

Impact of Roads on Income and Consumption of Rural Households in West Bengal

Joyoti Gayen* and Debashis Sarkar

Department of Agricultural Economics & Agricultural Statistics, Institute of Agriculture, Visva-Bharati, West Bengal, India

*Corresponding author: joyoti_gn@rediffmail.com

ABSTRACT

In several studies it has been observed that public goods like roads indirectly play a key role in the development process through multiplier effects in the long run, it effects positively not only in economic aspects but also in social aspects. This holds true for both urban and rural areas. It has been found in many cases how rural road connectivity acts as a driver of socioeconomic development and poverty reduction. In many studies it has been found that lack of roads constraints the access of rural people to markets leading to a reduction in income and consumption. In view of this, an attempt has been made in this study to consider the impact of rural roads on income and consumption of the households in West Bengal. It has been found that better roads and railway systems lead to access and opportunities leading to diversified livelihood and accordingly diversified income are generated. The study also reveals that there is both quantitative and qualitative divergence in employment of the households between near and away from main road and rail station leading to a diversified income which in turn has a significant effect on the consumption expenditure of the rural households. The Gini coefficient is higher in case of those households near to main roads and rail station as well as a statistically significant higher group means for monthly income as well as consumption expenditure of those households reflecting a diversified rural livelihoods mainly because of better access to public assets like rural roads and implying a variation and heterogeneity in income and consumption.

Keywords: Rural roads, employment, income, consumption, income inequality, Gini coefficient, group mean

Rural roads in particular are the backbone of all rural infrastructures and play a crucial role in socio-economic development of the rural mass. Rural road is a critical enabling infrastructure for improvement of living conditions in rural areas. They contribute significantly by creating linkages, thus increasing the opportunities to access goods and services located in nearby villages or major towns/markets. Presence of roads in rural areas increases the mobility of labour and materials, thus increasing the domain of rural livelihood beyond the rural production boundary. The increased commutation of rural people to urban neighbourhood for employment adds to wider dimensions of livelihood diversification facilitating economic growth, reduction of poverty and overall social development.

Road accessibility increases social service delivery. Better roads provide greater accessibility to educational, health, employment and market facilities (Lal, 1988). Physical access like rural roads is also related to changes in income sources as the road enhances non-agriculture income opportunities (Escobal and Ponce, 2002). Socioeconomic effects of road improvement reveal that the economic benefits and opportunities increase asset value, thus facilitating trade and business opportunities (Singru, 2007). Rural roads and transport are essential for sustaining agricultural development also. Basically rural roads play an important role in the provision of physical access. In rural areas place is accessible when people can reach there in an acceptable time, and the risk of not getting there on time would be

heavy (Tighe, 2006). Physical access further plays an important role in reaching a number of the Millennium Development Goals (Barret, Reardon & Webb, 2001). To have a long term benefit from improved access, rural roads should be properly managed and maintained.

Rural roads help labour and product markets to function better which indirectly redounds to the poor over time (Airey, 1989). In rural areas roads give a blending of non-farm economic activities along with farm activities and such diversification positively impacts the living conditions of the rural mass (Mandal and Sarkar, 2013). A study on linkages between government expenditure and poverty in rural India (Fan, Hazell, and Thorat, 2000) has revealed that an investment of ₹ 1 crore in roads lifts 1650 poor persons above the poverty line. Public investment on roads impacts rural poverty through its effect on improved agricultural productivity, higher non-farm employment opportunities and increased rural wages. Improvement in agricultural productivity not only reduces rural poverty directly by increasing income of poor households, it also causes decline in poverty indirectly by raising agricultural wages and lowering food prices.

On the other hand, increased non-farm employment and higher rural wages also enhance incomes of the rural poor and consequently, reduce rural poverty. Similar results are found in other developing countries with a correlation between roads and poverty reduction. In India this correlation between roads and poverty reduction is ranked at the top of the scale (Singru, 2007). The study by the same institute (Fan, Hazell, and Thorat, 2000) in China revealed that with every 10,000 Yuan (about \$1200) spent on rural roads eleven persons are lifted above the poverty line. Living Standard Survey in Vietnam showed that people living within 2 km of all-weather roads have lower poverty rates as noted in the draft Vision Document for Rural Roads, 2006 (MoRD, 2006). Statistical evidence apart, the link between poverty and lack of accessibility is quite apparent. A household survey (APERP, 1997) conducted in the state of Andhra Pradesh indicated that the rural road improvements lead to substantial reduction in freight charges, increase in household income. In this background, an attempt has been made in this study to consider the impact of rural roads on income and employment

of the households. Study on the impact of road improvement and construction on poverty reveals how it increases the income earning opportunities of the poor and reduces the costs of the goods they consume (Menon 2007). Road related studies have also suggested that household consumption is likely to get a boost from increased household income, consequently reducing poverty (BIDS, 2004; Fan, Hazell & Throat, 2000). A related research shows that road density has a significant positive effect on the consumption expenditure of rural farm households in poor regions. For every 1% increase in Km of roads per capita household consumption raises by 0.08% (Jalan and Ravallion, 2002). In this background an attempt has been made in this study to consider the impact of rural roads on income and consumption of the households.

Database and Methodology

The study has been conducted based on both primary and secondary data. Secondary data has been collected from different sources i.e. Census and Statistical Abstract published by Bureau of Applied Economics and Statistics, Government of West Bengal. The primary data has been collected from two districts.

At first, the road density of all districts of West Bengal has been calculated based on the secondary data. Then all the districts have been sub-divided into two groups i.e. high and low road density. Howrah district with high road density and Purulia district with low road density have been selected randomly. In the next stage, the list of blocks of the selected districts has been collected and one block from each district i.e. Uluberia-I from Howrah and Para from Purulia have been selected randomly. The list of all villages of the selected blocks has been collected and sub-divided into two groups, i.e., (i) proximity to main road and rail station along with presence of paved road and mud road within the villages, and a high population density second group of villages have been selected which are (ii) away from main road and rail station and which do not have paved road within the village but a high population density. Then two villages from each group i.e. four villages from each district have been selected randomly. In the next stage, the list of the households of the selected villages has been collected and 40 households from each village

i.e. 160 households from each district have been selected. Finally, 320 households have been selected as the ultimate sample unit of the study.

RESULTS AND DISCUSSION

In rural areas the road network has special significance since it provides the only mode of transport and communication. Construction of developmental roads is used as a means of encouraging economic growth (Border, Taylor and McNamara 1992). The main aim of road development is to provide infrastructural facilities and social transformation (Gerald 1986). It provides exposure to new techniques, methods and ideas to modify traditional practices. Therefore, development of a road network is indicated as the most important felt need for benefits to trickle down to local inhabitants (Singh and Chauhan 1984; Werner and Lucious

1992). Most of the researches defined poverty in terms of a region or rural economy, without disaggregating to the village or household level.

However, in this study, effort has been to segregate the households according to the presence or absence of rural roads and nearness to railway service. Table 1 shows how the employment pattern changes in accordance to road connectivity and vicinity to rail station and this diversification in occupational pattern gives rise to variation in household income.

Table 1 shows that the more number of households near to main road and rail station are engaged in business and non-agricultural labour, whereas the households away from main road and rail station are in agriculture and allied activities. If one can rank the employment of the households of Howrah district residing near main road and rail station on the basis of occurrence, it can be estimated

Table 1: Types of employment of the family members including respondents (in %)

Types of employment	Proximity to main road & rail station			Away from main road & rail station			Overall		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Howrah									
Agril & allied activities	12.84	10.89	23.74	41.59	12.83	54.42	26.29	11.80	38.10
Agril. Labour	7.39	1.56	8.95	15.04	4.42	19.47	10.97	2.90	13.87
Non-Agril Labour	16.34	0.78	17.12	5.75	0.44	6.19	11.39	0.62	12.00
Business	18.68	3.89	22.57	5.31	0.44	5.75	12.42	2.28	14.70
Artisan	3.50	6.61	10.12	1.77	1.77	3.54	2.69	4.35	7.04
Service	6.61	1.17	7.78	5.31	0.88	6.19	6.00	1.04	7.04
Others	5.45	4.28	9.73	2.65	1.77	4.42	4.14	3.11	7.25
Total	70.82	29.18	100.00	77.43	22.57	100.00	73.91	26.09	100.00
Purulia									
Agril & allied activities	12.02	17.05	29.07	28.93	23.55	52.48	20.20	20.20	40.40
Agril. Labour	3.88	6.98	10.85	10.33	8.68	19	7.00	7.80	14.80
Non-Agril Labour	18.99	2.71	21.71	11.16	0.83	11.98	15.20	1.80	17.00
Business	11.63	1.16	12.79	4.13	0.00	4.13	8.00	0.60	8.60
Artisan	8.91	2.33	11.24	2.89	1.24	4.13	6.00	1.80	7.80
Service	4.26	1.94	6.20	5.37	0.41	5.79	4.80	1.20	6.00
Others	4.65	3.49	8.14	1.65	0.83	2.48	3.20	2.20	5.40
Total	64.34	35.66	100.00	64.46	35.54	100	64.40	35.60	100.00
All Districts									
Agril & allied activities	12.43	13.98	26.41	35.04	18.38	53.42	23.19	16.07	39.27
Agril Labour	5.63	4.27	9.90	12.61	6.62	19.23	8.95	5.39	14.34
Non-Agril Labour	17.67	1.75	19.42	8.55	0.64	9.19	13.32	1.22	14.55
Business	15.15	2.52	17.67	4.70	0.21	4.91	10.17	1.42	11.60
Artisan	6.21	4.47	10.68	2.35	1.50	3.85	4.37	3.05	7.43
Service	5.44	1.55	6.99	5.34	0.64	5.98	5.39	1.12	6.51
Others	5.05	3.88	8.93	2.14	1.28	3.42	3.66	2.64	6.31
Total	67.57	32.43	100.00	70.73	29.27	100.00	69.07	30.93	100.00

Source: Field Survey (2015)

that business, non-agricultural labour, artisans, others, agricultural labour and service are the types of employment that have been found next to agriculture and agriculture allied activities.

Similarly, the status of employment of the households residing away from the main road and railway station are agriculture and allied activities, agricultural labour, non-agricultural labour, service, business, others who are engaged in unorganised sector and artisans respectively in terms of order of merit. So, there is a qualitative divergence in employment of the households between near and away from main road and rail station. This occurrence is also factual in Purulia. When we consider both the districts together we find that percentage of family members engaging themselves in activities like non-agricultural labour, business, artisan, others and service is higher in villages near main road and rail station along with paved road within the villages other than those at remote places having no paved road or only with mud road. This needs to be mentioned that by and large the employment of the households near the main road and rail station is pointed to other than agriculture. On the contrary, the households away from main road and rail station are resolute in agriculture and allied activities. Irrespective of the districts, it has been also observed that a very high level of employment diversification prevails in those villages situated near main roads, railway

connectivity and paved road within the villages (Table 1).

Consequently the household income is also diversified by enabling the individuals to have income sourced from diversified sources. How the mean household income (monthly household income), SD and CV varies according to the proximity of main road and rail station is shown below in Table 2. Irrespective of the district, mean monthly income of the households which have proximity to main road and rail station is somehow better than that of the households away from the main road and rail station. Result of CV also shows that the relative measure of variation is higher in case of households which are located near main road and railway station in Howrah district. Inter district comparison shows variation of income is much more prominent in Howrah in case of those households having good communication system due to nearness to road. Again degree of homogeneity in income is more in case of households near to main road and rail station in Howrah than that of Purulia.

Apart from these descriptive statistics group mean comparison method has been used to see whether the group mean, SD for monthly household income are significantly different from each other or not. Means of two groups for 'monthly household income' under study is 8335.89 in case of villages away from main road and railway station and 10534.75 in case of villages near main roads and

Table 2: Mean, standard deviation and coefficient of variation of monthly household income

District	Proximity to main road & rail station			Away from main road & rail station		
	Mean	SD	CV	Mean	SD	CV
Howrah	10534.75	6627.29	62.51	8335.89	4283.30	50.07
Purulia	10391.26	7427.21	71.03	8266.94	4891.60	58.31
All Districts	10463.00	7016.83	66.85	8301.41	4583.17	54.33

Table 3: Group statistics of monthly income of the households

District	Type of Group	Group Statistics			t-Test for Equality of Means		
		N	Mean	SD	t	Sig. (2 tailed)	Level of significance
Howrah	0	80	8335.89	4283.30	-2.571	0.011	5%
	1	80	10534.75	6627.29			
Purulia	0	80	8266.94	4891.60	-2.067	0.040	5%
	1	80	10391.26	7427.21			
All	0	160	8301.41	4583.17	-3.262	0.001	1%
	1	160	10463.00	7016.83			

railway station at Howrah. Whether these two means differ statistically or not is observed from independent samples t-test results. The result shows that the 'p'-value is 0.011 and degree of freedom is 158. So the mean value of monthly income of the household under study for two groups (Depending upon location) significantly differs at 5% level of significance (Table 3). Similarly for Purulia district intra district 'Group mean comparison' result shows mean value of monthly household income is ₹ 8266.94 in case of villages away from main road and railway station and ₹ 10391.26 in case of villages near main roads and railway station. The result shows that the 'p'-value is 0.040 and degree of freedom is 158. So the mean value for monthly income of the household differs significantly at 5% level of significance for the two different groups at Purulia depending on connectivity. When we compare the mean value of household income' for the entire samples, the mean household income is ₹ 8301.41 in case of villages away from main road and railway station and ₹ 10463.00 in case of villages near main roads and railway station. The result shows that the 'p'- value is 0.001 and degree of freedom is 318. So the two group means for monthly income of the household differs significantly at 1% level of significance.

From the above analysis, it can be concluded that the monthly income of the households located in villages that are near main road and rail station is higher than that are situated away from main roads and rail station. And the result is statistically significant.

Table 4: Gini-Coefficient of income

District	Proximity to main road and rail station	Away from main road and rail station
Howrah	0.304	0.231
Purulia	0.334	0.281
All Districts	0.320	0.257

Table 4 shows Gini-coefficient of income of the households under study, the variation in monthly income of household due to rural access. When one can observe the Lorenz curves (Fig. 1 & 2) and Gini coefficients (Table 4), it has been substantiated that variation in income is greater in those households

that are located in the vicinity of main road and this phenomenon is factual both in case of Purulia and Howrah district. The Gini coefficient is higher in case of those households who are near main roads and rail station mainly because of better access in income niche and implies variation and heterogeneity in income. Inequality is slightly higher in case of households having better communication both in Howrah and Purulia due to an assortment pattern of income of the households. Obstinate, households have low income which has relatively worse off transport system due to away from main roads and rail station and this holds both in case of Purulia and Howrah. Therefore, there are several evidences for conclusion that better roads and railway system leads to better access and opportunities leading to diversified livelihood and accordingly diversified income is generated. Rural road connectivity is a key component of rural development and it promotes access to economic and social services, thereby generating increased employment more specifically non-agriculture employment as well as non-agricultural productivity, which in turn expands opportunities and real income through which poverty can be reduced.

Means of two groups for 'consumption expenditure' of the households under study is 5556.05 in case of villages away from main road and railway station and 6122.59 in case of villages near main roads and railway station at Howrah district. Whether these two means differ statistically or not is observed from t- test. The result shows that the 'p' value is 0.090 and degree of freedom is 158. So the two group means for monthly consumption expenditure of the households under study significantly differs at 10% level of significance. Similarly for 'Consumption expenditure' of the Households under study is 3668.31 incase of villages away from main road and railway station and 3988.03 in case of villages near main roads and railway station at Purulia. And the two group means for monthly consumption expenditure of the households differs significantly at 5% level of significance. When we compare the group mean value for 'Consumption expenditure' of the households of all the samples taken together irrespective of districts and grouping them into two categories according to their location with respect to connectivity, mean value for consumption expenditure is 4612.18 in case of villages away from

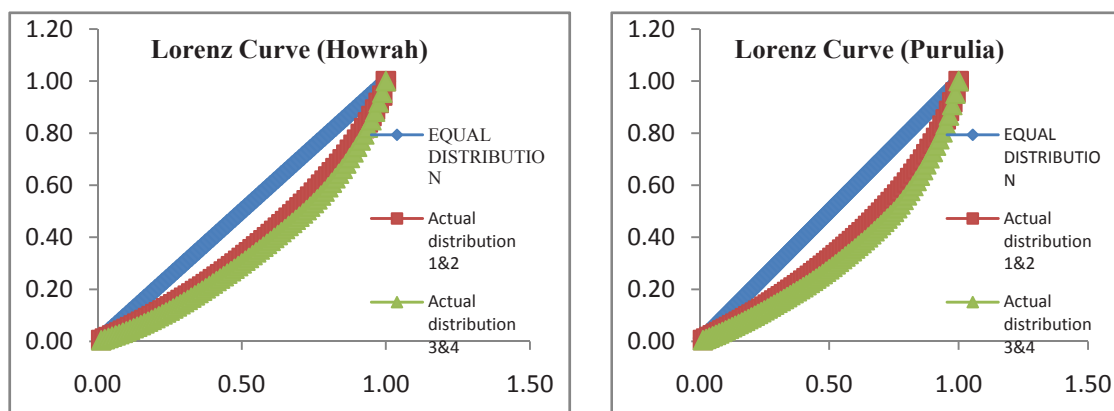


Fig. 1: Lorenz Curve of Howrah and Purulia

Note: 1 & 2 denotes away from main road and rail station whereas 3 & 4 denotes proximity to main road & rail station.

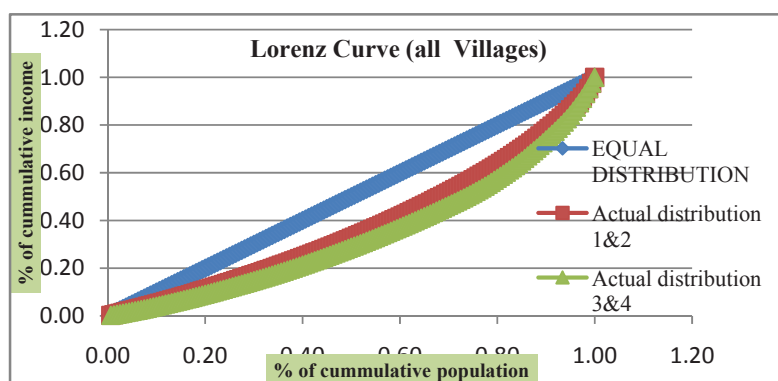


Fig. 2: Lorenz Curve for all Districts

Note: 1 & 2 denotes villages situated away from main road and rail station whereas 3 & 4 denotes villages near to main road and railway station.

main road and railway station (Group 0) and 5055.31 in case of villages near main roads and railway station (Group 1) irrespective of districts where they are situated. Whether these two means differs statistically or not is observed from independent samples t-test. The result shows that the significance value is 0.04 (p-value) and degree of freedom is 318. So the mean value for monthly consumption expenditure of two groups significantly differs at 5% level of significance.

From the above analysis it can be concluded that the monthly consumption expenditure of the households located in those villages that are near main road and rail station is higher than those that are situated away from main roads and rail station. And there exists a statistically significant difference between the mean values for consumption expenditure. Villages with better physical access give them higher access to better livelihood, better earning opportunity and higher consumption expenditure.

How total consumption expenditure changes along with change of income of the households residing at different locations has been tried to capture using simple linear regression model. Model summary with the Beta coefficients is given in table 6. At Howrah Group 0 (in the first case) there is a positive linear relationship between the Predictor/explanatory variable monthly household Income and the dependent variable i.e. monthly household consumption expenditure. Model summary tells that 37% of the total variation in the dependent variable is explained by the independent variable. ANOVA result shows that the regression effect is statistically significant with 'p' value 0.000 indicating that prediction of the dependent variable is accomplished better than can be done by chance. It is significant at 1% level of significance. Finally the Beta coefficient tells the effect size, ' $\beta=0.261$ ' i.e. for 1 unit increase in monthly income, household consumption expenditure will increase by 0.261. Correlation analysis says Pearson "r" is 0.607.

Table 5: Group statistics for monthly consumption expenditure of the households

District	Type of Group	Group Statistics			t- Test for Equality of Means		
		N	Mean	SD	t	Sig. (2 tailed)	Level of significance
Howrah	0	80	5556.05	1844.83	-1.705	0.090	10%
	1	80	6122.59	2329.19			
Purulia	0	80	3668.31	1008.12	-1.968	0.050	5%
	1	80	3988.03	1046.36			
ALL	0	160	4612.18	1758.54	-2.050	0.041	5%
	1	160	5055.31	2094.22			

Note: Equal variances assumed; Group 0- Villages away from main road and rail station, Group 1 –Villages near main road and rail station

Table 6: Results of regression analysis between monthly consumption expenditure and income of the households

Model	R ²	β Coefficient	Pearson Correlation Coefficient	t	Sig.
Howrah District: Group 0	0.369	0.261	0.607	6.748	0.000
Predictors (Constant)-Income; Dependent variable- Consumption expenditure	(37%)				
Howrah District: Group 1	0.571	0.266	0.756	10.192	0.000
Predictors (Constant)-Income; Dependent variable- Consumption expenditure	(57%)				
Purulia District: Group 0	0.445	0.138	0.667	7.911	0.000
Predictors (Constant)-Income; Dependent variable- Consumption expenditure	(45%)				
Purulia District: Group 1	0.563	0.160	0.75	10.021	0.000
Predictors(Constant)-Income; Dependent variable- Consumption expenditure	(56.3%)				
ALL irrespective of districts: Group 0	0.245	0.109	0.495	7.152	0.000
Predictors (Constant)-Income; Dependent variable- Consumption expenditure	(25%)				
ALL irrespective of districts: Group 1	0.356	0.178	0.597	9.35	0.000
Predictors (Constant)-Income; Dependent variable- Consumption expenditure	(36%)				

Note: Group 0- Villages away from main road and rail station, Group 1 –Villages near main road and rail station

Similarly at Howrah Group 1 (in the second row) there is a positive linear relationship between the explanatory variable “monthly household income” and the dependent variable “monthly household consumption expenditure”. Model summary tells that 57.1% of the total variation in the dependent variable is explained by the independent variable. ANOVA result shows that the regression effect is statistically significant with ‘p’ value 0.000 indicating that it is significant at 1% level of significance. Finally the Beta coefficient is ‘ $\beta=0.266$ ’ and Pearson Correlation coefficient, ‘r’ is 0.76.

Again at Purulia Group 0 (in the third row) there is a positive linear relationship between the Predictor “monthly household Income” and the dependent variable “monthly household consumption expenditure”. Model summary tells that 45% of the total variation in the dependent variable is explained by the independent variable. ANOVA result shows ‘p’ value 0.000 indicating that it is significant at 1% level of significance. Beta coefficient is, ‘ $\beta=0.138$ ’. Correlation analysis says Pearson “r” is 0.667. Similarly for Purulia Group 1 (in the fourth row) there is a positive

linear relationship between the Predictor “monthly household income” and the outcome variable or dependent variable i.e. “monthly household consumption expenditure”. Model summary tells that 56.3% of the total variation in the dependent variable is explained by the independent variable. ANOVA result gives ‘p’ value 0.000 indicating that it is significant at 1% level of significance. Beta coefficient is ‘ $\beta=0.160$ ’. Correlation analysis says Pearson “r” is 0.750.

In the fifth case taking all the samples together and then categorizing them into 2 groups in the same fashion, for ALL Group 0 (Fifth row) the result shows that there is a positive linear relationship between the predictor “monthly household income” and the dependent variable “monthly household consumption expenditure”. Model summary tells that 25% of the total variation in the dependent variable is explained by the independent variable. ANOVA result gives the ‘p’ value 0.000 indicating that it is significant at 1% level of significance. Beta coefficient value is, ‘ $\beta=0.109$ ’ and Pearson correlation coefficient “r” is 0.495.

In the Sixth row (last case) for ALL (Group 1) when the monthly income of all the households and the monthly consumption expenditure of all the Households residing near main road and rail station are taken irrespective of the districts the result reflects the same positive linear relationship between the explanatory variable “Monthly household Income” and the dependent variable “monthly household Consumption expenditure”. Model summary tells that 36% of the total variation in the dependent variable is explained by the independent variable. ANOVA result gives the ‘p’ value 0.000 indicating that it is significant at 1% level of significance. The Beta coefficient value is ‘ $\beta=0.178$ ’ and Pearson Correlation coefficient “r” is 0.597.

It may be referred from the above regression analysis of the monthly Household Income and Consumption expenditure of the households under study that the Pearson Correlation coefficient “r”, Beta Coefficients of the model is greater in those villages that are situated near main road and rail station with a good communication system than those households that are situated away from main road and railway station. The value of R^2 is also more in first case. So we can say that as income, occupation diversifies leading to increase in monthly

household income consumption expenditure also increases and the rate of increase in consumption expenditure with monthly household income is greater in households which are situated near main roads and rail station. This holds true for both the districts when studied separately and also when studied irrespectively of the districts.

CONCLUSION

In several previous studies it has been indicated that lots of rural communities are deprived from sufficient connectivity systems, mainly roads, bridges, and railway connectivity making them remotely situated by distance. This hinders the commutation of rural people to urban neighbourhood for their jobs; prevents the labour force participation in diverse industries and occupations, trade and business opportunities along with other social benefits like health service, education facility, marketing facilities, credit facilities etc.

Above discussion highlighted that better roads and railway system leads to better access and creates more economic opportunities paving way to a diversified livelihood with a diversified household income. It has been amply proved that there is a qualitative diversification of income sources between near and away from main road and rail station due to variation in employment pattern. The Gini coefficient is higher in case of those households who are near to main roads and rail station mainly because of better access in income recess which implies a slight variation and heterogeneity in income.

The above study also suggests an induced change in the consumption mix due to diversification of household income. Household consumption gets a boost from the increased household income. In fact it may be inferred from the ongoing study that there exist a significant positive effect on household consumption expenditure also due to road density. Thus rural roads should be regarded as instrumental in creating economic and social opportunity, facilitating empowerment of the village people thereby enhancing security.

REFERENCES

- Airey, T. 1989. The impact of road construction on hospital in-patient catchments in the Meru District of Kenya, *Social Science and Medicine*, 29(1): 95-106.

- APERP. 1997. Rural Transport Survey 1997, Andhra Pradesh Economic Restructuring Project, World Bank, Washington D.C.
- Barret, C.B., Reardon, T. and Webb, P. 2001. Non-farm income diversification and household livelihood strategies in rural Africa: Concepts, dynamics and policy implications. *Food Policy*, **26**: 315-331.
- BIDS. 2004. *Poverty Impact of Rural Roads and Markets Improvement and Maintenance project of Bangladesh*, Bangladesh Institute of Development studies.
- Broder, J.M., Taylor, T.D. and McNamara, K.T. 1992. Quasi experimental designs for measuring impacts of developmental highways in rural areas, *Southern Journal of Economics*, **24**(1): 199-207.
- Census 2011 and Statistical Abstract published by Bureau of Applied Economics and Statistics, Government of West Bengal, 2008.
- Escobal, J. and Ponce, C. 2002. The Benefits of Rural Roads: Enhancing Income Opportunities for the Rural Poor. GRADE Working Paper 40-I, Lima, pp. 52.
- Fan, S., Hazell, P. and Thorat, S. 2000. Government Spending, Growth and Poverty in Rural India. *American Journal of Agricultural Economics*, **82**(4): 1038-1051
- Gerald, G. 1986. Nepal's road network: A stimulus for economic development, *Applied Geography and Development*, **28**: 84-95.
- Jalan, J. and Ravallion, M. 2002. Geographic Poverty Traps? A Micro Model of Consumption Growth in Rural China. *Journal of Applied Econometrics*, **17**(4): 329-346.
- Lal, M. 1988. Impact of road improvement in a Chotanagpur village, *Tradition-and-Development*; pp. 255-263.
- Menon, Jay. Jan 2007. Does Road Improvement Reduce Poverty? A CGE Analysis for Lao PDR, *Asian Development Bank Institute*.
- Mondal Sarkar and Dr. Suchismita. 2013. Determinants and constraints of Rural Livelihood diversification: A study from Birbhum district, WB, *AARJSH*, **1**(8): 69-86.
- MoRD. 2006. *Rural Roads Development Plan: Vision—2025 (Draft)*, Ministry of Rural Development, Government of India, New Delhi.
- Reardon Thomas, Delgado Christopher and Matlon Peter. 2007. Determinants and effects of income diversification amongst farm households in Burkina Faso. *The Journal of Development Studies*, **28**(2): 264-296.
- Singh, S. and Chauhan, V.S. 1984. Regionalisation for Rural Development and Planning, Independent Publishing Pvt. Ltd., Meerut.
- Singru, Narendra. August 2007. Socioeconomic effects of Road Improvements, From the 2007 Sector Assistance Program Evaluation for the Transport Sector in India – Focusing on results, *Operations Evaluation Department, Asian Development Bank*.
- Tighe, D. 2006. Roads and Poverty Reduction. Paper presented at the International Seminar on Rural Road Transport, Siem Reap, Cambodia, 15-16 May. From [www.ruralroads.org/doc/roadsandpoverty reduction](http://www.ruralroads.org/doc/roadsandpoverty%20reduction).
- Werner, F. and Lucious, G.K. 1992. The influence of transportation infrastructure on the regional pattern of agriculture in West Africa, using as an example the impact of the minor road network in the Dan Hills region of the Ivory Coast, *Applied Geography and Development*, **39**: 30-47.