ASSESSMENT ON TRANSPORTATION LINKAGE AND ITS IMPACT ON RURAL MARKET ACTIVITIES: A CASE STUDY ON GODAGARI UPAZILA, RAJSHAHI

Angkita Sarkar*[1], Oma Sarker[2], Sandip Mandal Joy[3], Tabassum Mampy[4]

[1] *Undergraduate Student, Rajshahi University of Engineering & Technology, Bangladesh, e-mail: angkita.sarkar@gmail.com*
[2] *Undergraduate Student, Rajshahi University of Engineering & Technology, Bangladesh, e-mail: omasarker.352016@gmail.com*
[3] *Undergraduate Student, Rajshahi University of Engineering & Technology, Bangladesh, e-mail: sandip.ruet35@gmail.com*
[4] *Undergraduate Student, Rajshahi University of Engineering & Technology, Bangladesh, e-mail: tabassummampy.1998@gmail.com*

***Corresponding Author**

ABSTRACT

Bangladesh is an agriculturally dominant country where the majority of the population lives in rural areas. For this reason, Bangladesh is in an attempt to make the best possible profit out of the rural economy, as it contributes to the development index of Bangladesh. The rural economy substantially depends on the rural markets, as an enormous number of trade transactions take place there. Rural market transactions are greatly influenced by its market structure, its road network, sellers and buyers demands and needs and many more factors. The aim of our study is to explore the road network development over the years, the problems and potentials of rural markets and to find out the influence of road network connectivity on rural market activities. Furthermore, our study area consists of two specific huts in Godagari upazila are Rajabari hut and Kodomsohor hut. By following the stratified sampling method, data was collected from 64 sellers viewpoints. In addition to this, key informant interviews and focus group discussions were also conducted. The results found on the past and present condition of the road network where Godagari upazila road network has evolved significantly over the years including its surface condition, travel time and other facilities but it still needs development in access road condition, which is proclaimed. The problems faced by sellers, their distance from producing land to the market, travel time and the potential of a rural market scenario are matters of consciousness as these directly influence the individual seller's profit and ultimately the rural economy. The inadequate space, maintenance issues and no parking space result in unsatisfactory trade transactions, no market turnover, unemployment and weaken the rural economy. Multi-linear regression results revealed that independent variables in the study had a significant influence on sellers' profit ($p < 0.05$). The multiple correlation coefficient measure ($R = 0.874$) also indicates that the relationship between sellers' profit and independent variables was strongly correlated. Findings also expose that two-wheeler transport usage by sellers results in high transportation costs incurring, insufficient product loading and poor surface condition of the road (access and main) as the major factors in reducing profit scale. Therefore, the study suggested that local authorities should give attention to rural road infrastructure development and the supply of transportation modes to evaluate the rural economy.

Keywords: *Transportation, Rural market, Seller's profit scale, Rajshahi*

1. INTRODUCTION

Bangladesh is a country mostly focused on agriculture, with a large population residing in rural areas. Bangladesh's rural areas are fast transforming. They have an impact on Bangladesh's development index. It is trying to maximize its profits from the rural economy. Nevertheless, although the sector contributes only 13.65% to Bangladesh's GDP in 2019, over 40% of the nation's workforce is engaged in farming. According to data from the Bangladesh Bureau of Statistics' Labour Force Survey and Household Income and Expenditure Survey, 48% of all rural employment was nonfarm in the fiscal year 2016–17. Since 2000, this has climbed from 37%. (Khatun, 2020). So, despite cultivating only, people are engaged in the rural economy through rural markets. Rural markets face challenges in reaching larger ones due to remote locations and poor transportation systems. The effectiveness and accessibility of transportation networks directly impact the mobility of individuals, goods, and services within rural regions and their interactions with external markets. At present, most villages in Bangladesh are directly linked with the economy as rural market activities have increased. Improved transportation infrastructure in rural areas has made it possible to enhance market accessibility, allowing for the flow of agricultural produce, manufactured goods, and services to and from these regions. This has changed the rural landscape as well. Moreover, it indicates that the human resources and the entrepreneurship of rural people are increasing day by day. Rural marketing is a marketing system that involves the development, planning, pricing, and distribution of goods and services so that people in rural areas can access basic products at fair prices and also their products in a wholesale system. Rural market development activities are somehow connected to road network connectivity. Road infrastructure projects have received significant investment to facilitate the transportation of goods and services, thereby promoting economic growth (Moradi, 2016). In order to obtain an economic advantage, individuals must possess the means to acquire an extensive array of commodities, amenities, and knowledge. It can be possible through transportation development. Transportation networks significantly impact the agricultural sector, enabling farmers to efficiently transport perishable goods, reduce post-harvest losses, and access essential inputs, ultimately improving income and productivity. A good network of roads will expand the distribution of agricultural goods to markets, expand markets, economies of scale and improvement in factor market operations (kumar, 2017). Transportation linkage plays a pivotal role in stimulating economic activities within rural markets. It opens up the rural economy to greater competition for goods as well as additional opportunities for agricultural trade (Yu-hua, 2008). Improved connectivity boosts trade, investment, and local industry development. Efficient transportation systems reduce costs, encourage entrepreneurship, and competitiveness for rural businesses. However, the relationship remains underexplored. Our rural area is not fully developed, but a unique marketing strategy, rural marketing, has emerged to satisfy the needs of rural consumers (Meenakshi, 2015). Unfortunately, there are still some issues and problems they are facing in the case of marketing activities such as waste management, spacing problems, management issues and so on. But there are some rooms to develop their facilities with proper planning. The main aim of this study is to observe the road network connectivity between rural markets and how this linkage influences our rural market activities. Moreover, the rural economy is being developed day by day due to rural market activities. And this is happening because of road network activities. This paper also compares the past and present condition of road network connectivity in rural markets. Again, there are still some problematic issues with which rural market sellers are not fully satisfied. This paper also aims to identify the problems and potentialities of rural market activities and suggest some recommendations according to their difficulties. Based on the discussion above, the objectives of the study are to find out the rural market activities of Godagari and Kodomsohor, including their potentials and problems. Additionally, to explore the improvement of transportation and road network connectivity of the area, and also to find out the influence of transportation and road network connectivity on the market sellers' profit.

1.1 Scope of the Study:

The assessment of transport linkage, the correlation of its key influencing factors and the rural market activities are the focus objective of the study. The research investigates the causes of shifting development patterns in rural Bangladesh, revealing challenges and opportunities for planners in transportation and road network development. It also explores sellers' and buyers' perspectives on market access and the existing conditions of the rural market in Godagari upazila.

2. LITERATURE REVIEW:

Transport linkages are the developing index of a nation. They act as a tool for social inclusion, economic development and environmental sustainability. Transport link communities and their agricultural production contributes to the main transport system and markets. This affects increased production and productivity, crop diversification and increased profitability. Network has great impact on rural markets as the selling and buying activity has increased to a large extent due to the inner-connecting lanes of the markets. Rural markets are the main source of rural economy. (Murdoch, 2000) Moreover, Economic growth is crucial for global development, with indicators like GDP serving as a measure of progress. Rural transport infrastructure is a key driver of economic growth, contributing to market access, agricultural production, firm creation, poverty reduction, and facilitating the movement of goods and people. Even World Bank study (1997) estimated that 15% of the agricultural produce is lost between the farm gate and the consumer because of poor roads and inappropriate storage facilities alone, adversely influencing the income of farmers. Poor rural road infrastructure limits the ability of the traders to travel to and communicate with remote farming areas, limiting market access from these areas and eliminating competition for their produce. Easier access to market allows expansion of perishable and transport-cost intensive products. Furthermore, A research article attempted to analyse the impact of infrastructure on agricultural development using larger data set, both in terms of time period and coverage of infrastructural variables. The results indicated that transport, power, irrigation and research infrastructure are four critical components, which affect the agricultural productivity in a significant. (Thorat, 2017). Besides, again a case study concluded by (Dash, 2007), The market being an area of intense human activity are very much affected by the environmental and human aspects. Change and improvement in transport and communication, population growth, urbanization, social, economic and environmental changes influence the market activities operating in any region. The literature on rural roads and economic development has emphasised impacts on transport costs and prices with consequent welfare impacts. For example, rural roads may allow farmers in remote (and often poor) rural areas to obtain higher prices for their outputs, and/or reduce the prices they face for inputs and consumer goods. OECD (partnerships, 2013) also concludes the rural-urban partnerships approach for economic development, since they argue that this approach helps economic development through enhancing the production of public goods, achieving economies of scale in public services, developing new economic opportunities and capacity building, improving administration, taking into account negative externalities, and dealing with the coordination failures. Likewise, Global Monitoring Report (2013) adopts the important role of the rural-urban linkages for poverty reduction. In a research article presented by (Majumder, 2002) conclude that, on the basis of regression analysis of the State level cross-section data indicated that among various physical infrastructures, it is the transportation linkage that significantly affected the agricultural output level and the rural market activities.

3. METHODOLOGY

A crucial aspect of research is methodology, which directs the entire inquiry process. This includes design of research questions, sampling strategy, site visit, reconnaissance survey, data collecting, and analysis process.

Godagari Upazila, Rajshahi was chosen as the study area. To provide the study direction, three objectives are selected: to find out the rural market activities of Godagari and Kodomsohor, including

their potentials and problems, to explore the improvement of transportation and road network connectivity, and also to find out the influence of transportation and road network connectivity on the market sellers' profit.

Data collection was prepared through observing and surveying of the study area using primary and secondary data. Reconnaissance survey and physical survey were used to collect primary data through questionnaire and secondary data from various article, journals, newspaper etc. A method of stratified sampling method was conducted focusing on the local sellers, as a result, the population size of the local seller was 936 and the sample size was 64, with a 90% confidence level and 10% margin of error. Google Earth Pro and ArcGIS 10.8 were used to determine the study location and for data analysis, Statistical Packages MS Excel and SPSS were used.

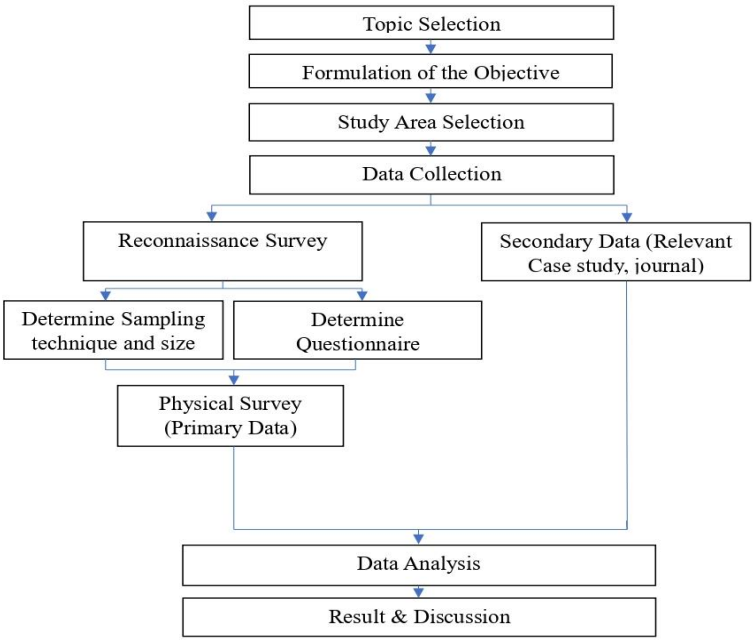

Figure 1: Methodological Framework

4. STUDY AREA:

Deopara union, Godagari upazila has three huts, including two - Kodomshohor and Rajabari. Rajabari is the largest and most renowned, attracting most sellers and buyers for trade transaction. Kodomsohor, a smaller hut, focuses on the local sellers, fostering economic growth.

Table 1 Study Area

Hut	Longitude, Latitude	Area (Acre)	Distance from CBD (Shaheb bazar)	Lease Amount
Rajabari	88°27'12.50"E,24°23'40.75"N	3	11	10,39,100 TK
Kodomsohor	88°30'28"E, 24°26'30.85"N	2	16	1,16,551 TK

(Field survey, 2022)

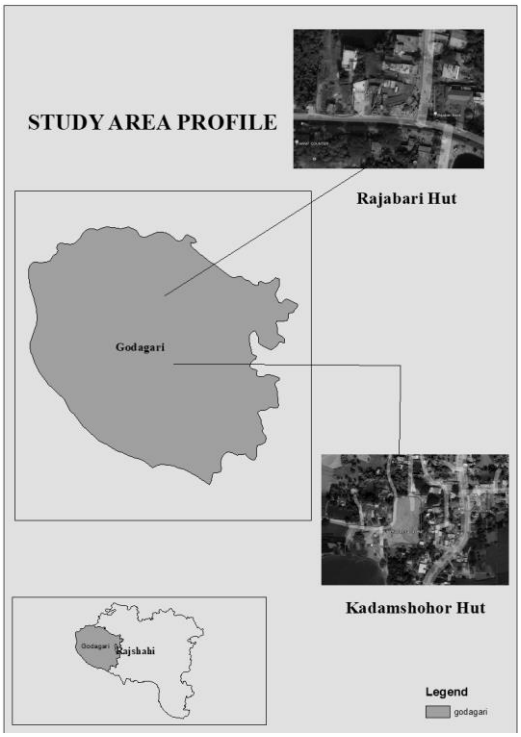

Figure 2: Study Area

5. RESULT AND DISCUSSION:

5.1 Farming types and Income level of Local Sellers:

Types of Farming Activities:

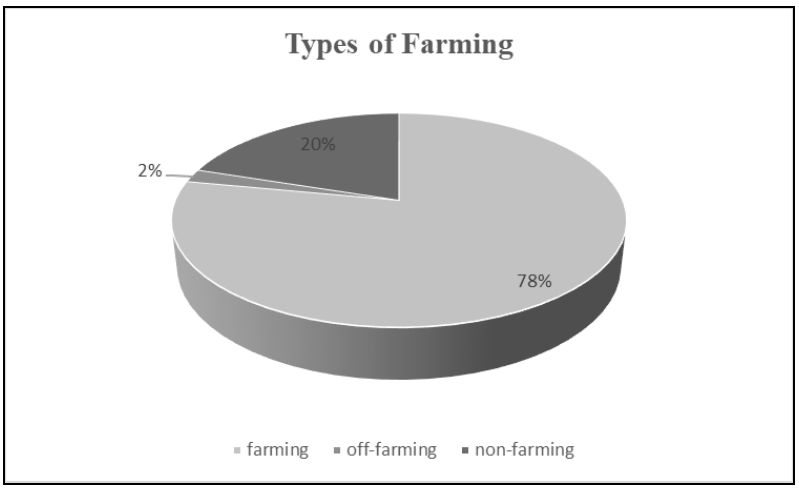

Figure 3: Farming activities in rural area

The pie chart shows that 78% of sellers in Rajabari and Kadomsohor huts are involved in agricultural production, and they are also majorly involved in off-farming but do not sell their off-farms in hut. Only 2% engaged in off-farming to sell. The huts are predominantly farming-based, with 20% engaged in non-farming activities like trading, driving and so on.

Monthly Income of the Sellers:

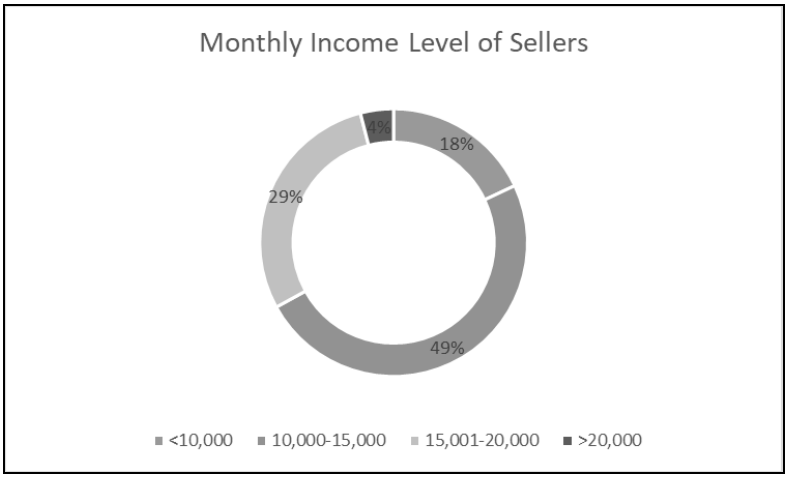

Figure 4: Monthly earning of the sellers

According to the figure, 18% of sellers make less than 10,000 taka a month, which results in low living standards and a lack of supply. A systematic approach to transport goods to Rajshahi Sadar and other parts of Rajshahi would significantly improve their business and the scenario of overall Godagari Upazilla. Merely 29% make between 15,000 and 20,000 taka, while 4% make more than 20,000 taka.

Per hut day profit of the sellers:

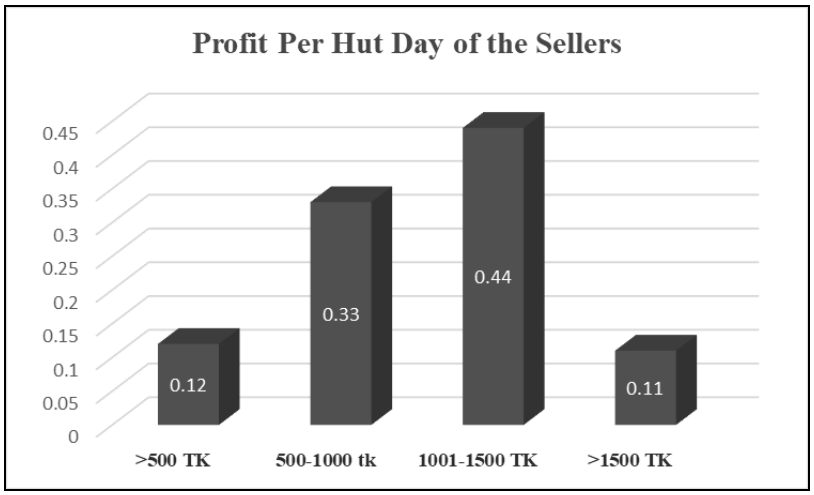

Figure 5: Profit per hut day

On Hut Day, 44% of rural sellers make 1001-1500 tk, contributing significantly to the economy, while 33% make 500-1000 tk, and 12% make less than 500 tk.

5.2 Exploring Improvement of Transportation and Road Network condition:

Utility Facilities of Roadway:

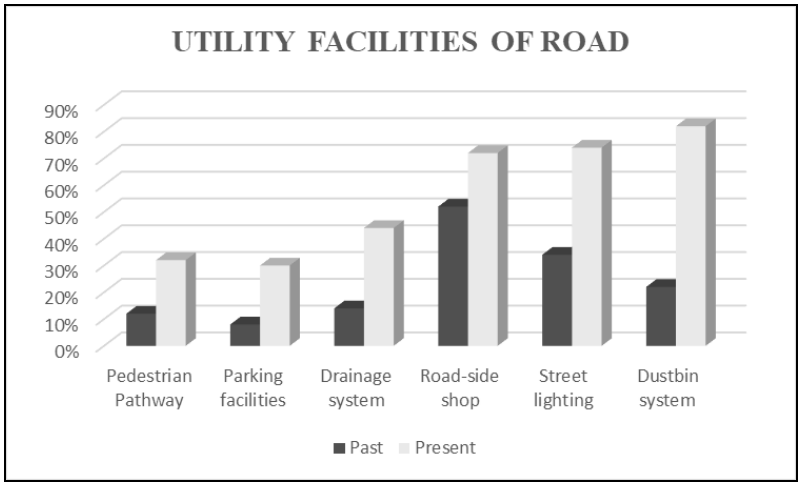

Figure 6 : Utility Facilities

This chart represents the development of utility facilities over the years, especially in terms of 74% satisfaction with street lighting and 82% with dustbin system whereas pedestrian pathway, parking facilities and drainage system are not satisfactory. Rajabari hut faces risks due to speedy four-wheeler transport and there is no such pathway or overbridge, while Kodomsohor hut has easier pedestrian movement but not fascinating road conditions. Parking facilities are unsatisfactory, with no space for buyers or loaded vehicles, causing congestion. Roadside shops also negatively impact the environment, creating a hazy and congested area.

Usage of Transportation mode by sellers for commuting goods:

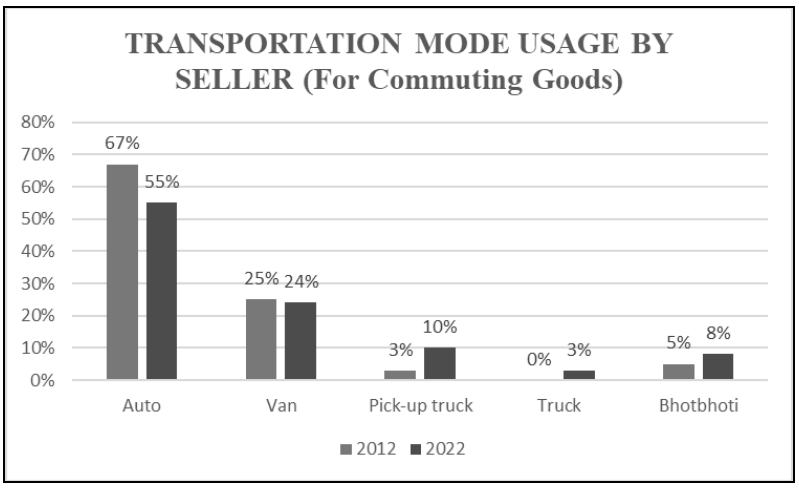

Figure 7:Usage of transport modes by sellers

55% of sellers transport goods by auto, with van and bhotbhoti usage increasing. However, auto remains the primary transport system, causing difficulties for sellers to commute plentiful goods. Rural authorities should consider providing four-wheelers for low-cost transportation, as only 8% of pickup-truck and 3% of truck are used.

Distance from producing land to market

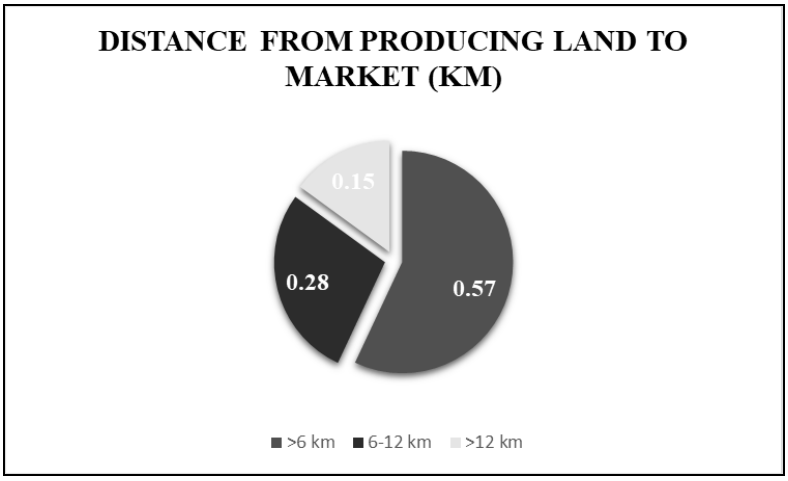

Figure 8: Distance from Producting Land to Market

The pie chart shows that most of the producers cross more than 12 km, which is 57%. 15% and 28% come from <6 km and 6-12 km distance, respectively, the sellers are basically local farmers or come from nearby villages.

Travel time to supply goods:

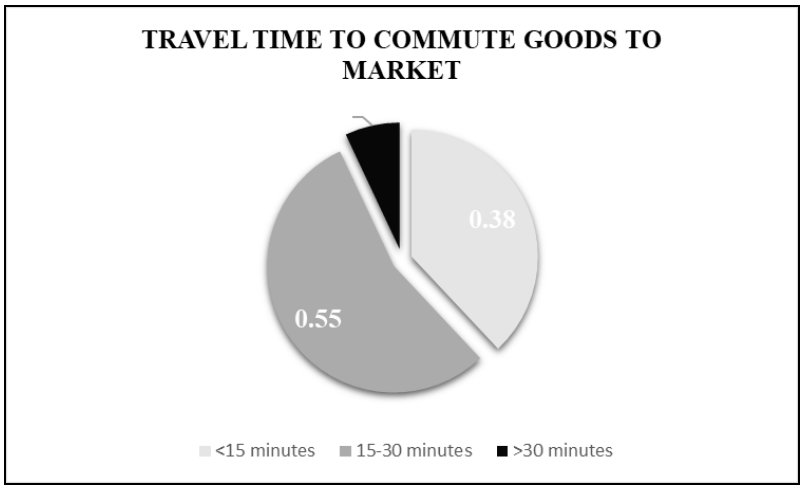

Figure 9: Travel Time to commute goods

Mostly it takes 15-30 minutes to commute goods for 55% sellers, followed by, >30 minutes and <15minutes for 38% and 7% sellers. Sellers coming from longer distance expressed, if government facilitate sellers with transportation modes that would help them to carry the goods at less cost, less time and also it would help to supply goods to other parts of Rajshahi which would add great monetary value and growth in rural economy.

5.3 Physical Characteristics of the Road:

Road Surface Type:

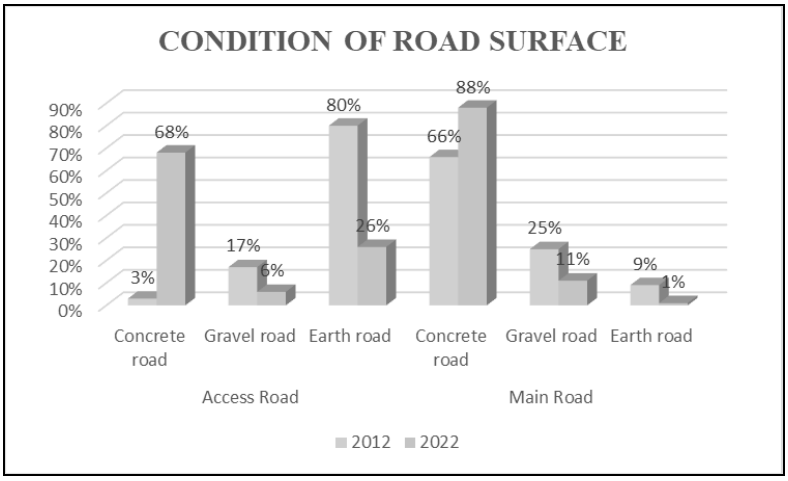

Figure 10 :Types of Road Surface

Main road surface condition is totally satisfactory as 88% sellers travel by concrete road, also the improvement of access road surface type is markable as the number of earthen road users decreased from 80% to 26% in a decade. It's a significant upgradation but still there are 26% of seller who face difficulties to move their goods to market in day-to-day life.

5.4 Potentials and Problems of Rural Market:

Problems faced by local sellers:

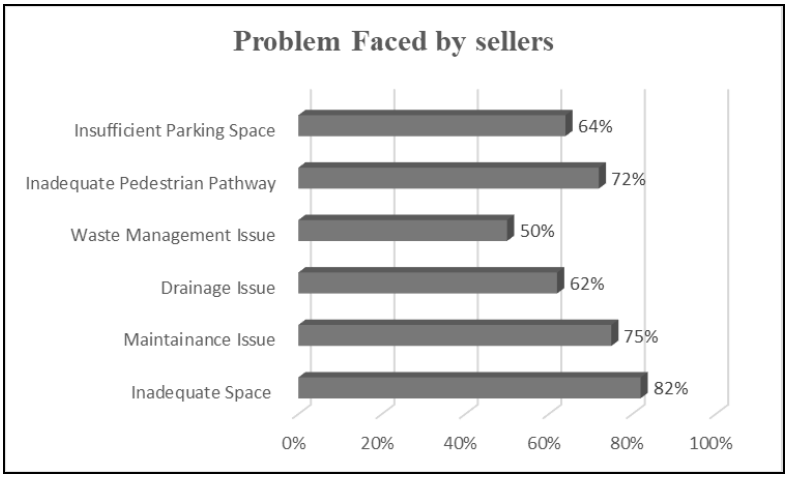

Figure 11: Problems faced by Sellers in the Market

Sellers face uttermost problems due to inadequate space, with 82% facing difficulties. 75% face maintenance issues, including waste management, sanitation and drainage issues. Lack of vehicle parking is the one of the major complications faced by 64% sellers, with limited two-wheeler space and no four-wheeler parking space.

Positive Impacts of Rural Huts:

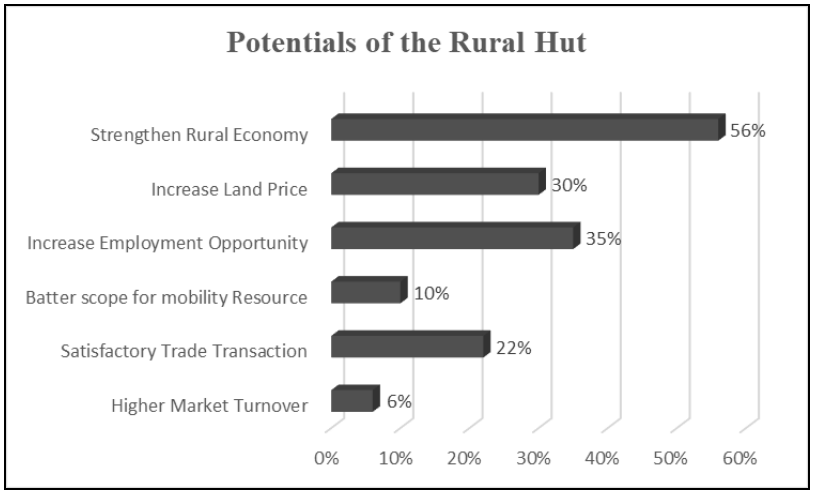

Figure 12: Potentials of the Rural Market

Despite higher market turnover, only 6% of respondents find trade transactions satisfactory, with most complaining about urban market movement for earnings. Only 10% believe these huts have scope for improved resource mobilization whereas 35% agrees these increase employment opportunities. 56% believe these two huts have overall positive impact on strengthening the rural economy of Godagari.

5.5 Influence of Transportation and Road Network on Rural Market activities:

Multiple linear regression model specification:

A multiple linear regression method was applied to determine significant factors from potential explanatory variables. Independent variables include road type, transportation mode and travel characteristics that may influence the dependent variable and dependent variable is sellers' profit.

The general form of a multiple linear regression model is shown using the following formula.
$y = b_1x_1 + b_2x_2 + \ldots + c$……(1)
where y is the dependent variable, x_1, x_2… are the independent variable, and c is the intercept.

Depending on multiple linear regression equations which were employed by the relationship between the dependent and independent variables of our interest were represented as follows:
SP = f (DPM, TT , STAR, STMR and MMT)……(2)
Where, Y = SP (Sellers' Profit) continues variable.
X_1 = DPM (Distance from Producing land to Market (km)) Categorical variable.
X_2 = TT (Travel Time (Minutes)) Categorical variable.
X_3 = STAR (Surface Type of Access Road) Categorical variable.
X_4 = STMR (Surface Type of Main Road) Categorical variable.
X_5 = MMTM (Major Means of Transportation Mode) Categorical variable.

By relying on the functional form of the relationship between variables of interest above, multiple regression model was developed as follows (equation 1).
$SP = b_1DPM + b_2TT + b_3STAR + b_4STMR + b_5MMTM + c$…….(3)

Assumption Test (Model Output diagnosis)

The study tested assumptions in multiple regressions, confirming a linear relationship between independent and dependent variables. The P-P plot confirms that the linear relationship between the independent and dependent variables is linear. The model's residuals are normally distributed, indicating homoscedasticity. The variance is constant or similar, indicating no multicollinearity. The

variance inflation factor (VIF) values are less than 2, indicating no significant correlation between predictors. Multiple correlations confirmed a strong correlation between sellers' profit and independent variables, confirming the assumption of normal distribution. The coefficient of determination showed that 76.4% of the total variable of sellers' profit was explained by independent predictors, indicating strong predictive power. Accordingly, the ANOVA result ($F = 60.853$; $P < 0.05$) showed that there is a good model fitting, thus, the explanatory variables included in the model jointly influence sellers' profit.

The Result of Multi-linear Regression: Influencing Variables of Sellers' Profit

Coefficients[a]

Variables	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-164.831	218.648		-.754	.453
Distance	-29.331	42.443	-.048	-.691	.491
Travel Time	-58.643	50.910	-.078	-1.152	.252
Surface Type of Main Road	160.090	64.000	.130	2.501	.014
Major Means of Transportation	218.028	21.747	.586	10.026	.000
Surface Type of Access Road	203.356	29.114	.395	6.985	.000

a. Dependent Variable: Sellers' Profit

The study reveals a significant positive relationship between sellers' profit and the major means of transportation. A better transport mode increases an individual seller's profit by a factor of 0.586. Small-scale vehicles like autos or vans may require multiple trips to transport products, while autos reduce costs. The study also found that good transport modes increase the quality and quantity of goods, and enable easy access to the market for buyers.

The study reveals a positive relationship between sellers' profit and the surface type of access road. Concrete roads, which allow easy movement, result in an increase in profit by a factor of 0.395. Conversely, gravel and earthen roads increase time, cost, and inconvenience, ultimately decreasing profit.

The surface type of main road significantly impacts sellers' profits, with concrete roads allowing easy movement and increasing profits by a factor of 0.130. The development of road networks has enabled more sellers to use concrete roads, resulting in reduced transportation costs and time.

The study found that distance from land to market doesn't significantly impact sellers' profit, suggesting that being far or near doesn't limit opportunities for delivery.

There is a negative relationship between travel time and seller profit, but found that smooth road surface, variety of transportation modes, and no traffic congestion influenced this relationship.

6. RECOMMENDATIONS AND CONCLUSIONS

The study suggests improving agricultural transportation in villages like Hazampara, Alipur, and Premtoli, reconstructing the rural market environment, and overseeing maintenance and waste management. Reconstructing Rajabari hut as a growth center by managing drainage, walls, and platforms and adaptive measures like providing labour and fixed transport could promote supply to Rajshahi Sadar areas. The empirical results and conclusions of the study are to find out the road network connectivity and its effects on different socioeconomic groups in rural markets as well as the changes in transportation linkage over time. Besides, the problems and difficulties they faced are also observed here. The completion of road connection enhancement projects in both urban and rural regions resulted in several common changes in the communities studied: improved accessibility, more mobility, additional utility facilities, and reduced travel time. Moreover, sellers' profit is influenced

by road-associated factors such as surface type of access road, surface type of main road and major means of transportation but profit is not dependent on distance or travel time. Our rural parts of Bangladesh have been developed day by day, as data showed that people are more satisfied than before but still, they are facing some problems. The rural market is crucial for the rural economy, and analysing transportation linkage in the peripheral network helps them flourish in Rajshahi city. This helps prevent urban-rural disparities in growth and development. Good road network connectivity reduces travel time and distance, benefits commuters, and ensures pedestrian safety. This study assesses transportation linkage, its changes over time, and its impact on rural market activities.

LIMITATIONS OF THE STUDY

The research explores the influence of transportation and road network connectivity on rural market activities, despite limitations such as time constraints, limited interviews, and insufficient exploration of other rural markets of Godagari upazila.

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