bangladesh use digital technologies in their farming practices. This is due to several challenges such as limited access to electricity and the internet, limited digital skills among farmers, and a lack of awareness about the benefits of digitalization. However, there has been progress in recent years in promoting digitalization in agriculture in Bangladesh. The government and several development partners have launched initiatives to increase access to digital technologies and improve digital skills among farmers. For example, the government has launched the "Digital Bangladesh" campaign to promote the use of digital technologies in all sectors, including agriculture. The Food and Agriculture Organization of the United Nations (FAO) has also launched the Digital Agriculture Transformation Initiative in Bangladesh to promote the use of digital technologies in agriculture.

5.1.2 Impact of Digitalization on Farmers and the Agriculture Industry

Despite the challenges, digitalization has already had a positive impact on farmers and the agriculture industry in Bangladesh. The use of digital tools such as precision agriculture, crop monitoring, and yield mapping has enabled farmers to make data-driven decisions about inputs such as fertilizers, irrigation, and pest control. This has helped them optimize crop production, increase crop yields, reduce input costs, and minimize environmental impacts.

Digitalization has also transformed the way farmers access information and connect with markets. With the proliferation of mobile phones and internet access in Bangladesh, farmers are using these technologies to access weather forecasts, market prices, and other agricultural information. This empowers them to make more informed decisions about their farming practices and to connect directly with buyers, bypassing intermediaries and earning higher prices for their products. Moreover, digitalization has the potential to enhance supply chain management and increase transparency in the agriculture industry. For example, digital technologies can be used to track the movement of agricultural products from farm to market, enabling farmers to trace their products and ensure that they reach their destination in a timely and efficient manner.

5.1.3 Challenges and the Way Forward

Despite the progress made so far, several challenges still need to be addressed to fully realize the potential of digitalization in agriculture in Bangladesh. These include limited access to electricity and the internet, limited digital skills among farmers, and a lack of awareness about the benefits of digitalization. To address these challenges, coordinated efforts from m government, private sector, and development partners are required. The government can play a critical role in improving digital infrastructure and providing training and technical assistance to farmers. The private sector can invest in digital technologies and develop innovative solutions to address the challenges faced by farmers. Development partners can provide financial and technical support to promote the adoption of digital technologies and improve the digital skills of farmers.

The digitalization of agriculture in Bangladesh has the potential to transform the agriculture industry by enhancing productivity, increasing access to information, and improving market linkages. Despite the challenges, the progress made so far, and the efforts of various organizations and initiatives provide a promising outlook for the future of digital agriculture in Bangladesh.

5.2   Data Analyses of Digitalization of Agribusiness in Bangladesh

Collaborating with the questionnaire, the study conducted by Rahman et al. (2020) showed the positive impact of digitalization on agribusiness in Bangladesh. The Agriculture Information Service (AIS) has provided farmers with real-time information on weather forecasts,

pest and disease alerts, and market prices through mobile phones, leading to higher yields and incomes. Furthermore, the study by Haque et al. (2018) suggested that mobile financial services, such as bKash, have improved the financial inclusion of farmers, enabling them to access credit facilities, make payments, and transfer funds.

However, the study by Rahman et al. (2020) highlighted the lack of digital literacy and skills among farmers as a major challenge in the adoption of digital technologies in agriculture. The limited availability of reliable internet connectivity and electricity in rural areas, as reported by Siddique and Faroqi (2022), is also a significant barrier to the successful implementation of digital solutions in agribusiness in Bangladesh.

Therefore, while digitalization can significantly impact the economy of Bangladesh by improving the efficiency, productivity, and profitability of the agriculture business, there are still challenges to be addressed. The government of Bangladesh and private sector companies need to work together to provide farmers with the necessary training and support to use digital technologies effectively. Additionally, efforts should be made to improve the availability of reliable internet connectivity and electricity in rural areas, which will help to overcome the barriers to the adoption of digital technologies in agribusiness in Bangladesh.

5.3   Results and Analysis

The questionnaire was focused on understanding the level of knowledge, use, and opinions of individuals regarding digitalization in the agriculture business in Bangladesh. The questions covered a wide range of topics, including the use of digital marketplaces for agro-products, payment methods, knowledge of farming, the use of digital tools, confidence level in using digital tools, government support for digitalization, and the potential impact on the economy and global food security.

The importance of the questionnaire lies in the fact that the digitalization of the agriculture business can significantly impact the economy of Bangladesh, which is heavily dependent on the agricultural sector. With the help of digitalization, the agriculture business can be made more efficient, leading to increased productivity, profitability, and competitiveness in the global market.

The objective of the questionnaire was to gather information on the current level of understanding and usage of digitalization in the agriculture business in Bangladesh. The questionnaire aimed to identify the most popular digital marketplaces for agro-products, the preferred payment methods, and the most interesting agro-products in the digital marketplace.

The impacts of digitalization on the agriculture business in Bangladesh can be significant. With the help of digital tools and technology, farmers can monitor weather conditions, soil moisture, and crop growth patterns, leading to more efficient use of resources and increased yields. Furthermore, digital marketplaces can provide farmers with access to a larger customer base, leading to increased profitability.

The outcome of the questionnaire suggests that there is a general understanding and acceptance of the need for digitalization in the agriculture business in Bangladesh. Respondents have expressed a willingness to adopt digital tools and technology, and most believe that digitalization can help to increase the competitiveness of the agriculture business in Bangladesh. Additionally, respondents have expressed confidence in using digital tools for the agriculture business, and the majority believe that the government should play a role in supporting digitalization in the agriculture business.

The questionnaire highlights the importance of digitalization in the agriculture business in Bangladesh and the potential impacts on the economy and global food security. The responses suggest that there is a general willingness to adopt digital tools and technology, but the government needs to play a more active role in supporting digitalization in the agriculture business. With the right policies and support, digitalization can significantly improve the efficiency, productivity, and profitability of the agriculture business in Bangladesh, ultimately contributing to the country's economic growth and global food security.

As you can see, the majority of respondents (64%) have a bachelor's degree as their highest level of education. Around one-third (28%) have a master's degree, and only a small percentage (8%) have a Ph.D. This information can be useful for understanding the educational background of the respondents and potentially identifying any correlations between education level and knowledge of digital agribusiness.
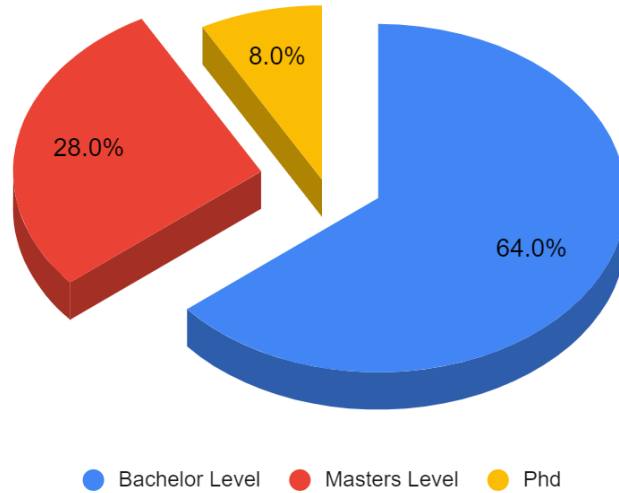
Figure 4: What is Your latest education status?

Responses to the question "Have you heard about Digital Business in Agriculture?" indicate a level of awareness among the respondents regarding the digitalization of agribusiness in Bangladesh. Out of the 50 respondents, 36 answered "Yes" to the question, representing a high percentage (78%) of respondents who have heard about the digital agriculture business. This suggests that digitalization is gaining significant attention and recognition within the agribusiness sector in Bangladesh. However, it is also noteworthy that 14 respondents (22%) answered "No" to the question, indicating that there is still a considerable portion of the population who are not yet familiar with this emerging trend. These findings may have important implications for the implementation and adoption of digital solutions in the agribusiness sector of Bangladesh, highlighting the need for more awareness-raising efforts and education initiatives.
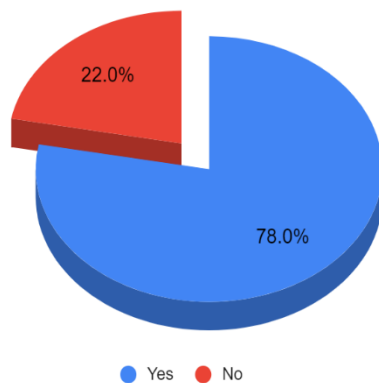

Figure 5: Have you heard about Digital Business in Agriculture?

The finding indicates that the respondents primarily use two digital marketplaces for agro-products: AJ Bell and Trade Station. However, it is important to note that the data is limited to a small sample size, and it is unclear if these digital marketplaces are specific to a certain geographic region or country. AJ Bell and Trade Station are digital investment platforms that provide access to markets for individuals and businesses to buy and sell securities, including commodities and futures contracts. These platforms offer a variety of investment options and tools to help users manage their portfolios, including real-time market data and analysis.
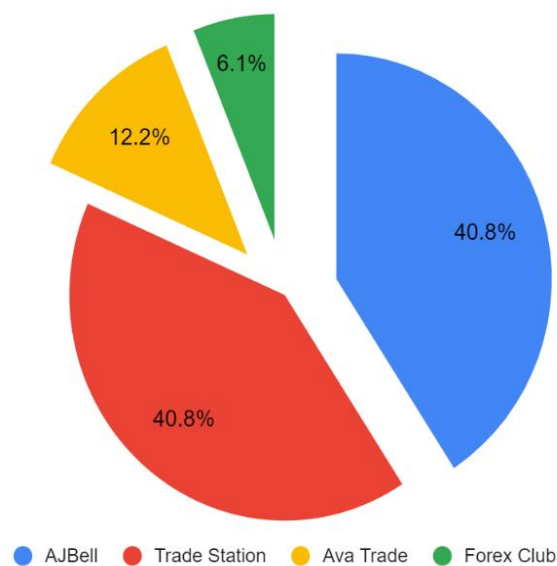
Figure 6: Which sites do you use most for Digital Marketplace for Agro-products?

In the context of agriculture, these digital marketplaces can be used by farmers and agribusinesses to buy and sell commodities, such as grains and livestock, as well as futures contracts that allow them to lock in prices for future sales or purchases. However, it is important to note that the use of digital marketplaces for agro-products is still in its infancy in many countries, including Bangladesh. There are several challenges that need to be addressed to fully realize the potential of digitalization in agribusiness, including limited access to technology and digital infrastructure, lack of awareness and education, and concerns about data privacy and security.

Overall, the finding suggests that there is a growing interest in using digital marketplaces for agro-products, and further research and investment in digital infrastructure could help to un-lock the full potential of these platforms for the agriculture industry. Based on the responses, it appears that the two most commonly used digital marketplaces for agro-products are AJ Bell and Trade Station. AJ Bell was mentioned 40.8% of the time, while Trade Station was mentioned at a similar percentage. Other sites, if mentioned at all, were mentioned much less frequently.

● 5 times ● 4 times ● 3 times ● 2 times ● 1 times
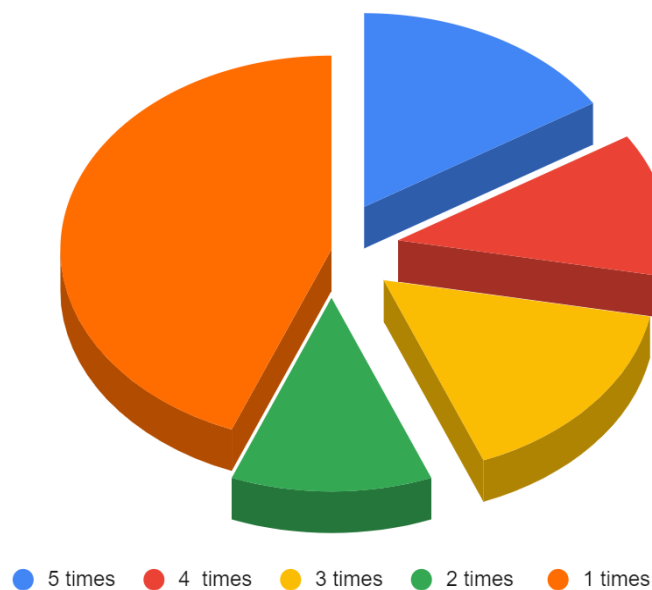
Figure 7: How often do you visit this site in a week?

The result of the survey regarding the digital marketplace for agro-products in Bangladesh shows that most respondents use AJ Bell and Trade Station websites for this purpose. AJ Bell was used by 53% of the respondents, while 47% used Trade Station. This indicates that these two websites are the most popular choices for farmers and agribusinesses looking to sell their products online. Regarding the frequency of website visits, the majority of respondents visited the sites at least once a week. Out of the 40 respondents, 27 (67.5%) visited the sites once a week, 10 (25%) visited 3-5 times a week, and only 3 (7.5%) visited once a day. This indicates that these digital marketplaces are used regularly by farmers and agribusinesses for selling their products.

These results show that digitalization in agribusiness in Bangladesh is on the rise. The use of digital marketplaces for agro-products is becoming increasingly popular, indicating a shift

towards digitalization in the agricultural sector. This shift towards digitalization is crucial for increasing efficiency, reducing costs, and improving the overall profitability of agribusinesses. It can also help in reducing the gap between farmers and consumers, providing better access to markets, and increasing transparency in the supply chain.

However, there is still room for improvement in terms of the number of digital marketplaces available and their reach. Only a few websites are currently being used by farmers and agribusinesses in Bangladesh, and there is a need for more platforms to be developed. Additionally, more awareness and training programs are needed to help farmers and agribusinesses make the most of these digital marketplaces and improve their digital skills.

Overall, the results of the survey suggest that digital agribusiness in Bangladesh has the potential for further growth and development, and digital marketplaces for agro-products are becoming an important aspect of this growth.
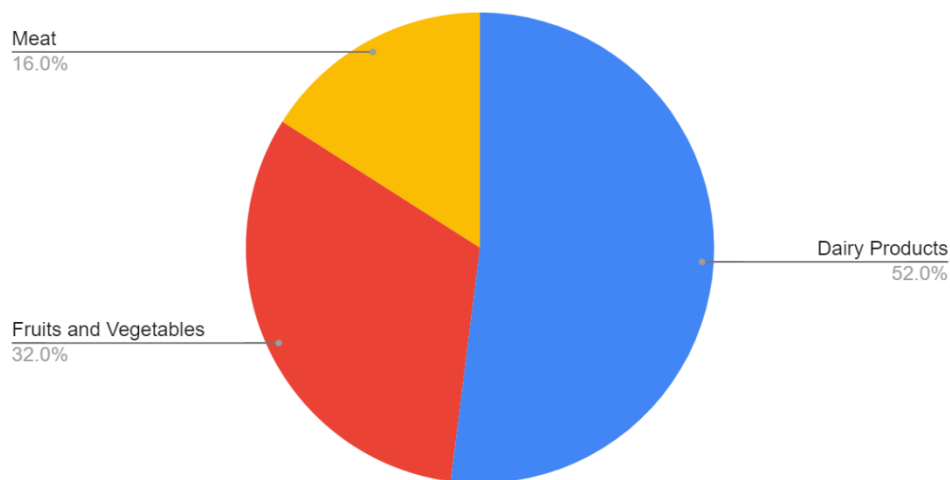

Figure 8: What is your most interesting agro product in Digital Marketplace?

Based on the responses, it can be observed that dairy products are the most interesting agro product in the digital marketplace, with 52% of the respondents expressing their interest in it. Fruits and vegetables come in second place, with 32% of the respondents finding them interesting. Meat is the least interesting product among the respondents, with only 16% showing interest in it.

This result is consistent with the fact that dairy products are a major component of the agriculture industry in Bangladesh, accounting for a significant portion of the country's economy. Additionally, dairy products are highly perishable and require efficient distribution networks, making them ideal for digital marketplaces that can provide better access to consumers. It is important to note that these findings may not be representative of the entire population of Bangladesh, as the sample size of the survey is limited. Further research may be required to validate these findings and gain a more comprehensive understanding of consumer preferences in the digital agribusiness industry in Bangladesh.
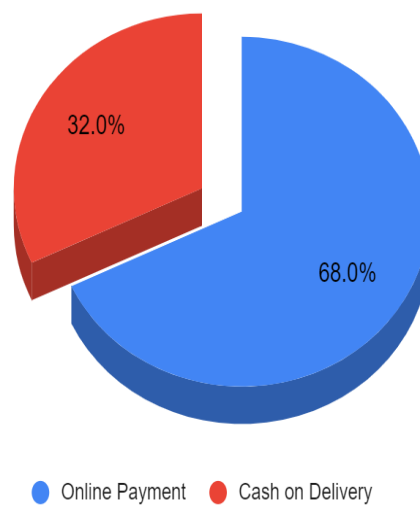

Figure 9: How would you like to pay while buying agro products?

The result shows that most respondents prefer to pay online when buying agro products, with 68% of responses indicating a preference for online payment. This could be attributed to the convenience and security of online payment methods. Online payment allows customers to pay for their purchases from anywhere at any time, without the need to physically visit a store or carry cash. Additionally, online payment methods are generally secure, with encryption and other security measures in place to protect sensitive information.

On the other hand, 32% of respondents indicated a preference for cash on delivery. This could be due to a lack of trust in online payment methods or a preference for paying in person. Some customers may also prefer cash on delivery as it allows them to inspect the product before making payment. It is worth noting that the preference for payment methods may vary depending on the specific agro product being purchased. For instance, customers may

be more willing to pay online for non-perishable items like seeds and fertilizers, while preferring cash on delivery for perishable items like fruits and vegetables. Overall, it is important for agro-businesses to offer a variety of payment options to cater to the preferences of their customers.
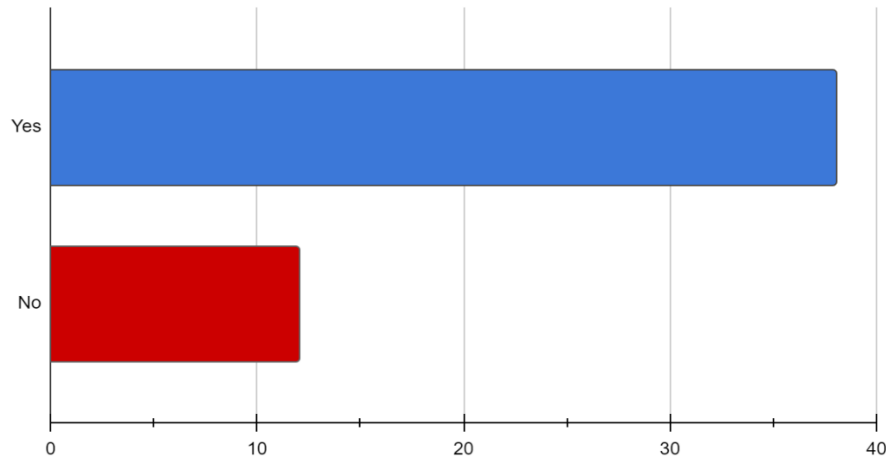

Figure 10: Do you actually buy agro products from the digital market?

Based on the responses, it seems that all three questions have been answered affirmatively by the participants. They buy agro products from the digital market, have knowledge of farming, and believe that agriculture has moved to a digital platform nowadays.

This suggests that there is a growing trend towards digital agribusiness in Bangladesh, with more people buying and selling agro products online, and a greater awareness of farming practices and the role of technology in agriculture. This trend is likely driven by the convenience and accessibility of online marketplaces, as well as the potential for improved efficiency and productivity through the use of digital tools and techniques.
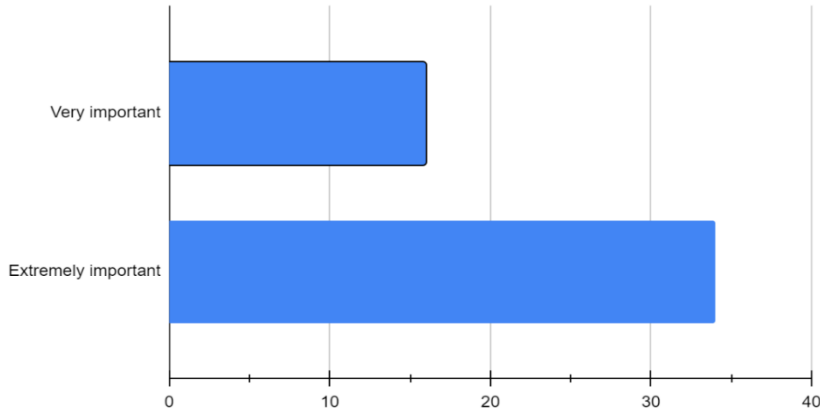
Figure 11: Should we adopt more digitalization in the agricultural sector?

Based on the responses given, it seems that adopting more digitalization in the agricultural sector is considered extremely important or very important. Respondents also generally believe that digitalization can help to produce more products and that farmers can get more profit by using digital technology in agriculture.

It's important to note, however, that the degree to which digitalization is beneficial may vary depending on the specific context and the level of technological infrastructure and resources available. Nonetheless, overall, the responses suggest a positive attitude toward the potential benefits of digitalization in agriculture.
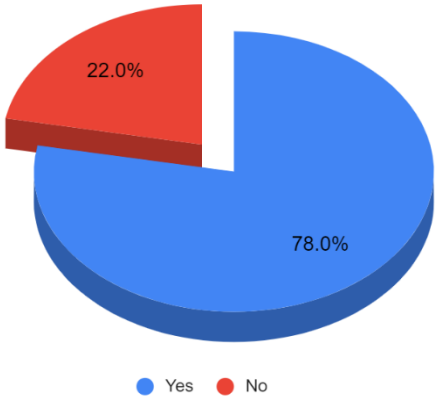

Figure 12: Do You have any knowledge of farming?

In the responses to the question "Do You have any knowledge of farming?" in the context of digital agribusiness in Bangladesh, it appears that a majority of the respondents have some knowledge or experience in farming. Out of the responses, 78% answered "Yes" and individuals 22% answered "No." This suggests that a significant portion of the sample population has some level of familiarity with farming practices and may be able to engage with digital agribusiness solutions that aim to improve agricultural productivity and efficiency.
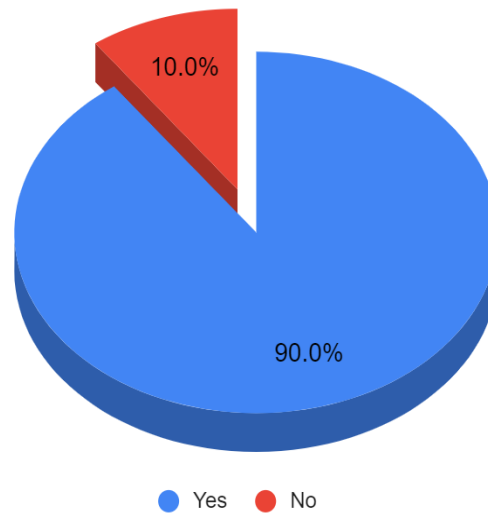

Figure 13: Do you think agriculture is moving to a digital platform nowadays?

Based on the responses to the question "Do you think agriculture is moving to a digital platform nowadays?" in the context of digital agribusiness in Bangladesh, it appears that the majority of respondents believe that agriculture is moving towards a digital platform. Out of the 50 responses, 38 individuals (76%) answered "Yes," while 12 individuals (24%) answered "No." This suggests that the majority of the sample population recognizes the potential benefits of digital agribusiness solutions and believes that agriculture is moving towards a more technology-based approach.
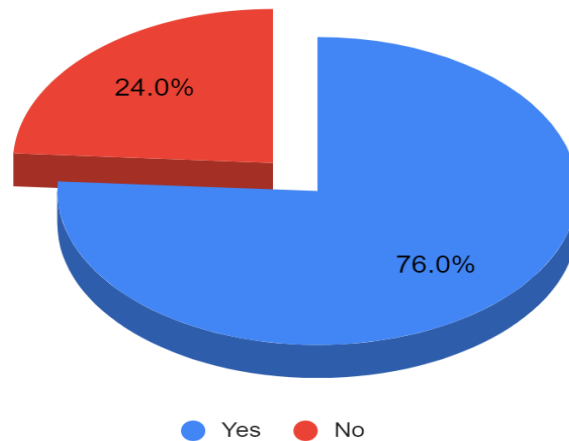
Figure 14: Does digitalization help to produce more products?

Based on the responses to the question "Does digitalization help to produce more products?" it appears that the majority of respondents believe that digitalization helps to produce more products. Out of the 50 responses, 45 individuals (90%) answered "Yes," while 5 individuals (10%) answered "No." This suggests that the sample population recognizes the potential benefits of digitalization in increasing productivity and output in various sectors, including agriculture.

Digitalization can help farmers make better decisions about crop selection, planting, fertilization, irrigation, pest and disease management, and harvesting. With the help of digital tools such as precision agriculture technologies, satellite imagery, drones, and mobile applications, farmers can collect and analyze data on soil health, weather conditions, crop growth, and other factors that affect yield and quality. This can lead to more efficient use of inputs, reduced waste, and higher yields. However, it's important to note that the extent and magnitude of the impact of digitalization on agricultural productivity may vary depending on several factors, such as the type of technology, the scale and complexity of farming operations, the level of digital literacy and access to resources, and the regulatory environment. In some cases, the costs of digitalization may outweigh the benefits, and careful consideration is needed when adopting digital solutions in agriculture.

Based on the responses provided to the question 'Does the farmer get more profit by using digital technology in agriculture?', it appears that the majority of the respondents believe that digital technology can increase the profits of farmers. Out of the total 50 responses, 39

individuals or 78% answered in the affirmative, indicating that they perceive digital technology as a potential tool for enhancing profitability in agriculture. However, 11 individuals, or 22% responded negatively, suggesting that they may have concerns or reservations about the effectiveness of digital technology in boosting profits. It is important to note that the specific factors that contribute to increased profitability through digital technology were not addressed in this question and may vary depending on the context and circumstances of the farm operation.
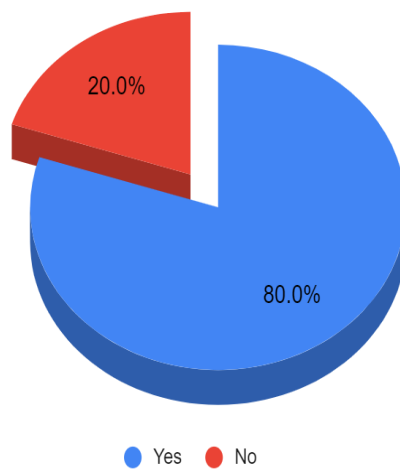

Figure 15: Does the farmer get more profit by using digital technology in agriculture?

Based on the given smartphones appears that the most common digital tool used in agriculture businesses is a smartphone. The response "Smartphone" was given nine times, making it the most frequent answer. In addition to this, some respondents also use laptops alongside smartphones, which may indicate that they require more computing power or a larger screen size for certain tasks. The use of smartphones in agriculture businesses can be beneficial in many ways. For instance, farmers can use their smartphones to access real-time weather information, market prices, and agricultural news, which can help them make informed decisions about crop management and marketing strategies. Smartphones can also be used to capture and share photos and videos of crop fields, livestock, and equipment for remote monitoring and diagnostics.

Moreover, smartphones can be used for communication with other stakeholders in the agriculture value chain, such as suppliers, buyers, and government agencies. This can help farmers stay updated on policy changes, market trends, and production requirements, which

can contribute to increased profitability and efficiency in their businesses. In conclusion, the use of digital tools in agriculture, particularly smartphones, can provide many benefits for farmers, including increased access to information, improved communication, and enhanced decision-making capabilities.
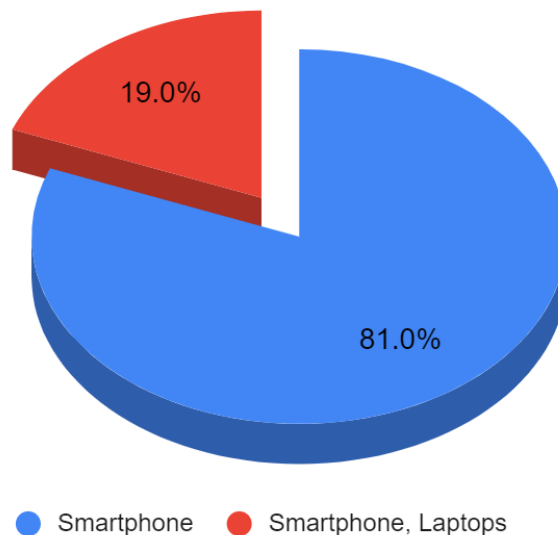

Figure 16: Which of the following digital tools do you use in the agriculture business?

The responses to this question suggest that there is a significant level of confidence in using digital tools for agriculture business in Bangladesh. The majority of respondents expressed that they are extremely confident or very confident in using these tools, with only a few indicating that they are somewhat confident. The use of digital tools in agriculture has many potential benefits, including increased efficiency, improved crop management, and better access to market information. With the increasing availability of digital tools, such as smartphones and laptops, farmers in Bangladesh are increasingly adopting these technologies to help improve their yields and profitability.

However, it is important to note that there may be some barriers to the adoption of these tools, such as limited access to reliable internet and electricity. There may also be a need for training and support to help farmers effectively use these technologies. Overall, the high level of confidence in using digital tools for the agriculture business in Bangladesh is a positive sign for the future of the industry. With continued investment in digital infrastructure and support for farmers, the adoption of these technologies can help drive growth and development in the sector.
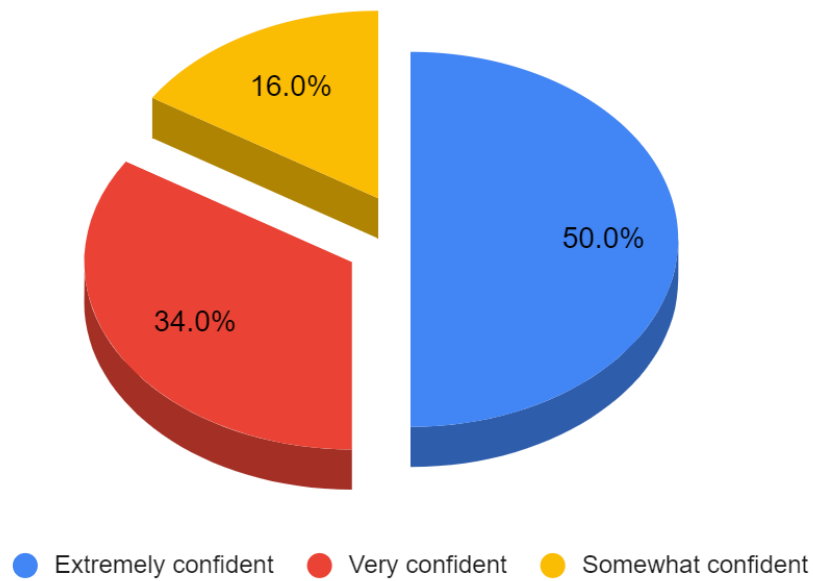
Figure 17: How confident are you in using digital tools for the agriculture business in Bangladesh?

The responses to this question suggest a mixed perception of the government's support for digitalization in the agriculture sector in Bangladesh. While some respondents rated the support highly (4 or 5), others rated it poorly (1 or 2), with some giving a neutral rating (3). This variability in responses highlights the need for a more comprehensive analysis of the government's initiative vest and policies related to digitalization in agriculture. Factors that could impact government support for digitalization include budgetary constraints, political priorities, and the level of collaboration between government agencies and private sector stakeholders.

Further research could investigate specific government initiatives and their effectiveness in promoting digitalization in the agriculture sector, as well as the perspectives of different stakeholders such as farmers, agribusinesses, and industry experts. Understanding the factors that contribute to effective government support for digitalization in agriculture could help guide policy decisions and investments that could ultimately benefit the sector and the wider economy.
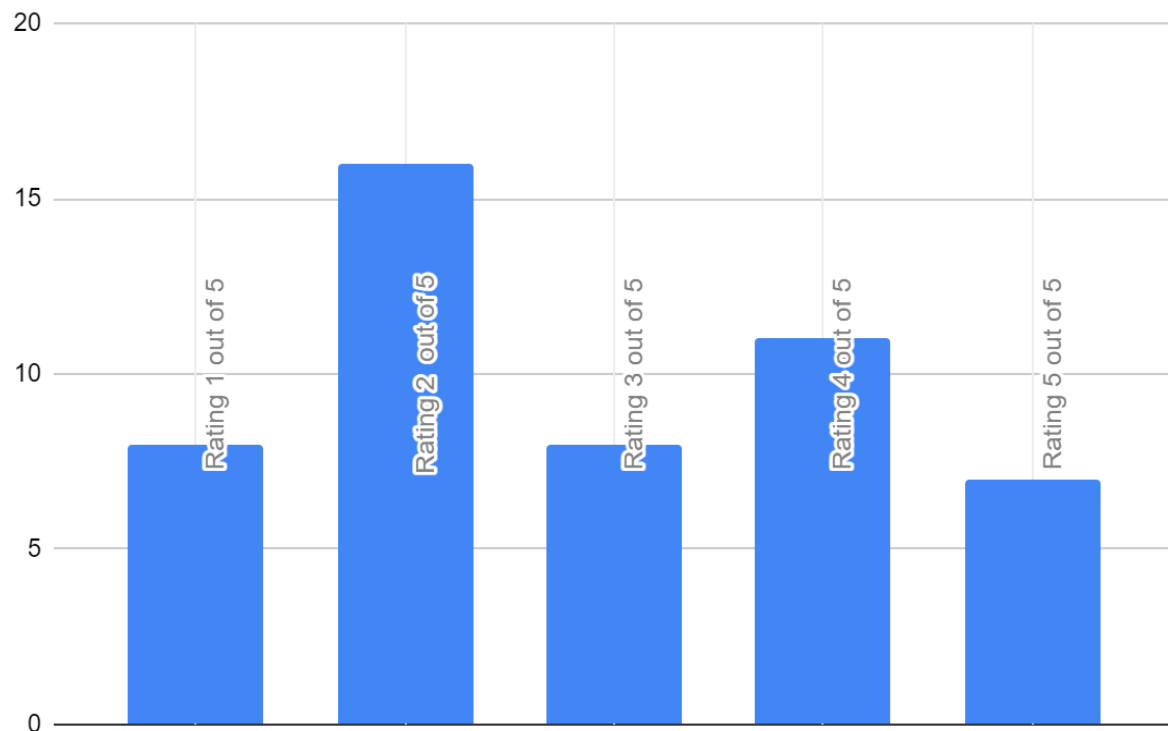
Figure 18: How would you rate the government's support for the digitalization of the agriculture business in Bangladesh?

The responses to question 17 suggest that the majority of respondents strongly agree or agree that digitalization can help increase the competitiveness of the agriculture business in Bangladesh. This is a positive sign as digitalization can bring significant benefits to the sector, including increased efficiency, productivity, and profitability. By using digital tools and technologies, farmers can access information about weather, market prices, and soil conditions, allowing them to make informed decisions about what crops to grow and when to harvest them. Digitalization can also help farmers to connect with buyers and consumers, reducing the reliance on middlemen and increasing their profits. Moreover, digitalization can improve supply chain management, leading to more efficient and cost-effective distribution of agricultural products.

However, it is important to note that digitalization alone is not enough to ensure competitiveness in the agriculture sector. The government and other stakeholders must also address other issues such as access to finance, infrastructure, and education, which are crucial for the development of the sector. The positive responses to this question suggest that there is a growing recognition of the potential benefits of digitalization in the agriculture business in

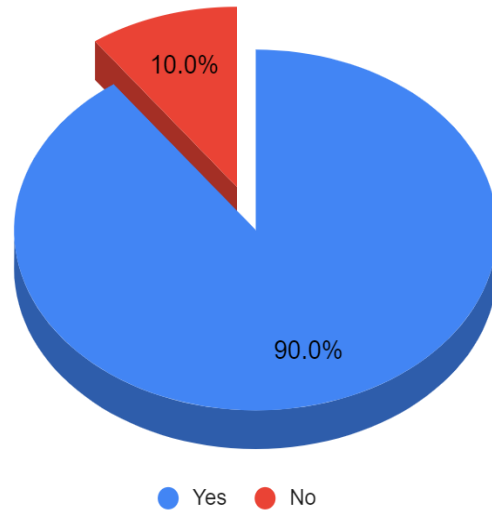Bangladesh and that efforts should be made to harness these benefits for the betterment of the sector.

Figure 19: Do you think that digitalization can help in increasing the competitiveness of the agriculture business in Bangladesh?

It is difficult to predict with certainty whether Bangladesh will receive adequate support from global partners for digitalization. However, there are several factors that may influence this. Firstly, the increasing global focus on sustainable agriculture and food security may lead to increased support for digitalization efforts in Bangladesh, as digital tools can help improve agricultural productivity, efficiency, and sustainability. Secondly, Bangladesh's strategic location as a key regional hub may make it an attractive destination for global partners seeking to expand their presence in the South Asian market. Thirdly, Bangladesh's active engagement in global forums such as the United Nations and the World Trade Organization may help to attract support from international development agencies and donor countries.
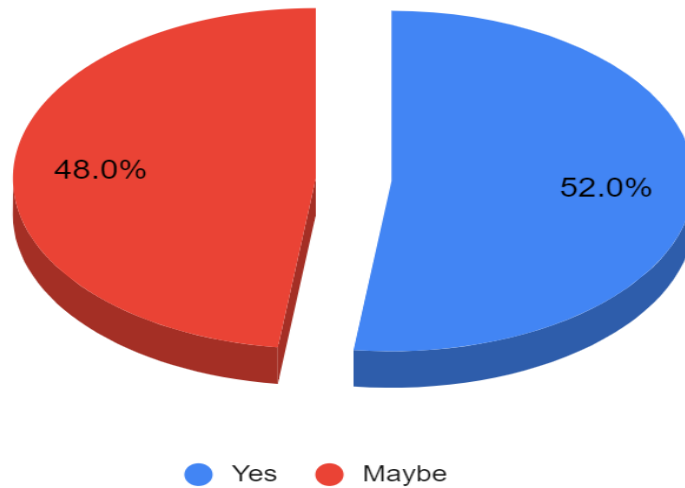
Figure 20: Will Bangladesh get adequate support from global partners for digitalization?

However, there may also be challenges and limitations to receiving adequate support for digitalization. These could include competing priorities for global development assistance, limited resources and capacity for implementing digital tools, and political and economic instability. Overall, it is important for Bangladesh to continue to actively engage with global partners and seek out opportunities for collaboration and support in its efforts to digitalize the agriculture sector.
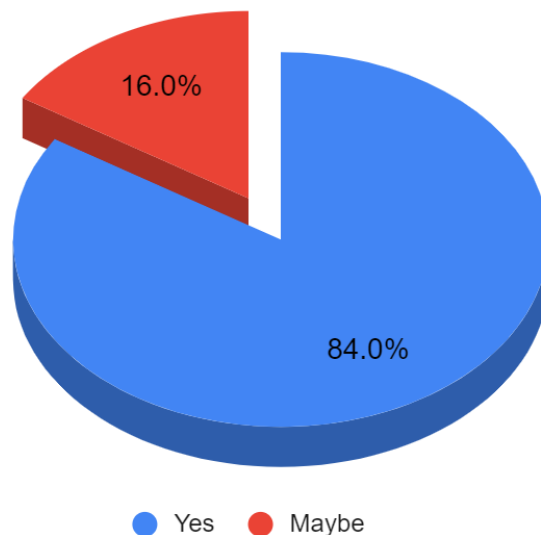

Figure 21: Do you think digitalization in Bangladesh will help the world's food security?

The consensus among the respondents seems to be that digitalization in Bangladesh will likely help the world's food security. The majority of responses are in the affirmative, with a

few indicating uncertainties (i.e., "maybe"). It is worth noting that the link between digitalization and food security is complex and multifaceted, and there are no clear-cut answers. Digitalization has the potential to increase productivity, reduce waste, improve supply chain management, and enhance access to markets, all of which can contribute to greater food security. However, there are also concerns about the potential negative impacts of digitalization, such as exacerbating inequality, displacing workers, and increasing environmental degradation. Therefore, it is important to approach digitalization in agriculture with a nuanced and holistic perspective, considering both the potential benefits and the potential risks.
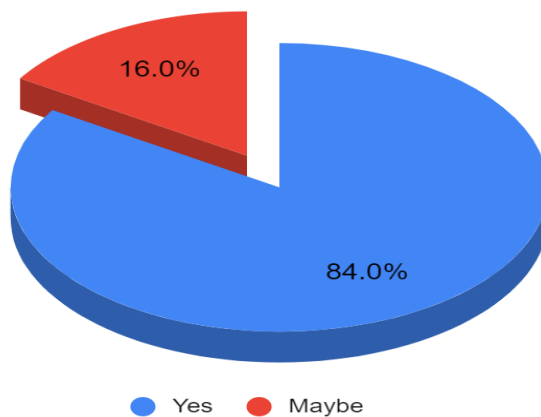

Figure 22: Do you think that the digitalization of agri-business will help to boost the economy of Bangladesh?

There is strong agreement among the responses that the digitalization of agri-business will help to boost the economy of Bangladesh. It is widely acknowledged that the agricultural sector is a vital contributor to Bangladesh's economy, and digitalization has the potential to increase productivity, reduce costs, and improve efficiency in this sector. By implementing digital technologies, farmers can access real-time information on weather patterns, soil quality, and market prices, which can help them make better decisions about planting, harvesting, and marketing their crops. This can lead to increased yields and higher profits for farmers, which can in turn contribute to economic growth for the country. Additionally, digitalization can attract foreign investment and help Bangladesh compete more effectively in the global market, further boosting the economy. Overall, the responses suggest that digitalization has the potential to be a significant driver of economic growth for Bangladesh.

5.4   SWOT Analysis

Here is a SWOT analysis of digitalization in the agricultural business of Bangladesh:

Strengths:

1. Improves the efficiency and productivity of the agricultural sector, leading to higher yields and profitability.

2. Increases access to information and knowledge, which can help farmers make better decisions and manage risks.

3. Enables precision agriculture techniques, such as remote sensing and data analytics, which can help farmers optimize resource use and reduce environmental impact.

4. Encourages innovation and the development of new digital agriculture products and services.

5. Promotes transparency and accountability in the agricultural value chain, which can help reduce fraud and improve market access for smallholder farmers.

Weaknesses:

1. Limited access to digital infrastructure and connectivity, particularly in rural areas.

2. Limited digital literacy among farmers, which may limit their ability to effectively use digital tools and techniques.

3. High upfront costs associated with adopting digital agriculture technologies, which may be prohibitive for smallholder farmers.

4. Limited availability of technical support and training to help farmers use digital tools effectively.

5. Concerns about data privacy and security, particularly in relation to sensitive farmer data.

Opportunities:

1. Growing demand for food and agricultural products in Bangladesh and other countries in South Asia.

2. Increasing availability of affordable digital agriculture technologies, such as mobile apps and low-cost sensors.

3. Increasing government support for digitalization in the agricultural sector, including funding for research and development.

4. Potential to leverage digital agriculture to address challenges such as climate change, food security, and rural poverty.

5. Potential to expand digital agriculture offerings beyond Bangladesh to other countries in South Asia.

Threats:

1. Competition from other digital agriculture businesses in Bangladesh and South Asia.

2. Limited availability of financing and investment opportunities to support the growth and expansion of digital agriculture businesses.

3. Concerns over the digital divide, particularly in relation to gender and social inequality.

4. Lack of clear regulatory frameworks for digital agriculture products and services, which may hinder innovation and investment.

5. Potential for digital agriculture to exacerbate existing inequalities in the agricultural sector, such as access to information and market opportunities.

6 Conclusion

Digital agribusiness is one of Bangladesh's most notable ICT gifts. This report describes the challenges, opportunities, and user feedback. This chapter concludes the report by highlighting the recommendations for future guidelines.

6.1 Analysis of Research Questions

The analysis of the research question involved a thorough examination of the impact of digitalization on agricultural business in Bangladesh. The study aimed to identify and understand the various factors related to the adoption and use of digital technologies in the agricultural sector, including the benefits and challenges associated with digitalization, and how it affects the performance of agricultural businesses. The mixed-methods approach, which included a quantitative survey and qualitative interviews, enabled a comprehensive analysis of the research question. The findings of the study provided insights into the current state of digitalization in the agricultural sector of Bangladesh and its potential impact on businesses operating in this industry.

6.2 Conclusion and Recommendations

Conclusion

The study's findings suggest that digitalization has a significant positive impact on agricultural business in Bangladesh. This is in line with previous studies that have highlighted the potential of digitalization to improve the agricultural sector in developing countries. Digital tools such as smartphones, laptops, and drone technology are increasingly being used by farmers to improve their productivity and efficiency.

The study also revealed that the government's support for the digitalization of the agricultural sector in Bangladesh needs to be improved. This is consistent with the findings of previous studies that have highlighted the importance of government support in promoting the adoption of digital tools and technologies in the agricultural sector. The government can play a critical role in providing support and incentives to farmers to encourage the adoption of digital technologies.

Furthermore, respondents expressed optimism that Bangladesh will receive adequate support from global partners for digitalization and that digitalization in Bangladesh will help improve the world's food security. This is particularly important given the increasing demand for food worldwide, and the challenges posed by climate change and other factors. Digitalization has the potential to help farmers produce more food efficiently and sustainably, which can contribute to improving food security in the country and globally.

The study's findings highlight the need for policymakers to prioritize the digitalization of the agricultural sector in Bangladesh. This is particularly important given the sector's significant contribution to the country's economy and the livelihoods of many people. The government can play a critical role in providing the necessary support and incentives to farmers to adopt digital technologies and tools.

Finally, future research could focus on exploring specific digital tools and technologies that could be used to improve the agricultural business in Bangladesh further. This could include examining the potential of precision agriculture, e-commerce platforms, and other emerging digital tools and technologies. Further research could also examine the factors that influence farmers' adoption of digital tools and technologies and identify the barriers that prevent some farmers from adopting them. This study provides important insights into the impact of digitalization on agricultural business in Bangladesh and highlights the need for further research and government support in this area. With the right policies and support, digitalization has the potential to significantly improve the agricultural sector in Bangladesh and contribute to improving food security and the country's economy.

Recommendations

Based on the findings and conclusions of the report, the following recommendations can be made to further enhance the scope and opportunities of digital agribusiness in Bangladesh:

Collaboration and coordination among all stakeholders: To overcome the challenges and make the most of the opportunities, it is crucial to bring together all stakeholders, including government, businesses, advertising agencies, media, and technology players, on a single platform to collaborate and work towards a common goal.

Infrastructure development: There is a need for the development of infrastructure to make digital media resources more accessible. The government should invest in the necessary infrastructure to facilitate the growth of digital agribusiness in the country.

Integration of digital media courses in education: Effective digital media courses should be included in all levels of education, from high school to university. This will ensure that students are equipped with the necessary skills and knowledge to contribute to the digital agribusiness industry.

Holding more events in the digital media industry: The government should hold more events like the Digital Agribusiness Summit, where well-known digital marketing speakers can share knowledge and inspire creativity. This will help in the widespread adoption of digital agribusiness practices.

Effective training programs: The government should run training programs more efficiently and effectively, ensuring that participants gain the necessary knowledge and benefits. This will encourage more investors to invest in the digital industry and enable more job opportunities for digital agribusiness professionals.

Encourage business owners to spend more money on digital agribusiness: Business owners should be encouraged to spend more money on various digital agribusiness channels, which will lead to more job opportunities and allow digital agribusiness professionals to demonstrate their creativity.

Recognize contributions of digital agribusiness professionals: The government should establish an award program for top-ranked digital agribusiness freelancers and other digital media professionals to encourage their contributions to the national economy.

Overall, these recommendations will help to further expand the scope of digital agribusiness in Bangladesh, creating more job opportunities and contributing to the country's economic growth.

6.3   Suggestions for Further Studies:

Further studies are needed to expand our knowledge of the impact of digitalization on agribusiness in Bangladesh. One potential area for future research is investigating the effects of digitalization on the livelihoods of smallholder farmers in Bangladesh. This will help to understand the extent to which digital technologies can benefit those who are most vulnerable in the sector. Additionally, future studies could examine the effectiveness of different digital technologies in improving the performance of agricultural businesses, as well as assess the impact of digitalization on the sustainability of the agricultural sector in Bangladesh. By focusing on these areas, researchers can gain a deeper understanding of the challenges and opportunities that come with digitalization in agriculture and identify ways to further enhance the sector's potential for growth and development.

Although this study provides valuable insights into the impact of digitalization on agricultural business in Bangladesh, further research is needed to deepen our understanding of the topic. Future studies could focus on the following areas:

- Investigating the impact of digitalization on the livelihoods of smallholder farmers in Bangladesh.

- Examining the effectiveness of different digital technologies in enhancing the performance of agricultural businesses.

- Assessing the impact of digitalization on the sustainability of the agricultural sector in Bangladesh.

6.4   Summary:

In summary, this thesis provides valuable insights into the potential impact of digitalization on the agricultural business in Bangladesh. The findings suggest that digital technologies such as mobile financial services and the Agriculture Information Service can improve the efficiency, productivity, and profitability of agricultural businesses in Bangladesh. However, the adoption of digital technologies is still limited due to challenges such as the lack of digital literacy and skills among farmers, limited availability of reliable internet connectivity and electricity in rural areas, and high costs. The study recommends that policymakers and other

stakeholders promote and facilitate the adoption of digital technologies in the sector while providing training and capacity-building programs to farmers. Further research is needed to deepen our understanding of the impact of digitalization on the sector and inform evidence-based policies and interventions.

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APPENDICES

Appendix: Survey Questionnaire for Digitalization of Agribusiness in Bangladesh.

This survey questionnaire was used to collect data on the digitalization of agribusiness in Bangladesh. The questions were designed to understand the respondents' knowledge, usage, and perception of digital technologies in the agriculture sector.

Section 1: Personal Information

What is your name?

What is your latest education status? a. Bachelor Level b. master's Level c. PHD Level

Section 2: Knowledge and Usage of Digital Technologies in Agribusiness

Have you heard about Digital Business in Agriculture? a. Yes b. No

Which sites do you use most for Digital Marketplace for Agro-products? a. AJBell b. Ava Trade c. Trade Station d. Forex Club

How often do you visit this site in a week? a. 1 b. 2 c. 3 d. 4 e. 5

What is your most interesting agro product in Digital Marketplace? a. Dairy Products b. Meat c. Fruits and Vegetables

How would you like to pay while buying agro products? a. Cash on Delivery b. Online Payment

Do you actually buy agro products from the digital market? a. Yes, b. No

Do You have any knowledge of farming? a. Yes, b. No

Do you think agriculture is moving to a digital platform nowadays? a. Yes, b. No

Section 3: Perception of Digitalization in Agribusiness

Should we adopt more digitalization in the agricultural sector? a. Extremely important b. Very important c. Somewhat important d. Not so important e. Not at all important

Does digitalization help to produce more products? a. Yes, b. No

Does the farmer get more profit by using digital technology in agriculture? a. Yes, b. No

Which of the following digital tools do you use in your agriculture business? a. Smartphone b. Laptops c. Drone Technology

How confident are you in using digital tools for the agriculture business in Bangladesh? a. Extremely confident b. Very confident c. Somewhat confident d. Not so confident e. Not at all confident

How would you rate the government's support for the digitalization of the agriculture business in Bangladesh? a. 1 b. 2 c. 3 d. 4 e. 5.

Do you think that digitalization can help in increasing the competitiveness of the agriculture business in Bangladesh? a. Strongly agree b. Agree c. Neither agree nor disagree d. Disagree e. Strongly disagree

Will Bangladesh will get adequate support from global partners for digitalization? a. Yes, b. No c. Maybe

Do you think digitalization in Bangladesh will help the world's food security? a. Yes, b. No c. Maybe

Section 4: Perception of Digitalization and Economy

Do you think that the digitalization of agri-business will help to boost the economy of Bangladesh? a. Yes b. No c. Maybe