

## An Analytical Approach for Digital Transformation & Modernizing Agricultural Framework through ICT in Rural Areas, Rajshahi

R. D. Chakraborty<sup>1</sup>, M. Hasan<sup>2</sup>, M. A. Shahriar<sup>3</sup>, R. Jahan<sup>4</sup>, M. A. Wakil<sup>5</sup>, D. Sarker<sup>6</sup>

<sup>1</sup>Department of Urban and Regional Planning, RUET, Bangladesh ([rowdra2@gmail.com](mailto:rowdra2@gmail.com))

<sup>2</sup>Department of Urban and Regional Planning, RUET, Bangladesh ([mehediurp18@gmail.com](mailto:mehediurp18@gmail.com))

<sup>3</sup>Department of Urban and Regional Planning, RUET, Bangladesh ([shahriaromi007@gmail.com](mailto:shahriaromi007@gmail.com))

<sup>4</sup>Department of Urban and Regional Planning, RUET, Bangladesh ([rownikjm58@gmail.com](mailto:rownikjm58@gmail.com))

<sup>5</sup>Assistant Professor, Department of Urban and Regional Planning, RUET, Bangladesh ([mawakil.wakil@gmail.com](mailto:mawakil.wakil@gmail.com))

<sup>6</sup>Assistant Professor, Department of Urban and Regional Planning, RUET, Bangladesh ([dulalsarker.ruet@gmail.com](mailto:dulalsarker.ruet@gmail.com))

### Abstract

The advent of Information and Communication Technology (ICT) has ushered in a new era of revolutionary digital development for Bangladesh, offering a fast-track route toward nation-building. However, rural areas, where human capital was ranked 111th globally in 2017, and ICT development was placed 147th, have been unable to keep pace with urban counterparts, due to factors such as reduced access, utilization, and skill levels in the industry. To achieve faster economic growth, the development of ICT skills among both children and adults is a critical first step. As an agriculture-based country, Bangladesh can leverage the modernization of agriculture to achieve the goal of digitalization, while enhancing the economy through cost-effectiveness and reducing dependency on foreign markets. For example, Charghat Upazila in Rajshahi, one of the country's major agriculture sectors, has been facing significant challenges in agricultural production and a decline in living standards due to the COVID-19 pandemic. By promoting ICT for the development of agricultural frameworks and educational systems, it is possible to enhance the economy by empowering the young generation with their vast ICT expertise, while also promoting occupational diversification, entrepreneurship, and women's empowerment. The resultant changes will constitute a digital economic revolution for Bangladesh, helping to attain Sustainable Development Goals (SDGs) such as growth based on education and employment.

**Keywords:** ICT (Information and Communication Technology), Agriculture, Education, Economy.

### 1. Introduction

Digital development is one of the effective ways to develop one country rapidly. Digitalizing the population by improving telecommunication and network systems can relate to every aspect of the country's development. Bangladesh was ranked 111th in the global human capital index in 2017 and 147th in global ICT development. Promoting ICT skills among kids and adults is widely acknowledged as a vital step toward greater economic growth. **Education** and **Employment** based growth is one of the main SDGs (Sustainable Development Goals) in recent years. Deployment of an ICT-based SDG information system that connects public services, public facilities, the business sector, and the public will be an initial step for the growth of the rural area. The concept of the **Modern Village** is nothing more than an improvement of ICT and telecommunication. Rajshahi, one of the influential cities of Bangladesh has a prominent impact on the northern region of Bangladesh in terms of economy and development. Charghat Upazila (Rajshahi district), is located between 24°14' and 24°22' north latitudes and in between 88°46' and 88°52' east longitudes for its river-based location and agricultural influence in the regional economy having river interdependence. According to BBS 201, 227,356 people are living in Charghat. 50.44 % of people are male and 49.56 % are female. 44.02% of people are literate (males 52.72%, females 35.08%). Charghat Union is remarkable in the production of rice, wheat, and sugarcane. The involved 80% of the population in agriculture makes it an important agricultural hub of Rajshahi. The research emphasizes the community-based assessment and development of the rural community and economy of the Rajshahi considering ICT and telecommunication in the education and agricultural sector. The major objectives of the research are to get knowledge about advanced technology and apply digital methods in rural agricultural aspects, create self-employment opportunities in various sectors, improve technical-based education systems, and get higher educational opportunities. This will be a base for digital Bangladesh in the revolution of the economy.

## **2. Literature Review**

### **2.1. Digitalization of Agriculture in Bangladesh**

Digital transformation creates new forms of organizational, innovation, and management activities, takes the lead in the development of domestic industrial potential, and creates new competitive advantages by improving business processes for knowledge and information management, increasing the number of technological innovations, and staffing them with professional competencies. Bangladesh is forming agricultural programs to introduce new technologies and promote ICT in rural areas. Although crop production in Bangladesh has advanced significantly, data indicates that farmers there do not fully utilize technology, and that input usage might be decreased through the adoption and dissemination of increased agricultural mechanization (Nargis, F., & Lee, S., 2013)

Crop diversification is suggested as a desired technique for agricultural expansion to enhance Bangladesh's resource economy, productivity, and farming efficiency (Rahman, S., 2010). The output and income of smallholder vegetable growers in Bangladesh's interior and coastal regions could increase thanks to innovative agricultural methods (Ferdous, Z. et al., 2017). So, digitalizing the framework in the supply and market chain has become one of the prime concerns for rural markets.

### **2.2. ICT in Rural Market Framework of Bangladesh**

Currently, "rural diversification" is a top priority for rural development (Herslund, L., 2007). The rural market mechanism is much more dependent on the growth center. It is the market for the distribution of agricultural goods all over the country. Growth regions for rural development and suggestions for future state and local policies in rural areas that are intended to raise the standard of living for rural residents and keep labor resources in their typical rural areas of residence (Erokhin, V., 2014). Rural growth highly depends on the development of the markets. The rural market is vastly influenced by small-scale farming. In the context of Bangladesh, female economic participation in small-scale farming helps them to overcome prejudice, and socioeconomic barriers, and achieve the highest level of empowerment. If the government adopts the right gender policy, rural women's income and livelihood status will also significantly increase (Kabir, M. et al., 2019).

ICT significantly enhances the competitiveness of agriculture and forestry, the quality of life, and the diversification of the rural economy while encouraging entrepreneurship (Musingafi, M., & Zebron, S., 2014). So, rural development can be easily enhanced with proper policy planning through ICT. Government backing, top management support, financial assistance, and awareness of the advantages all play a significant role in determining the adoption of ICTs in rural SMEs in Bangladesh (Hoque, M. et al., 2016).

### **2.3. Information and Communication Technology in Education Sector**

The development process of an area is vastly dependent on educational growth. The modern education system enables the young generation to be skilled in every sector which will bring a revolutionary change in rural regions. Communication and Information Technology has the power to boost academic enthusiasm, questioning prowess, research spirit, and grade point average (Ghaznavi, M. et al., 2011).

Information and Communication Technologies in Education are essential as a significant "support" in developing students' critical and creative thinking considering political and geographical knowledge (Ferreira, N et al., 2014). Shortly, ICT may present a significant potential to improve the supply of technology and information services to Bangladesh's rural residents (Haque, M., & Hoque, M., 2021).

## **3. Methodology**

The data collecting and data analysis process is conducted through questioner survey with a sample of 50 with a simple random sampling technique to delineate the demographic scenario of Charghat. It provides the demographic data of 50 families. To illustrate the community-based scenario and overall education and agricultural chain, PRA (Participatory Rural Appraisal) is used. GIS modeling is used for market connectivity and service area. The SPSS-based analysis provides a proper demographic and education condition of Charghat. This will be influential establish an ICT-based education system and market system in Charghat.

## **4. Data Analysis and Discussion**

The data analysis portion of the research includes the PRA and GIS-based tool application analysis to enrich the information of the existing scenario and delineate proper recommendations for the development of education and agricultural perspective.

#### 4.1 Demographic condition of Charghat Upazila

The demographic scenario concludes the housing status, utility, population, and occupation condition regarding the educational condition of the area. The questionnaire survey-based research concludes the highest percentage of housing is semi-pucca about 32%. The rapid population growth of 1.8% average annual pace has significance in the economy as the majority of people are involved with agricultural production. The **Palli Bidyut** covers almost 90% of housing with electricity. But the load-shedding condition in recent times is influencing people to move towards solar. The local people are highly dependent on tube-well water sources. The overall percentage indicates the rural perspective of the people. More than 80% of individuals work in agriculture directly, and the remaining 20% work in agriculture indirectly through farming services, businesses, labor, or marketing (Field Survey, 2022). However, the farmers do not receive the real price or a good life because of the poor market chain and 3<sup>rd</sup> man issues in the market. The questionnaire data represents the influence of the agricultural sector which requires a modification to enhance the demographic condition and living standard of the people. A digital market model will surely be a revolutionary change for the economic growth of Charghat.

Considering the educational condition, higher study condition is quite good among family sizes. The Correlations analysis between NUMBER\_OF\_FAMILY\_MEMBERS & NO\_EDUCATED\_PERSON\_FAMILY concludes **as the number increase for a family, the number of educated persons also increases**. This tendency is the result of the **literacy rate growth** of the upazila. Charghat upazila is growing in the education sector by year but in the overall scenario, it is quite in a poor condition. Among Over 60% of families have access to higher education, with 20% enrolling in college, 10% pursuing master's degrees, and 26% attending universities (Field Survey, 2022). People in the area work in the agriculture sector in addition to their day jobs and have solid educational backgrounds. But in terms of technological advancement, they are quite lagging in the agricultural and educational sectors. The modernizing process of the village emphasizes ICT-based improvement among the students and as well as among the farmers. The present scenario analysis helps in policy-making for the improvement of ICT in Charghat Upazila.

#### 4.2 ICT (Information & Communication Technology) and Technological Condition in Charghat Upazila

One of the major based on the existing situation of ICT and its uses by different services of people more probably with specific to **students and farmers**. The internet environment and its connecting service are necessary for ICT-based development.

Table 1: Daily Device Used based on social media of the students of Charghat

DAILY_DEVICE_USED * SOCIAL_MEDIA_USED_MOST Crosstabulation						
		SOCIAL_MEDIA_USED_MOST				Total
		Facebook	YouTube	TV	Game	
DAILY_DEVICE_USED	1-3hr	0	0	0	2.86%	2.86%
	3-6hr	5.71%	22.86%	2.86%	25.71%	<b>57.14%</b>
	9-12hr	11.43%	0	0	20.00%	31.43%
	>12hr	0	0	0	8.57%	8.57%
Total Percent		17.14%	22.86%	2.86%	<b>57.14%</b>	100%

The crosstabulation shows about **88%** of the people have an average time of **6-12 hrs**. The tendency to use devices more is in the age range of **12-25 years**. Games are highly popular among the **young generation**. About 80% of people use devices for gaming in the time range of 3-12 hrs. Over the last 5 years, the rate has increased at a high scale. As from the analysis, the tendency in gaming is leading students away from their studies. Familiarity with modern devices is required among the farmers to enhance the condition.

#### 4.3 Influence of Internet and ICT among Students at Charghat Upazila

Along with the modern world, Bangladesh is taking various programs to introduce ICT among students. Charghat is getting familiar with these modern technologies as 85% of students are familiar with ICT and internet usage. In Charghat Upazila, 45% of residents have access to 4G, compared to 40% who have 3G. The potential ICT expansion is now conceivable thanks to the 84% area coverage of 3G and 4G (Field Survey, 2022). According to the factor Analysis, gamers have higher device time of using and a negative relation with classes attendance in corona time which means gamers have lower attendance in online classes. Daily device use is the primary reason for the increasing gaming popularity of games like PUBG, FREE-FIRE, COD, MINI-MILITIA, and so on. That effect the education and class attendance of the students. So, the overall analysis represents the poorly maintained use of the internet among the young generation which needs to be controlled for the better

future of the young generation. The future economy of Charghat can be enhanced by maintaining the addictive nature of the young generation with the guidance of the teachers or by motivating them to the proper utilization of smartphones than only gaming.

#### 4.4 Economic Zone Analysis and Problems Occurring in the Market at Charghat Upazila

In Charghat, Rajshahi there are 4 Growth Centers & 14 Rural Markets which serve the area for the business of agriculture. Agricultural products were the primary source of income for the vast majority of people in the village. The growth center or neighboring bazaars are where they sell their wares. They lack the finances or the confidence to travel to larger cities, and they have no access to or knowledge of online platforms. According to Expertise, a growth center covers a range of 5 km around it which refers to the service zone of a growth center.

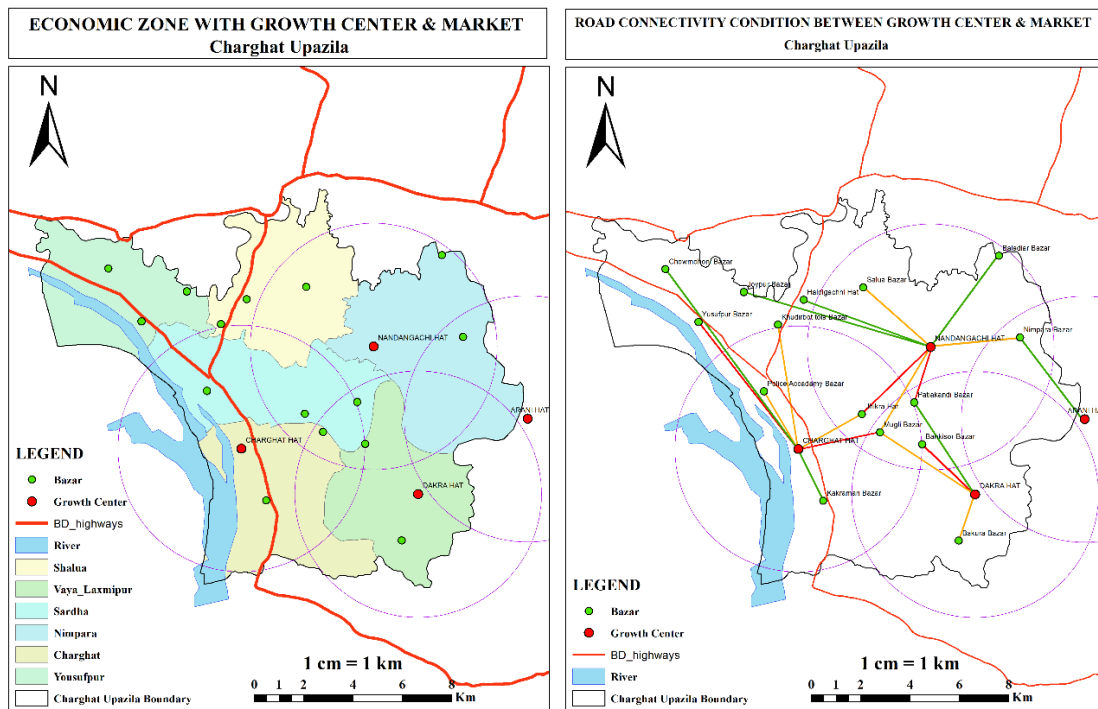


Figure 1: Economic Zone and Transportation Facility Condition at Charghat Upazila, Rajshahi

The network service analysis shows the bazaars that attain services from the growth centers. The growth center's service zones cover different markets and villages in perspective of economic services. Markets like Mughli, Bankishor, and Jhikra have benefited from different growth centers. The economic performances depend on the competitiveness and transportation condition which requires interconnectedness to develop the overall economy and less facilitated markets can be developed with ICT based market model to improve the agriculture market Chain. The transportation network scenario presented through the map concludes the major used minor road condition between a bazaar and a growth center based on **participatory focus group discussion** where Chowmohon, Kakramari with Charghat Hat; Patiakandi with Dakra; Joypur, Holidaygachi, Baladiar with Nandangachi and Nimpara with Arani Hat have a good transportation system. Farmers face difficulties in transporting goods from Bankisor, Jhikra, and Yusufpur Bazar. Except for the national highway, the internal minor roads are mostly in poor condition which hampers the market field to market transportation. The analysis repents the requirement of online markets to lessen the loss through transportation.

#### 4.5 Agricultural Condition and Market Chain of Charghat Upazila

The agriculture market runs through the Growth center for the rural areas. Being agriculture the main occupation, 60% of the people have around 40k-80K income range. Over the last 60 years, Magno business and Cattle farming have increased in rural areas (Field Survey, 2022). Charghat holds about 13.51% of the total agricultural land of Rajshahi District.

Charghat Hat, Dakra Hat, Nandangachi Hat, and Arani Hat are the major growth centers that cover small markets and Bazar like Bakura, Kakramari, Bankishor, Mugli, Patiakandi, Nimpara, Holidaygacchi, Yusufpur and so on. The market process is quite simple in Charghat. In the meantime, farmers are having issues like 3<sup>rd</sup> parties and low goods prices.

The marketing system that runs from manufacturing to the consumer's hand is referred to as the "market process." This image illustrates how a village (Gobindapur) functions in conjunction with adjacent bazaars (Kakramari) and a growth center (Charghat Hat).

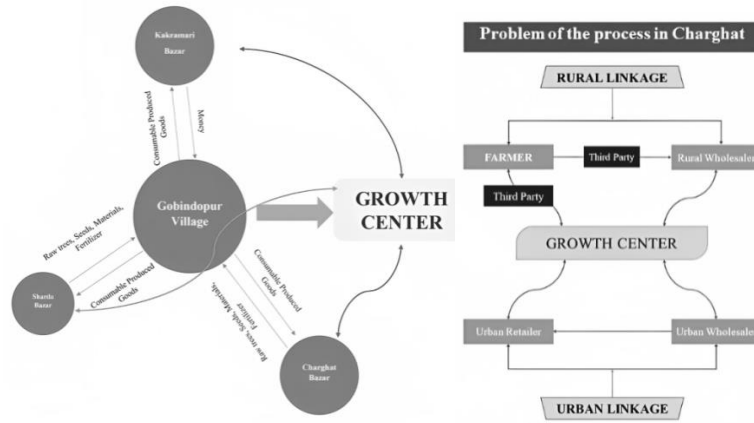


Figure 2: Market Chain and Problems in the market flow of Charghat Upazila

The intermediate role of brokers, who buy goods and services from farmers at reduced prices and sell them as their own, results in unequal remuneration for Charghat farmers' goods. Poor road conditions with the main market and knowledge gap in ICT to know the market price are some of the causes of this problem. So, a proper market is required for the economic development of Charghat Upazila.

## 5. Recommendation

### 5.1 Author's Prospects Based on Ground Validation

The GIS, SPSS, and PRA analysis shows various factors of the agricultural market and educational sector. Community-based analysis has been identified. A cause solution framework and a market module are proposed based on ground validation, local perspectives, and the SDGs framework.

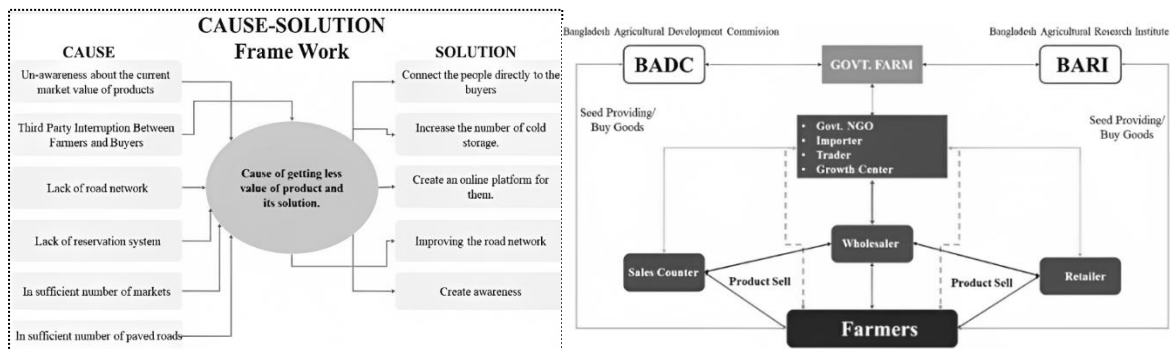


Figure 3: Cause Solution Framework and Proposed market model for Charghat Upazila

The cause-solution framework confuses the local issues and less value of the products. The improvement of roads and modernized markets based on ICT help the farmers to get along with the world market and that will change the agricultural perspective of the present agriculture in the long run. The ICT-based solutions are implemented to make a proposed model of the market where farmers get connected with wholesale, retail, trade, and Growth center as well as govt farms all at once at a platform. The proper connection will build a strong connection of economic interchange where farmers have direct access to buyers without the need for brokers. That will change the scenario of Charghat Upazila.

### 5.2 Dreamscape of Community and SDG (Relevancy of the SDGs: The Goals and Targets, Ministry of Agriculture)-based Solution

The market model is proposed to ensure economic growth considering SDGs adding policies like,

#### 1. Agricultural Modification and empowerment

- Ensure that farmers and those engaged in agriculture production and marketing are empowered.

- Give farmers the means to use the internet properly to access current market prices.
2. **ICT-based Instruction for Students and Farmers**
    - Rural students should be exposed to ICT-based education.
    - Teach farmers how to use the internet profitably by showing them how to get market data.
    - Encourage rural women to study by giving them access to ICT-enabled training for cottage industries.
  3. **Online Fair Value Market Platform**
    - Create a website that enables fair-value transactions for farmers to sell their goods directly to consumers, cutting down on their reliance on middlemen.
    - Reduce the use of brokers and allow farmers to sell their products directly to consumers.
    - By giving farmers access to the online marketplace in real-time.
  4. **ICT Facilities and Computer Labs for online help and promoting freelancing**
  5. **Agricultural and Educational Framework**
    - Develop a framework for agriculture that is suited to the requirements of stakeholders and farmers.
    - Promote ICT-related education-focused seminars or activities to encourage the right use of the Internet for learning and educational objectives.

To improve rural students' knowledge and abilities, it is crucial to offer them formal ICT education as well as chances for online learning. This will enhance the growth of Charghat Upazila in new ways and open new opportunities for the new generation

## 6. Conclusion

Bangladesh is a country with rural heritage and agriculture. The research illustrates the agricultural markets and difficulties farmers confront in selling their agricultural products, which are made worse by a lack of support from the government and funding from NGOs in Charghat. By encouraging ICT-based education in the targeted industries and facilitating digital transformation in farming, cultivation, women empowerment, and education, the study seeks to address these difficulties with an interactive market chain. The execution of the market model faces challenges including PPP (Private Public Partnership), influential market syndicate, and lack of online market-based knowledge among the farmers. As, for Charghat, community involvement helps to identify these major issues in the market and community. The policy implementation should include the community people to enhance the educational and economic sector of Charghat and interactive programs like policy camps, and online training centers can reduce the limitations of model implementation. These small steps will be the economic base for the Upazila and bring an impact on the national economy.

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