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RESEARCH PAPER

Trends in Rural Roads of West Bengal and its Socio-economic Impact on Rural Livelihood Patterns

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ABSTRACT

Development of rural areas has been a priority of the government since the advent of the planning process. Keeping in view the crucial role of rural roads in the all-round growth of the rural economy, a number of measures have been taken by the Government of India to facilitate the rapid growth of rural roads. Construction and maintenance of rural roads have remained an important component and have received impetus through increased central and state funding in a number of development schemes. In light of the above, a study has been undertaken where an effort has been made to see the trends in rural roads of West Bengal leading to the growth and development of rural masses in West Bengal. It has been found that rural roads, although defined as low traffic volume roads, are a key component of rural development, since they promote access to economic and social services, thereby generating increased agricultural productivity, non-agricultural employment, non-agricultural productivity, which in turn expands rural growth opportunities and real income through which poverty can be reduced. Better road connectivity raises awareness, personal knowledge, leading to improved accessibility to the health services, further use of sanitation which enables people to pursue different livelihood strategies. Secondary data for different variables also lead to significant results. The study concluded that rural roads with a positive trend bear a relationship with rural infrastructure and can change rural livelihood patterns.

HIGHLIGHTS

- A rising trend in rural roads both in the districts and the state as well.
- Curve fitting technique has been employed to see the best fit for the surfaced rural roads of the state and the selected districts.
- Rising trend in road density, an important indicator of road infrastructure.
- A positive correlation coefficient with various economic growth promoting parameters with rural roads leading to socio-economic growth and rural livelihood diversification.

Keywords: Rural Roads, rural economy, trends in rural roads, growth and development

In India, rural roads consist of roads built and constructed by Panchayati Raj Institutions, (Zilla Parishad, Panchayat Samiti, Gram Panchayat), Pradhan Mantri Gram Sadak Yojana (PMGSY) and State PWDs. Roads cause a substantial increase in the availability of transportation services. As of 2011, West Bengal has a total road length of 92,023 Km with a road density of 1.04 Km per Km^2. Studies reveal that on a macroscopic scale, West Bengal's access to the basic and welfare needs such as safe water, power and the road network is connected with national per capita income. It has been seen several times that 'road connectivity' is a prime contributor to enhancing the quality of rural life. Since the 1940s, the Government of India and the state governments have drawn up several policies, programmes and conceived various schemes for the

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development of rural roads in India. The policies framed and targets were set under the long-term road development plans and accordingly, funds were allocated to various rural development programmes/schemes under the Five-Year Plans. Several strategies are being implemented by the Ministry of Rural Development (MoRD) to address rural poverty and improve the economic wellbeing of the people in rural areas with the main focus on increasing livelihood opportunities. One solution to the employment problems in rural areas lies in creating infrastructure and better connectivity, which leads to increased employment opportunities by connecting such areas to the markets and to places of employment in abundance. The availability of roads facilitates more business in the villages, thereby increasing the employment opportunities as well as helping people to travel outside for jobs. Rural roads play an important role in creating employment for unskilled workers and social awareness. An efficient transportation system is essential for sustainable economic development and modernization. Transportation has an important role in the overall development of the country's economy and plays an important role in maintaining national integration. It is believed that the growth of GDP and the transport sector bears a positive relationship. Policy makers have given great importance to road connectivity for poor rural remedies. This is not only the main infrastructure for the development process, but also plays an important role in maintaining the national high rate of growth, which will definitely indicate high transport. In view of this, an effort has been made in this study to find out the trend in rural roads of West Bengal and its socio-economic impact on rural livelihood patterns.

Literature Review

Studies of Van Dujine and Nijman (2019), based on their fieldwork in West Bengal and Bihar, show that there has been a shift in the employment structure away from agriculture causing in situ urbanization in a dispersed manner. They identify the absence sufficient employment opportunities in existing urban settlements or major cities as one of the reasons behind this dispersed pattern of urbanization.

It has been claimed in the past study of Sharma (2013) that commuting to the nearest city is an important reason for observed expansion of non-farm employment in the villages.

Model of Harris and Todaro (1970) suggests that urban condition i.e. cities and towns are better of with higher infrastructure facilities attracting more rural people. They opined that impact of infrastructure (physical infrastructure, social infrastructure both) plays a major role in migration and development. People migrate to the city to satisfy their demand for infrastructure. So the study of rural roads occupies a significant role in socioeconomic development of rural masses.

Moreover a large majority of the rural roads were not in a good condition due to the poor quality construction and maintenance (Sarkar *et al*. 2007). With a view to improve road connectivity in rural areas Government of India had launched the PMGSY (Pradhan Mantri Gram Sadak Yojna) in 2000. The Rural Roads Development Plan: Vision 2025 has also suggested the development of network based approached for connecting habitations with small population (MORD, 2007). It has been found that in some developing countries, over 90% of the road network remains unpaved, mostly gravelled, and our problem is not just in the logistics of building good roads but maintaining them too. This creates immense problem whilst the traffic increases. In view of these, an attempt has been made in this section to examine the trends in development of rural roads in West Bengal. Saha *et al*. (2011) found that livelihood diversifiers were found to have more number of livestock than non-diversifier. In various past studies, it has been demonstrated at macroscopic scale that access to basic and welfare needs such as safe water, power and the road network is connected with national per capita income. Border, Taylor and Mc Namara (1992) studied and came out with the suggestion that the construction of developmental roads as a means of encouraging economic growth. With a view to improve road connectivity in rural areas Government of India had launched the PMGSY (Pradhan Mantri Gram Sadak Yojna) in 2000. The Rural Roads Development Plan: Vision 2025 has also suggested the development of network based approached for connecting habitations with small

population (MORD, 2007). It has been found that in some developing countries, over 90% of the road network remains unpaved, mostly gravelled, and our problem is not just in the logistics of building good roads but maintaining them too. This creates immense problem whilst the traffic increases. In view of these, an attempt has been made in this section to examine the trends in development of rural roads in West Bengal.

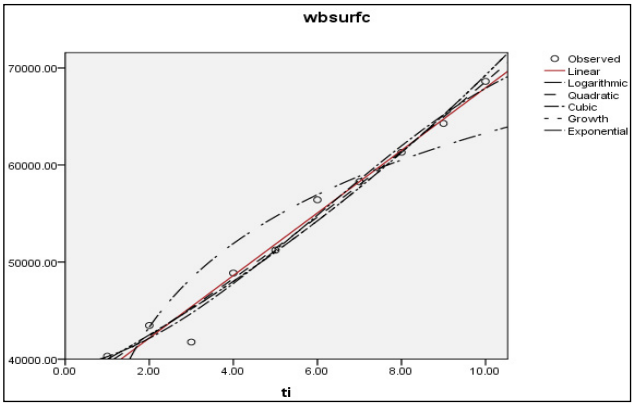
Database and Methodology

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 a list of blocks of the selected districts has been prepared 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 & 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 & rail station and which do not have paved road within the village but a high population density (According to Census data). 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.

Time series secondary data have been used to examine the trends in development of rural roads. Curve fitting method has been employed to see the trend of the rural roads using SPSS 16.0. Since curve fitting method is perhaps the best and most objective method of determining trend. Regression analysis has also been employed in between rural roads (Km) versus various economic growth generating variables to see whether rural roads is resulting in economic growth and development.Tabular analysis of secondary data has also been used to see the status and trends of rural connectivity.

Results and Discussion

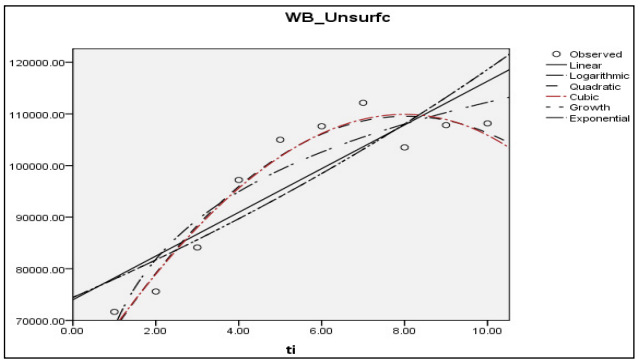
An attempt has been made in this study using the curve estimation technique from the available secondary data on length of roads in Km. A picture of the best fit/trend has been reflected. Here in this discussion curve fit for rural roads of West Bengal (both surfaced and un-surfaced) in Km, with N=10 has been depicted (With the available data).



NB: *Wbsurfc- West Bengal surfaced road in Km, ti- Time*

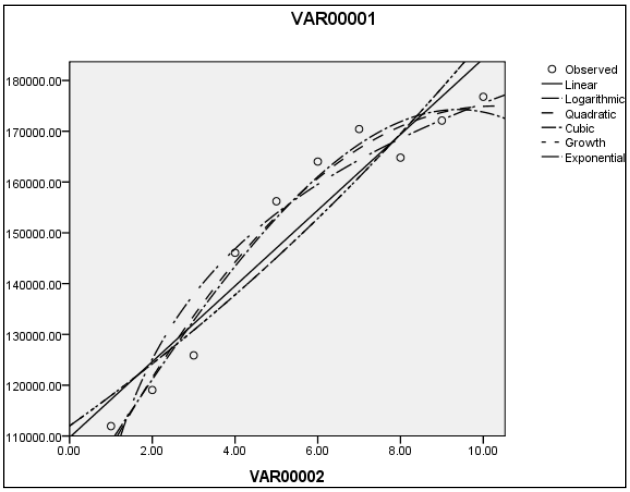
Fig. 1: Curve estimates of surfaced rural roads of West Bengal

From the results of SPSS curve estimation method it has been observed that among all the different types of curves obtained for surfaced rural roads in West Bengal, linear trend (Fig. 1 shown above) is the best fit curve with highest R^2 value of 0.98, 'p' value of 0.000 and a positive intercept term.



NB: *WB_Unsurfc- West Bengal un-surfaced road in Km, ti – Time*

Fig. 2: Curve estimates of un-surfaced rural roads of West Bengal



NB: Dependent Variable: Total length of Roads (Surfaced + Un-surfaced) VAR00001; Independent variable is Time VAR00002

Fig. 3: Curve estimates for rural roads (Surfaced + un-surfaced) in West Bengal

Table 1: Model Summery for Rural roads (Surfaced+ unsurfaced) in West Bengal as shown in Fig.3

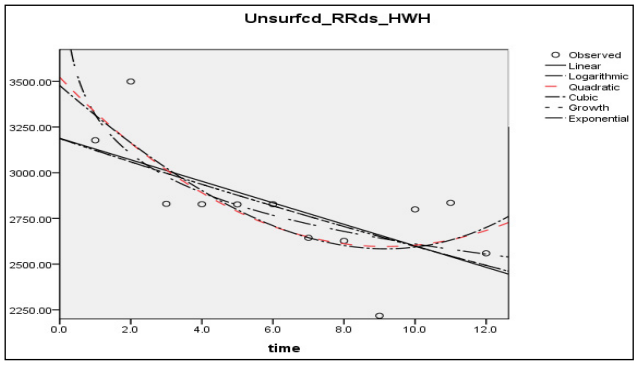
Model Summery						
	R^2	Sig.	Constant	b1	b2	b3
Fig. 3	0.904	.000	109709.68	7458.354		

Source: *District Statistical Hand Book, Bureau of Applied Economics and Statistics, Govt. of West Bengal.*

When the curve estimates for both surfaced and un-surfaced rural roads taken together has been analysed it has been found that the 'Linear Trend' (Fig. 3) gives the best fitted curve for rural roads of West Bengal (taken together) with the highest R^2 value of 0.904 and least 'p' value of 0.000 and a positive intercept term. The available curves are shown in the Fig. 3.

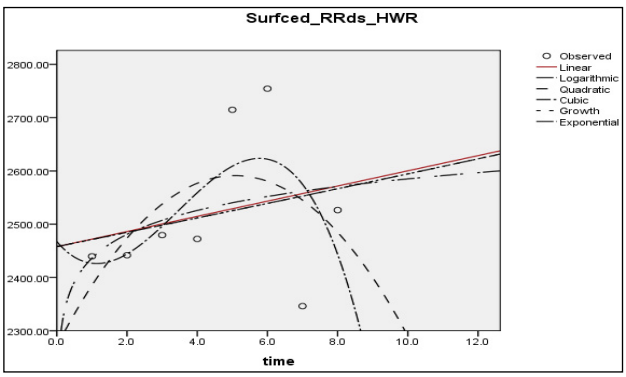
Now we have tried to see the trend in rural roads (both surfaced and unsurfaced) in the district of Howrah with high road density and Purulia district with low road density.

Curve estimation for rural roads in Howrah district (both for surfaced and un-surfaced roads) (N = 12) has been presented in Fig. 4, 5 and 6. It has been observed that among all the different types of curves obtained for un-surfaced rural roads in Howrah, quadratic trend (Fig. 4) is the best fit curve. On the other hand linear trend (Fig. 5) is observed to be the best fit curve in case of surfaced road. The figures are as follows.



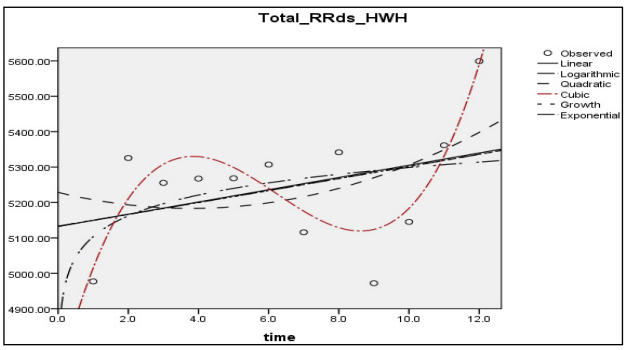
NB: *Unsurfcd_RRds_HWH: Un-surfaced rural roads Howrah, ti – Time*

Fig. 4: Curve estimates of un-surfaced rural roads of Howrah district



NB: *Surfced_RRds_HWR – Surfaced Rural roads Howrah, ti – Time year 2001-02 to 2012-13 (As per the availability of data)*

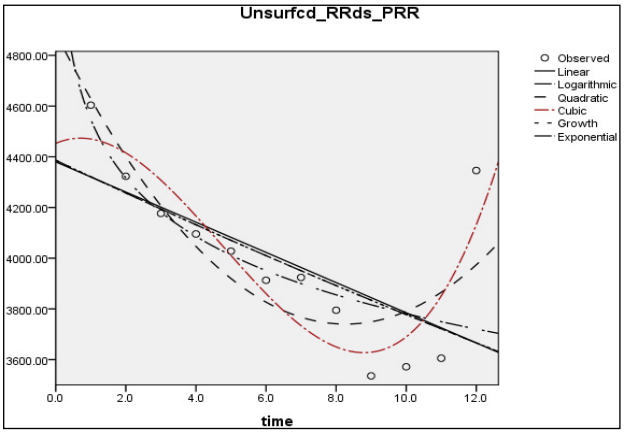
Fig. 5: Curve estimates of Surfaced rural roads of Howrah district



Source: *(1) P.W.D (Roads), Govt of W.B. (2) Zilla Parishad, Howrah, (3) All B.D.Os of Howrah (District Statistical Hand Book, Bureau of Applied Economics & Statistics, Govt. of West Bengal).*

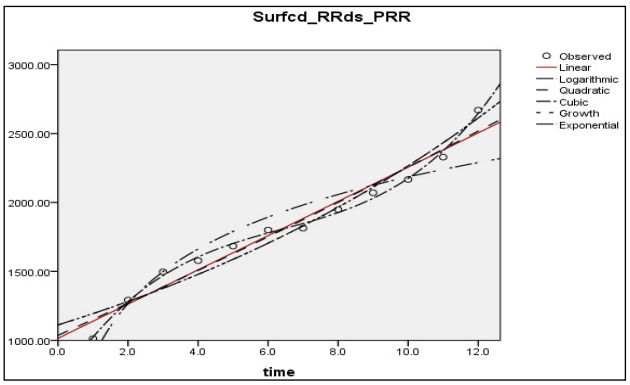
Fig. 6: Curve estimates of total rural roads of Howrah district (combining both surfaced and un-surfaced roads) showing Cubic Trend as the best fit

Similarly we have tried to captured the trend of surfaced rural roads, unsurfaced rural road and combining both of them in the same plot in case of Purulia.



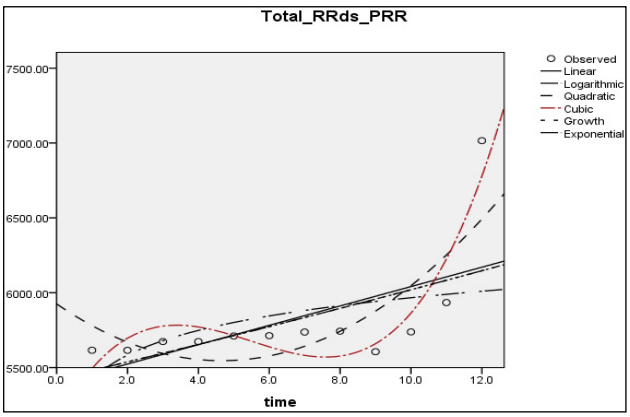
NB: *Unsurfcd_RRds_PRR – Unsurfaced rural roads Purulia, ti – Time*

Fig. 7: Curve estimates of un-surfaced rural roads of Purulia district, with the cubic Trend as the best fit



NB: *Surfcd_RRds_PRR – Surfaced rural roads Purulia, ti – Time.*

Fig. 8: Curve estimates of Surfaced rural roads of Purulia district, with the Linear Trend as the best fit



NB: *Total_RRds_PRR- Total length of rural roads (Surfaced + unsurfaced) at Purulia;* ***Source:*** *(1) P.W.D (Roads), Govt of W.B. (2) Zilla Parishad, Purulia, (3) Each Gram Panchayat and Samity, Purulia*

Fig. 9: Curve estimates of total rural roads of Purulia district (combining surfaced and unsurfaced roads) showing Cubic Trend as the best fit

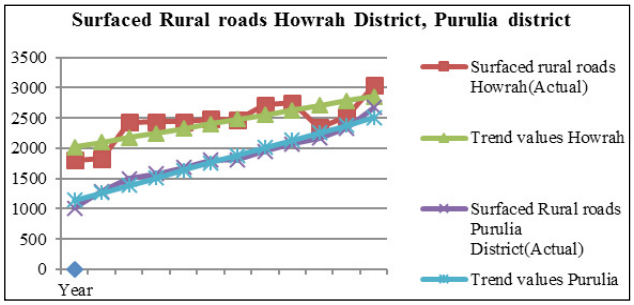
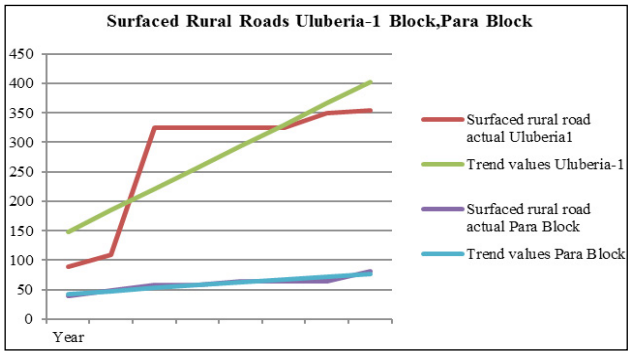


Fig. 10: Superimposed trend lines of surfaced rural roads of Howrah and Purulia district assuming simple linear regression model

Fig. 11 below shows the graphical presentation of trends in rural roads of the selected blocks when superimposed on the same plane.



Source: *Ex. Engineer PWD (Roads), Howrah, Ex. Engineer Zilla Parishad, Howrah, BDOs, Howrah.*

Ex. Engineer PWD (Roads), Purulia, Ex. Engineer Zilla Parishad, Purulia, BDOs Purulia, Each GP & Samity, Purulia. District Statistical Hand Book, Bureau of Applied Economics and Statistics, Govt. of West Bengal.

Fig. 11: Superimposed graphs of surfaced rural roads of Uluberia-1 and Para block

From these analyses, it has been observed that an upward rising curve both in case of Purulia and Howrah. This feature is also similar in case of West Bengal as a whole when we consider the trend in rural road growth and development. Again for simplicity using simple linear regression model of curve fitting estimation we have tried to superimpose the curve fit of Howrah district and Purulia district on the same plane. It has been observed how the actual values and the trend values differ using a simple linear model of regression. Vertical axis represent length of surfaced rural roads in Km and horizontal axis represent the time (N = 12 years). Here also both the districts show an uprising trend. But the curve for surfaced rural road is found to be more steeper in case of Purulia

district than that of Howrah district implying that Purulia being less developed than Howrah district and situated remotely had base year length less than that of Howrah and gradually rural road development progress is going on at a satisfactory pace. By simply adding the trend values of Howrah and Purulia we will get a positive rising trend once again. (3100, 3500, 3700, 3900……. Like that). Or in other way if we take the vertical summation of the trend lines of surfaced rural roads of Howrah and Purulia districts once again it reveals a positive trend of surfaced rural roads in West Bengal.

Again for the sake of simplicity for the selected blocks both the graphs of surfaced rural roads have been superimposed on the same plane to see if there exist any difference (N=8, as per available data), we can find that there exist a positive upward rising trend (Fig. 11) in both the blocks over years. It has been observed that the growth rate is relatively higher at Uluberia –I than that of Para.

Table 2: Rural Roads Network

Year	Length (Km)	% Share in Total Roads
1950-51	2,06,408	51.6
1960-61	1,97,194	37.6
1970-71	3,54,530	38.7
1980-81	6,28,865	42.3
1990-91	12,60,430	54.2
2000-01	19,72,016	58.5
2010-11	27,49,804	58.8
2014-15	33,37,255	61
2015-16	39,35,337	70.2
2016-17	41,66,916	70.7
2017-18	44,09,582	70.9
2018-19	45,22,228	71.4

Source: *Basic Road Statistics of India 2018-19, MORTH.*

Since 1940's the Government of India and the State Government had drawn several policies, programmes and conceived various schemes for the development of rural roads in India. The policies framed and targets were set under the long-term road development plans and accordingly funds were allocated in various rural development programmes under the Five Year Plans. The above results show that there is a positive trend in rural roads which may lead to development and economic growth of the state and the district as a whole thereby improving the living conditions of the rural people.

If we look at the trends in Rural Road density we find that percentage of rural road density has increased from 3.30% in 2012-13 to 5.42% in 2018-19 i.e. a rise in 2.12 percentage points. Road density/ availability have increased from 886.61 in 2011-12 to 1,458.10 in 2018-19. (Population and area is as per 2011 census and road length is as on 31/3/2019; Source: Basic Road Statistics of India 2018-19, MORTH)

Road density is an indicator of road infrastructure. The above data depicts an increasing trend since 2011- 12. This indicates an improvement of the quality and strength of public transportation system in the country.

Again if we look at the trend in the construction of rural roads we find a positive trend particularly from the year 2010 to 2019. It has been observed through review of literature that livelihood diversifiers were found to have more number of livestock than non-diversifier. In this background, an attempt has been made to examine the nature of regression analysis between rural roads of West Bengal with that of various economic growths promoting variables including agriculture and allied activities.

How various economic growth promoting parameters vary with the growth of rural roads has been tried to capture using simple linear regression model. Like Predictors (Constant)-Surfaced rural roads; Dependent variable- Per capita income, Predictors (Constant)-Surfaced rural roads; Dependent variable- Gross state domestic product etc.

We find a positive linear relationship between the explanatory variable 'Surfaced rural roads' of West Bengal and the outcome variable or dependent variable i.e. per capita income. Model summary tells that 92.4% of the total variation in the dependent variable is explained by the independent variable. Correlation analysis says Pearson "r" 0.961. There is a positive linear relationship between the explanatory variable surfaced rural roads of West Bengal and the dependent variable i.e. Gross State Domestic Product (GSDP). Model summary tells that 92.3% of the total variation in the dependent variable is explained by the independent variable. Correlation analysis says Pearson "r" 0.961.

Therefore, from these analyses we may conclude that there is a positive trend in rural roads of West Bengal encouraging economic growth and rural livelihood diversification. However, there is some limitation of the secondary data because this data is not available for a long period of time.

CONCLUSION

Rural Roads although defined as low traffic volume roads but are a key component of rural development, since it promotes access to economic and social services, thereby generating increased agricultural productivity, non-agriculture employment, non-agricultural productivity, which in turn expands rural growth opportunities and real income through which poverty can be reduced. Better road connectivity raises awareness, personal knowledge leading to improved accessibility to the facilities of health services, further use of sanitation which enables people to pursue different livelihood strategies. Secondary data for different variables also leads to a significant results. Therefore it can be stated that rural roads with a positive trend bear a relationship with rural infrastructure and can change rural livelihood pattern.

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