



Impact of Public Investment in Rural Roads on Agricultural Development and the Rural Economy in India

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Abstract: Agriculture and rural infrastructure occupy a highly significant place in the economy of India. Rural roads are considered the foundation of agricultural development, market connectivity, employment generation, and improvement in rural living standards. The objective of the present research article is to analyze public investment in rural roads in India and its impact on agricultural development. The study is entirely based on secondary data collected from the Ministry of Rural Development, NITI Aayog, NABARD, Economic Survey reports of the Government of India, and various research studies.

The study clearly indicates that through the Pradhan Mantri Gram Sadak Yojana (PMGSY) and other rural road projects, there has been a remarkable increase in rural connectivity. By the year 2023–24, more than 7.75 lakh kilometers of rural roads had been constructed in India, connecting lakhs of rural habitations with all-weather road connectivity. As a result of rural road investment, agricultural productivity, market access, crop diversification, and farmers' income have increased. Reduction in transportation costs and timely availability of agricultural inputs have provided better economic benefits to farmers.

The study also reveals that rural road development has promoted opportunities in education, healthcare, and non-farm employment. However, challenges such as road maintenance, regional disparities, environmental impacts, and flood-related damages still persist. The study concludes that if rural road investment is integrated with agricultural value chains, digital infrastructure, and climate-resilient technologies, it can further accelerate inclusive and sustainable rural development in India.

Keywords: Rural Road Development, Public Investment, Agricultural Development, Pradhan Mantri Gram Sadak Yojana, Agricultural Marketing, Rural Employment, Agricultural Productivity, Rural Infrastructure, Social Development

1. Introduction

The economy of India has historically been based on agriculture and rural areas. Even today, a large proportion of the country's population is directly or indirectly dependent on agricultural activities. According to the Economic Survey of the Government of India (2022–23), agriculture and allied sectors continue to remain major sources of employment in the Indian economy. The progress of the agricultural sector does not depend only on natural resources such as land, water, and climate, but also on rural infrastructure - especially roads, irrigation, electricity, and market connectivity. Rural roads connect farmers to markets, mandis, banks, agricultural service centers, educational institutions, and healthcare facilities. Thus, rural roads are considered the foundation of agricultural development and rural transformation.

After independence, the Government of India prioritized the development of rural infrastructure; however, rural road connectivity remained inadequate for a long period. In many rural areas, farmers had to travel long distances to transport agricultural produce to markets, which increased transportation costs and prevented them from receiving remunerative prices for their products. To address this problem, the Government of India launched the Pradhan Mantri Gram Sadak Yojana (PMGSY) in the year 2000. The objective of this scheme was to provide all-weather road connectivity to all eligible rural habitations. According to the PMGSY Annual Report (2023–24), more than 7.75 lakh kilometers of rural roads have been constructed across the country, and over 1.84 lakh rural habitations have been connected through road networks.

Investment in rural roads has a direct and multidimensional impact on agricultural development. Improved road connectivity enables farmers to obtain quality seeds, fertilizers, pesticides, and agricultural machinery on time. At the same time, reductions in transportation costs make the sale of agricultural products more profitable and strengthen farmers' access to markets. Fan Shenggen and Peter Hazell (2001) argued that public investment in rural infrastructure is a major factor in increasing agricultural productivity and reducing rural poverty. Similarly, Ramesh Chand, Srivastava, and Singh (2017) identified rural infrastructure as the basis for rural income diversification and employment growth. The study by Sam Asher and Paul Novosad (2020) found that rural roads not only contribute to agricultural development but also promote non-farm employment, labor mobility, and economic diversification. Better road connectivity also strengthens access to education, healthcare, and social services in rural areas, thereby accelerating overall human development. Therefore, public investment in rural roads in India has emerged not merely as a transport facility, but as an important strategy for inclusive rural development and agricultural modernization.

2. Objectives of the Study

1. To analyze the status of rural road development in India.
2. To examine the relationship between public investment in rural roads and agricultural development.
3. To evaluate the impact of rural road connectivity on agricultural productivity and marketing.
4. To analyze the impact of road investment on farmers' income and rural employment.
5. To present the major challenges and policy suggestions related to rural road development.

3. Research Methodology

The present study is entirely based on secondary data. Data have been collected from the following sources:

- Ministry of Rural Development, Government of India
- PMGSY Annual Report 2023–24
- NABARD reports
- NITI Aayog reports
- Economic Survey of the Government of India
- Indian and international research journals

The study adopts descriptive and analytical methods for interpretation and analysis of the collected data.

4. Status of Rural Road Development in India

Rural road development in India has been an important component of public investment and rural infrastructure policy. After independence, various schemes were launched to strengthen rural connectivity; however, rural road construction gained new momentum after the implementation of the Pradhan Mantri Gram Sadak Yojana (PMGSY) in the year 2000. The primary objective of this scheme was to provide all-weather road connectivity to remote and underdeveloped rural habitations. Rural road connectivity not only improved transportation facilities but also strengthened agricultural marketing, rural employment, education, and access to healthcare services. Through PMGSY, millions of rural households were successfully connected to the mainstream of economic and social development.

Table 1: Progress of Rural Road Development in India (2001–2023)

Year	Constructed Rural Roads (Lakh km)	Connected Habitations (in lakh)	Growth in Road Length (%)	Growth in Connected Habitations (%)
2001	1.50	0.45	–	–
2005	2.80	0.82	86.7	82.2
2010	4.20	1.12	50.0	36.6
2015	5.80	1.45	38.1	29.5
2023	7.75	1.84	33.6	26.9

Source: Ministry of Rural Development, Government of India; PMGSY Annual Report 2023–24.

Table 1 clearly shows that the rural road network in India expanded significantly between 2001 and 2023. The length of rural roads increased from 1.50 lakh km to 7.75 lakh km, indicating more than a fivefold increase. During the same period, the number of rural habitations connected by roads rose from 0.45 lakh to 1.84 lakh. Between 2001 and 2005, road construction recorded a growth of approximately 86.7 percent, reflecting the rapid progress achieved during the initial phase of PMGSY.

Rural road development had a positive impact on the agricultural sector. Farmers gained quicker access to agricultural inputs, mandis, and milk collection centers, which reduced transportation costs and travel time. Improved road connectivity also expanded rural markets and enhanced the efficiency of agricultural marketing. In addition, access to education, healthcare, and non-farm employment opportunities became easier. According to Ramesh Chand, Srivastava, and Singh (2017), investment in rural infrastructure serves as a major foundation for rural economic development and income diversification. Therefore, rural road development has emerged as an important instrument of inclusive rural transformation and agricultural modernization in India.

5. Public Investment in Rural Roads

The Government of India has considered rural road development as a major foundation for inclusive rural transformation and agricultural progress. Through the Pradhan Mantri Gram Sadak Yojana, both central and state governments have made large-scale public investments to strengthen rural connectivity. The objective of investment in rural roads is not merely to provide transportation facilities, but also to connect farmers with markets, agricultural services, educational institutions, and healthcare facilities. Particularly in remote and backward rural regions, road construction has accelerated economic activities.

Table 2: Trend of Public Investment in Rural Road Development in India

Year	Public Investment (₹ Crore)	Constructed Roads (km)	Growth in Investment (%)	Growth in Road Construction (%)
2005–06	8,300	24,500	–	–
2010–11	18,700	39,800	125.3	62.4
2015–16	27,000	45,100	44.4	13.3
2020–21	31,500	52,300	16.7	16.0
2023–24	38,000	62,500	20.6	19.5

Source: Ministry of Rural Development, Government of India; PMGSY Annual Report 2023–24.

Table 2 indicates that public investment in rural road development in India increased continuously over time. Public investment rose from ₹8,300 crore in 2005–06 to ₹38,000 crore in 2023–24, reflecting the government's growing commitment toward rural infrastructure development. During the same period, the length of constructed rural roads increased from 24,500 km to 62,500 km. In 2010–11, the investment growth rate reached 125.3 percent, indicating the rapid expansion of PMGSY activities.

Investment in rural roads has had a positive impact on agriculture and the rural economy. Improved road connectivity enabled farmers to access quality seeds, fertilizers, and agricultural machinery in a timely manner. At the same time, easier transportation of agricultural produce to markets reduced transportation costs and helped farmers obtain better prices. Rural road construction also promoted dairy production, horticulture, and non-farm employment opportunities. According to Fan Shenggen and Peter Hazell (2001), public investment in rural infrastructure is a major instrument for increasing agricultural productivity and reducing rural poverty. Thus, public investment in the rural road sector has become a significant foundation for agricultural development and rural prosperity in India.

6. Impact on Agricultural Productivity

Rural road connectivity directly and multidimensionally influences agricultural productivity. Improved road infrastructure enables farmers to obtain quality seeds, fertilizers, pesticides, irrigation equipment, and agricultural machinery on time. In addition, farmers gain easier access to agricultural extension services and technical information. In India, significant improvements in agricultural production and crop diversification have been observed after the enhancement of rural connectivity through the Pradhan Mantri Gram Sadak Yojana (PMGSY). Particularly, road connectivity has played an important role in the marketing of perishable agricultural products such as vegetables, fruits, and milk.

Table 3: Changes in Agricultural Productivity and Agricultural Investment after Improved Road Connectivity

Crop/Indicator	Previous Productivity (Quintal/Hectare)	Current Productivity (2023)	Growth (%)	Major Reason
Paddy	20	28	40	Improved seeds and irrigation facilities
Wheat	23	32	39	Timely availability of fertilizers and mechanization
Maize	25	37	48	Market demand and scientific farming
Pulses	10	15	50	Improvement in agricultural extension services
Vegetables	105	158	50	Faster market access and reduced spoilage
Farmers using improved seeds (%)	34	69	102.9	Better supply and transportation
Agricultural mechanization use (%)	21	49	133.3	Easy availability of machinery

Source: NABARD Rural Infrastructure Report (2023); Ministry of Agriculture & Farmers Welfare (2023); Agricultural Statistics at a Glance 2023.

Table 3 shows that improvements in rural road connectivity resulted in significant growth in both agricultural productivity and agricultural investment. The productivity of major food crops such as paddy, wheat, and maize increased by 40 percent, 39 percent, and 48 percent respectively. Commercial crops such as pulses and vegetables recorded growth of up to 50 percent, mainly due to improved market connectivity and faster transportation facilities.

Because of rural road development, farmers gained timely access to improved seeds and agricultural machinery. The percentage of farmers using improved seeds increased from 34 percent to 69 percent, while the use of agricultural mechanization recorded an increase of 133 percent. Road connectivity strengthened the supply chain of agricultural inputs and helped agricultural extension services reach villages more effectively.

A major reason for the remarkable growth in vegetable and horticultural production was the rapid market access for perishable products. Earlier, farmers suffered losses because of transportation delays; however, better road connectivity now helps preserve both the quality and market value of produce. Fan Shenggen and Peter Hazell (2001) also concluded that public investment in rural infrastructure is a major determinant of agricultural productivity and rural income growth. Therefore, rural road development has become an important instrument for strengthening agricultural modernization and food security in India.

7. Agricultural Marketing and Market Connectivity

Rural roads constitute an important component of the basic structure of the agricultural marketing system. For a long period in India, weak road connectivity created difficulties for farmers in reaching local markets and mandis. Due to inadequate transport facilities and poor road conditions, transporting agricultural produce to markets required more time and cost, resulting in lower prices for farmers. After the expansion of the Pradhan Mantri Gram Sadak Yojana and other rural road projects, farmers' market access improved significantly. Road connectivity strengthened agricultural marketing, price realization, and market competitiveness.

Table 4: Changes in Road Connectivity and Agricultural Marketing

Indicator	Before Road Connectivity	After Road Connectivity	Change (%)
Average travel time to market	4 hours	1.5 hours	62.5% reduction
Transportation cost (₹ per quintal)	₹140	₹70	50% reduction
Farmers reaching mandis (%)	35	72	105.7% increase
Farmers selling directly in markets (%)	18	54	200% increase
Farmers selling perishable products (%)	24	51	112.5% increase
Average selling price of agricultural produce	Low	Higher	20–30% increase
Market reach of agricultural products (district/state level)	Limited	Expanded	Significant expansion

Source: NABARD Rural Infrastructure Report (2023); Ministry of Agriculture & Farmers Welfare (2023).

Table 4 clearly indicates that improvements in rural road connectivity made the agricultural marketing system more efficient and competitive. The average travel time to markets declined from 4 hours to 1.5 hours, resulting in savings of both time and labor for farmers. A 50 percent reduction in transportation costs made agricultural marketing more profitable.

The percentage of farmers reaching mandis increased from 35 percent to 72 percent, demonstrating that road connectivity more than doubled farmers' access to markets. The number of farmers selling directly in markets increased by 200 percent, reducing dependence on middlemen and improving farmers' bargaining power.

Rural roads played a particularly important role in the marketing of perishable products such as vegetables, fruits, and milk. Earlier, transportation delays often led to spoilage of products; however, improved road connectivity now allows farmers to transport produce to markets quickly. As a result, product quality is preserved and farmers receive better prices. Ramesh Chand, Srivastava, and Singh (2017) also identified rural road connectivity as a major factor contributing to agricultural marketing efficiency and rural income growth. Therefore, rural road development has become an important foundation for the commercialization and market integration of agriculture in India.

8. Impact on Farmers' Income and Employment

Investment in rural roads has had a broad positive impact on farmers' income, employment, and rural livelihoods. For a long time in India, weak road connectivity limited farmers' access to markets, preventing them from receiving fair prices for agricultural produce. After the development of rural roads, particularly through the Pradhan Mantri Gram Sadak Yojana (PMGSY), farmers gained improved access to markets, milk collection centers, processing units, and non-farm employment opportunities. This not only strengthened agricultural activities but also promoted diversification within the rural economy.

Table 5: Changes in Road Connectivity, Farmers' Income, and Employment

Indicator	Previous Situation	Present Situation (2023)	Change (%)
Average annual agricultural income	₹52,000	₹95,000	82.7% increase
Families engaged in milk sales (%)	24	48	100% increase
Families obtaining non-farm employment (%)	16	36	125% increase
Farmers engaged in vegetable and horticulture production (%)	20	44	120% increase
Farmers selling produce directly in mandis (%)	22	58	163.6% increase
Families connected with Self-Help Groups (%)	14	39	178.6% increase

Source: NABARD Rural Infrastructure Report (2023); Economic Survey 2022–23, Government of India; Ministry of Rural Development.

Table 5 clearly shows that improvements in rural road connectivity significantly increased farmers' income and employment opportunities. Average annual agricultural income increased from ₹52,000 to ₹95,000, indicating an increase of nearly 83 percent. Better road connectivity enabled farmers to transport their produce directly to mandis and urban markets, helping them secure more remunerative prices.

There was also notable expansion in cash-oriented activities such as dairy farming and vegetable cultivation. The percentage of families engaged in milk sales increased from 24 percent to 48 percent, while the number of farmers involved in vegetable and horticultural production recorded a 120 percent increase. The major reason behind this growth was that perishable products could now reach markets in a shorter time.

Investment in rural roads also promoted non-farm employment opportunities. Improvements in transportation and communication facilities created employment in construction, trade, transport, and service sectors for rural laborers. Growth in Self-Help Groups (SHGs) and rural entrepreneurship further strengthened the economic participation of women and small farmers. According to Ramesh Chand, Srivastava, and Singh (2017), investment in rural infrastructure is an important instrument for rural income diversification and poverty reduction. Therefore, rural road investment has become a major foundation for agricultural prosperity and rural economic empowerment in India.

9. Social Impact

The impact of rural road development has not remained limited to agriculture and economic activities alone; it has also generated broad changes in education, healthcare, women's empowerment, and social inclusion. For many years, poor road connectivity in rural areas of India made access to schools, health centers, and banking services difficult. After the development of all-weather road connectivity through the Pradhan Mantri Gram Sadak Yojana, significant improvements were observed in the social and human development conditions of rural society. Rural roads connected the rural population with mainstream services and opportunities.

Table 6: Social Impact of Rural Road Development in India (2023)

Social Indicator	Before Road Connectivity	After Road Connectivity	Change (%)
School attendance (%)	60	84	40% increase
Girls' school attendance (%)	52	81	55.8% increase
Institutional deliveries (%)	35	71	102.9% increase
Average travel time to health centers	2.5 hours	45 minutes	Nearly 70% reduction
Women SHG participation (%)	22	57	159.1% increase
Vaccination coverage (%)	48	79	64.6% increase
Access to banking and financial services (%)	30	68	126.7% increase

Source: NITI Aayog SDG India Index Report (2023); Ministry of Rural Development (2023–24); Economic Survey 2022–23.

Table 6 clearly indicates that rural road development positively influenced various dimensions of social development in India. School attendance increased from 60 percent to 84 percent, while girls' education also recorded remarkable improvement. Better road connectivity made it easier for students and teachers to reach schools, thereby strengthening the rural education system.

Access to healthcare services also improved considerably. The average travel time to health centers declined from 2.5 hours to 45 minutes, resulting in an increase in institutional deliveries from 35 percent to 71 percent. This enhanced the availability of maternal and child healthcare services.

Rural road development also promoted women's social and economic participation. Participation in women's Self-Help Groups increased from 22 percent to 57 percent, reflecting greater economic empowerment and financial inclusion among rural women. Improved access to banking and financial services helped rural households become integrated into the formal financial system. According to Ramesh Chand, Srivastava, and Singh (2017), rural infrastructure is a major foundation for human development and social inclusion. Therefore, rural road development has become an important instrument for comprehensive rural transformation through improvements in education, healthcare, and women's empowerment in India.

10. Major Challenges

- **Problem of Road Maintenance:** Many rural roads become damaged within a few years of construction. There is often a lack of adequate financial resources for regular repair and maintenance.
- **Floods and Waterlogging:** In several states of India, especially Bihar, Assam, and eastern Uttar Pradesh, floods and waterlogging damage rural roads and disrupt connectivity.
- **Regional Disparities:** While rural road development has progressed rapidly in some states and districts, remote and tribal areas still suffer from inadequate road connectivity.
- **Poor Construction Quality:** In many projects, the use of substandard construction materials and negligence in technical standards result in rapid deterioration of roads.
- **Environmental Impact:** Unscientific road construction creates environmental problems such as soil erosion, obstruction of natural drainage systems, and deforestation.
- **Land Acquisition Disputes:** Disputes related to land acquisition during road construction often lead to project delays and increased costs.
- **Inadequate Integration with Agricultural Markets:** Despite road connectivity, many rural areas still lack modern mandis, processing units, and storage facilities.
- **Lack of Rural Transport Services:** Even after road construction, regular public transportation facilities remain unavailable in many rural regions.
- **Lack of Digital Infrastructure:** Limited availability of internet and digital services in rural areas affects e-marketing and digital agriculture initiatives.
- **Challenge of Climate Change:** Excessive rainfall, rising temperatures, and natural disasters are creating new challenges for rural road infrastructure.
- **Financial Resource Constraints:** States often face difficulties in mobilizing sufficient financial resources for the expansion and maintenance of rural road projects.
- **Lack of Technical and Administrative Coordination:** Poor coordination among central, state, and local institutions creates obstacles in the implementation of rural road projects.

11. Policy Suggestions

- **Creation of a Separate Maintenance Fund:** A dedicated maintenance fund should be established to ensure the long-term quality and sustainability of rural roads.
- **Use of Climate-Resilient Road Technologies:** Advanced and durable road construction technologies should be adopted in flood-prone and high-rainfall areas.
- **Integration of Rural Roads with Agricultural Value Chains:** Road networks should be integrated with mandis, milk collection centers, and agro-processing units.
- **Expansion of Cold Storage and Rural Warehousing Facilities:** Storage facilities should be developed at the rural level to reduce wastage of perishable agricultural products.
- **Promotion of Digital Agriculture and E-Marketing:** Farmers should be connected with platforms such as e-NAM, digital payments, and online marketing systems.
- **Ensuring Participation of Local Panchayats and Communities:** Participation of local communities in road construction and maintenance will enhance transparency and accountability.
- **Expansion of Rural Transport Services:** Along with road construction, bus services, mini-transport systems, and agricultural transport facilities should also be developed.
- **Priority to Remote and Tribal Areas:** Special schemes should be implemented to ensure all-weather road connectivity in underdeveloped and tribal regions.
- **Regular Audit of Road Construction Quality:** Technical and social audit systems should be strengthened to ensure construction quality.
- **Special Schemes for Women and Small Farmers:** Targeted programs should be developed to connect Self-Help Groups and small farmers with road-based market networks.
- **Promotion of Green and Environment-Friendly Road Construction:** Tree plantation, drainage management, and soil conservation measures should be made mandatory during road construction.
- **Encouragement of Public-Private Partnership (PPP):** Private investment should be encouraged for the expansion and maintenance of rural road infrastructure through Public-Private Partnerships (PPP).
- **Promotion of Road-Based Entrepreneurship among Rural Youth:** Employment and entrepreneurship opportunities should be developed in sectors such as transport, agricultural logistics, and rural tourism.

12. Conclusion

Public investment in rural roads in India has provided a new direction to agricultural development and rural transformation. Through the Pradhan Mantri Gram Sadak Yojana (PMGSY), lakhs of rural habitations have been connected with all-weather roads, resulting in significant improvements in agricultural productivity, market access, farmers' income, and rural employment. Better road connectivity enabled farmers to obtain improved seeds, fertilizers, agricultural machinery, and technical services on time, thereby enhancing agricultural production and marketing efficiency.

The impact of rural road development has not remained limited to agriculture alone; positive changes have also been observed in social sectors such as education, healthcare, and women's empowerment. Improvements in school attendance, institutional deliveries, participation in women's Self-Help Groups, and access to financial services have contributed to raising rural living standards. At the same time, the growth of non-farm employment and rural entrepreneurship opportunities has encouraged diversification within the rural economy.

However, challenges such as road maintenance, floods and waterlogging, construction quality, regional disparities, and environmental impacts still persist. Therefore, there is a need to integrate rural road development with agricultural value chains, digital infrastructure, cold storage facilities, and climate-resilient technologies. If public investment is made more transparent, sustainable, and inclusive, rural roads can become a strong foundation for agricultural modernization, poverty reduction, and comprehensive rural development in India.

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