

RURAL ROAD INFRASTRUCTURE IN AGRICULTURAL DEVELOPMENT IN KARNATAKA: A REVIEW

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Abstract

Since the First Five-Year Plan, the Indian and state governments have invested heavily in agriculture infrastructure to accelerate economic growth. Irrigation, roads, transportation, electric power, agricultural markets, and other infrastructure investments have added to agricultural development at the macro level and too wide regional disparities in agricultural growth through road infrastructure. In India, the vast territories must be accessible via village roads or country roads. Rural roads facilitate agricultural product marketing, which encourages healthy competition. A more effective distribution system can be ensured with a better transportation network. Since the state provides infrastructure, decision-makers invest heavily in areas with fast agricultural growth to achieve other developmental goals like poverty alleviation. Thus, bias in decision-making and the financial strength of various governments decide the infrastructure level in different regions, causing an imbalance in agricultural growth and regional development. This study examines how road infrastructure accelerates the status of agricultural growth based on secondary sources of data collection.

Keywords: Rural Infrastructure, Agricultural Development, Roads, Economic Growth

INTRODUCTION

Infrastructure services are typically provided by the private sector, but they are usually supported by the public sector. Infrastructure like water, sanitation, transportation, electricity, telecommunications, irrigation dams, regulated markets, and banks generate services. The agricultural infrastructure contains all basic services, facilities, equipment, and institutions needed for food and fibre market growth and efficiency. Infrastructure investment requires a firm commitment to the study and cooperative extension system that improves production, marketing, food safety, nutrition, natural resource conservation, and other functions of agricultural infrastructure agencies. Economic, social, financial, technical, agricultural, and other infrastructure types exist. All infrastructures are complementary and necessary to economic development. The combined benefits of all these types of infrastructure are greater than the benefits of each form individually. Thus, providing multiple essential infrastructure facilities generates more net benefits than offering one. This assertion implies that infrastructure, both vertically and horizontally, drives regional or sectorial development and economic growth.

The economic growth paradigm asks how production factors affect overall output. In a perfectly competitive market without externalities, factor income equals marginal value products. Since the market responds to price signals that reflect private benefits and ignore "externalities," this has policy consequences for sector investment levels. To allocate resources

more efficiently, big externalities require government intervention, which has costs. Infrastructure services are often rationed or unpriced because they are supplied by the public sector, making it difficult to estimate infrastructure capital's private productivity. Development economics research has shown that infrastructure levels positively affect economic growth. Keynesian macroeconomics also links spending to output and income. It should be noted that of the four factors contributing to a nation's income—consumption expenditure, investment expenditure, government expenditure, and net income from abroad—investment income comes from both private and government spending. In the Keynesian model, income is assessed annually, but investment includes long-term investments like infrastructural facilities. Infrastructure investment is economically warranted because the model assumes a positive correlation between income and investment.

Rostow, (1960) claims that expanding and improving transport and infrastructure is a prerequisite for capital formation, production, and productivity during various stages of economic growth. Since infrastructure investment boosts economic growth, supply and demand must match to avoid disequilibrium, which causes regional inequities. Economic "public goods theory" underpins infrastructure theory. Basic infrastructure spending yields public goods. Notable traits include: non-excludability means that no user group member can be excluded from using infrastructural services unless strict enforcement is implemented. Even if someone can be legally prevented from using the benefits, the transaction cost would make it monetarily unviable. For instance, preventing a farmer downstream of a newly built irrigation dam from using the groundwater recharged by the dam would be more expensive, and non-rival consumption means that one person's consumption does not affect another's unless a negative externality problem like water pollution arises. Unless there is excessive water pollution, one agent's consumption of water's service (say, industry using the river's disposal service) does not affect another agent's consumption (say, farmer using water for irrigation). Infrastructure is social wealth that benefits society without externality.

In developing countries, where a large proportion of the poor rely on agriculture for subsistence, agricultural infrastructure is crucial. Infrastructure enhances growth, so regional views should examine the relationship between agricultural development and infrastructure. The agricultural sector alleviates poverty, infrastructure investment is crucial to its growth and its components, such as jobs, income, output, and so on. Thus, which farm infrastructure may explain regional agricultural growth imbalance. As mentioned, the crux of the study examines how infrastructure promotes agricultural growth and regional development. The present analysis should identify backward regions based on agricultural infrastructure and propose policy changes to boost regional economies, increases the Regional Value Added, social benefits, economies of scale, accelerator effects, increased welfare of producers and consumers, reduction in price Oscillation. (L, n.d.)

Rural Infrastructure

In general, the physical framework of rural amenities used to deliver facilities and services to the broader population is referred to as rural infrastructure. Due to India's predominately rural nature, as well as the critical connections between infrastructure and economic growth, poverty

reduction, and human development, rural infrastructure is given primary importance weight in the nation. The term "rural infrastructure" refers to a broad range of services, including transportation, energy production, transmission, and distribution, telecommunication, and port handling facilities, water supply, sewage disposal, irrigation, and other essential services. (Manjunath, 2016)

REVIEW OF LITERATURE

This study examined impact of rural road infrastructure in agriculture development in Karnataka. The study examined rural infrastructure and agricultural growth using 30 years of district-level data and an infrastructure availability and utilisation framework. The regression analysis showed that infrastructure availability index and infrastructure utilisation index positively and significantly affected agricultural output growth. Infrastructure utilisation had a greater impact on productivity growth than supply. Infrastructure availability and use had a greater impact on agricultural output. Spatial convergence of agricultural productivity growth showed districts converge in land yield over time. (Manjunath & Kannan, 2017).

(Kumar, 2008) Agriculture needs productivity growth to grow and this study examined agricultural productivity in Bangladesh, India, Nepal, Pakistan, and Sri Lanka. South Asia's TFP growth and output growth over 30 years are summarized. For three decades, India has updated crop-specific TFP growth numbers using micro farm data. South Asian countries' main crops, crop systems, crops, and livestock sectors' TFP changes and growth sources were also discussed. TFP computation and growth methodology has been given. Food-secure South Asia policies include stopping total factor productivity deceleration, increasing major commodity yields, empowering small farmers, protecting the environment, and strengthening the national agricultural research system. This paper's productivity concerns could guide future study(n.d.).

(Manjunath, 2021) For its multiplier impacts in India, the agricultural sector is important in discussions of SDGs and low-income development. Agriculture's low growth performance is due to institutional incongruence, low public spending in rural infrastructure, and marketing structures. Infrastructure improves agricultural productivity, and much has been written about infrastructure provision and agricultural growth. Recent research suggests infrastructure quality drives economic growth. The chapter examines rural infrastructure using both quantity and quality parameters to influence development results. The chapter examines how economic, institutional, and human capital affects agricultural growth in Karnataka by identifying various quality dimensions. The linear regression analysis examines infrastructure access and quality to explain agricultural growth disparities across Karnataka. The chapter shows how quality affects infrastructure usage efficiency and productivity growth.

(Edeme et al., 2020), Using panel autoregressive distributed lag (PARDL) methodology; this study investigates the effect of infrastructure development on agricultural output and employment in the Economic Community of West African States (ECOWAS) and demonstrates that infrastructures that support agricultural productivity promote the creation of jobs. Information and communication technologies positively impact agricultural output, while access to electricity positively impacts agricultural employment, according to estimated results.

The impact of transportation infrastructure on agricultural output was negative and insignificant. This paper makes a significant contribution by demonstrating that investment in infrastructure development with the goal of enhancing agricultural productivity may contribute to job creation.

(Ghosh, 2017) This article evaluates rural infrastructure facilities in 16 main Indian states and their effects on income and non-income rural development. Despite public infrastructure development efforts in rural India, facilities remain poor and progress has been mostly unsatisfactory with state-by-state differences. Improved physical and social infrastructure and livelihood opportunities boost agricultural productivity and output, literacy and life expectancy, and poverty and infant mortality, according to regression coefficient estimates of rural infrastructure composite indices and indicators. To improve well-being, the government should spend more in electricity, roads, irrigation, housing, and telecommunications.

(Wanmali & Islam, 1995) Based on three decades of data from Andhra Pradesh, Maharashtra, and Tamil Nadu, this study examines rural service distribution. Christaller's Central Place Theory allows us to study settlements' demographic, functional, and spatial characteristics despite economic disparities. Since the late 1960s, rural services have improved in all areas, especially in smaller settlements. Complex services have become more widespread. In Andhra Pradesh and Tamil Nadu, new agricultural technologies spurred such improvements, while in Maharashtra, urban industrial growth in a metropolitan city. During early regional growth, the government was crucial, which allowed the private sector to become more involved later. Decentralized service centre planning in India examines rural service provider changes. This study's insights and methods could form the basis for a more integrated regional approach to planning and policy formulation for rural service provision at the district level in India.

(Datar et al., 2007), this study analyzed the role of health facilities and community health workers in rural India's low immunization rates. The 1993 and 1998 National Family Health Surveys (NFHS) sampled 43,416 rural Indian infants aged 2-35 months. Separate multinomial logit regression models for polio and non-polio vaccines estimated the probability that a child would receive "no cover," "some cover," or "full age-appropriate cover." The key measure of health infrastructure was a hierarchical variable that assigned each child to a category (no facility, dispensary or clinic, sub-centre, main health care centre, and hospital) based on the village's best health facility, also included village health facilities and community health staff availability variables. While rural health infrastructure was under-provided, results showed that it had only a modest impact on immunization coverage. Larger and better-equipped centres affected immunization coverage more. Village community health workers did not boost immunization coverage.

Objectives

- To review the role of rural infrastructure in agricultural development in Karnataka
- To examine the impact of road infrastructure programmes on agricultural development

METHODOLOGY

This study is made an attempt to examine the role of rural road infrastructure in agricultural development in Karnataka. For this purpose the researcher imposed the secondary data. The secondary data collected from the annual reports, documents, journals published and Websites etc.

ROLE OF RURAL INFRASTRUCTURE IN AGRICULTURAL DEVELOPMENT

Most developing nations realize the importance of infrastructure for agriculture. Rural infrastructure development is vital for productivity gains and poverty reduction. Climate, government support, technological advances, policy decisions, international trade, and other factors can boost output, but ground-level infrastructure is still crucial. India's policymakers have long struggled to balance regional growth. Due to the dominance of a few growing areas in the economy, rural-urban differences may contribute to developmental imbalances. In rural areas, agriculture is the most important field, but it has performed poorly.

Despite more than half of rural population working in this area, GDP share is declining, indicating poor performance. Even today, agricultural growth reduces regional differences. Due to its inconsistent production, Karnataka is a good case study for the relationship between agricultural growth and rural infrastructure. Most of Northern Karnataka has lower development due to vast dry areas and drought-prone districts. "The vast extent of dry, un-irrigated land, primarily in Northern Karnataka, casts its long shadow on the socio-economic development of the local people in many significant ways". Natural resource endowments and socio-economic and institutional factors often explain regional disparities in agricultural success. Given the importance of infrastructure for agricultural growth, it is crucial to examine how targeted infrastructure can reduce regional disparities. To increase output and primary sector growth, scarce resources must be mobilized.

The provision of economic and institutional infrastructure, as well as the provision of fundamental services and facilities to the farming population, assumes that the producers possess the necessary skills and competencies to maximize their potential. In this light, the development of social infrastructure becomes significant because it indirectly contributes to the development processes. Improving farmers' skill formation to achieve greater operational precision in accessing and utilizing services provided by other infrastructure facilities is crucial. In agricultural research literature, social infrastructure has not received as much attention as economic and institutional infrastructure. When all three categories of rural infrastructure are combined with better agricultural inputs, such as improved seeds, fertiliser, and agricultural machinery, they contribute to decisions regarding inputs and farming practices, thereby increasing agricultural output. Additionally, infrastructures should be made accessible in rural areas. In addition, it is proposed that these public facilities and services must be utilized to their utmost potential in order to reap the benefits of these investments and increase agricultural productivity. In our framework, economic policy and political factors are considered exogenous factors necessary for infrastructure investment(Manjunath & Kannan, 2017).

Infrastructure development in Karnataka 2018-19

Infrastructures	2018-19	
Irrigation	Actual rain fall (in mm)	1340
	Gross irrigated area (in hectares)	4719029 (45.04%)
	Net irrigated area (in hectares)	4001495 (37.68%)
Electricity	Electricity consumption of I P sets (in million units)	HT
		LT
		2724.25
		19579.72
Transport	Number of tractors registered (in numbers)	468433
	Tillers (in numbers)	329800
Credit(agricultural cooperatives)	Total loan (in lakh)	262988.51
	Agriculture loan (in lakh)	142062.28

Source: Directorate of economics and statistics, Bengaluru

Rural road Infrastructure

Infrastructure in rural areas is mostly supported by rural roads. For the redevelopment of villages' socioeconomic structures, they are essential. They make it easier for villages to interact with the rest of the country. They aid in getting agricultural surplus to urban markets where it may be sold, allowing farmers to get fair prices for their goods. There will be an increase in the income and living standards of farmers. Agriculture that was formerly traditional and used for sustenance is now commercialized. Rural workers' mobility is improved and the local economy is altered by the presence of a cost-effective transportation network. (Sivasankaraiah, 1999)

Impact of Road Infrastructure in Agricultural Development

Indian agriculture is crucial. Most people live off agriculture, which provides 17.5 percent of GVA (Economic survey 2015-16); 68.84% of people live in rural areas (Census 2011) and depend on agriculture. Agriculture employs 50% of India's workers and occupies 43% of its land. Thus, the state must provide facilities to accelerate agricultural output to achieve developmental goals like food security, industrial development, unemployment reduction, and poverty alleviation. Due to government efforts to boost agricultural output, our agricultural sector has thrived. Farmers are still not benefiting. Indian agriculture lacks equipment. Infrastructure includes fiscal, financial, technological, social, agricultural, and others. In developing countries, where a large percentage of the poor rely on agriculture for subsistence, agricultural infrastructure is important. Agriculture still employs 50% of the people. Infrastructure improvements should be linked to agricultural growth. This is important because the agricultural sector reduces poverty and depends heavily on infrastructure spending. Thus, farming growth is linked to infrastructure. Infrastructure's part in agricultural development is our main goal. Agricultural infrastructure includes rural roads. The lack of all-weather village-to-market paths has hindered Indian agriculture. Most villages lack roads to market areas and each other. Road improvement would lower average and marginal output costs by encouraging the use of more productive inputs and farming methods and lowering the cost of holding inventory and buying inputs from the market. All-weather roads would help farms learn

modern agriculture. Rural roads support economic and social services, agricultural income, and productive jobs. India has 600 million people in 6 lakh towns. Roads connect rural people to the mainstream. Better roads improve farm input delivery, lower transport costs, and boost special agricultural output and distribution. Better roads will increase agricultural trade and delivery. Good infrastructure helps markets grow, scale, and operate factor markets. It also exposes rural economies to more rivalry. This could be cheaper products from lower-cost suppliers or new or improved products that displace locally made items. Many studies show that infrastructure spending boosts rural incomes. Export crop acreage increased with road quality and distance from industrial centres. Investment in rural roads boosts business, lowers freight and passenger charges, and improves services (Bonney, 1964). Roads are the nation's infrastructure. India's rural nature makes rural facilities crucial. Rural roads not only connect rural areas, but they also change cropping patterns due to market access, increase productivity by making inputs like fertilizer, seeds, and pesticides more readily available, improve farmer prices for agriculture and allied products like milk, increase school attendance, and create new non-farm and service sector jobs. All-weather paths would boost agriculture. Fresh vegetables, milk, eggs, poultry, fresh fruits, and other perishable agricultural goods will be most affected by it. Rough and slow transport can spoil these goods. The lack of all-weather village-to-market roads hinders their market-oriented output. Rural roads and transportation networks improve agricultural contact and break village isolation by awakening rural farmers. To efficiently distribute food and accelerate rural development in India, rural transport services that allow product to flow to consumer centres and agricultural inputs to rural areas are needed. It protects farmers and rural artisans from unscrupulous traders and middlemen and supplements their meagre incomes.

Rural Road Infrastructure Development Programmes in India

Rural Road Connectivity promotes access to economic and social services, increasing agricultural incomes and productive employment in India, and reducing poverty. Despite years of State and Central Programs, many Habitations in the country are still not connected by All-weather roads. It is commonly recognized that even where connectivity has been provided, the roads developed are of such quality (due to poor construction or maintenance) that they cannot always be classified as All-weather roads. On December 25, 2000, the government started the PradhanMantri Gram SadakYojana to give eligible unconnected habitations all-weather access. The PradhanMantri Gram SadakYojana 1 (PMGSY) is 100% centrally funded. This Program receives \$0.75/liter from the Cess on High Speed Diesel (HSD). The PMGSY's main goal is to connect eligible unconnected Habitations in rural areas with a population of 500 or more in Plain areas to an all-weather road with culverts and cross-drainage structures. The goal is to connect eligible unconnected Habitations with a population of 250 or more in the Hill States (North-East, Sikkim, Himachal Pradesh, Jammu & Kashmir, and Uttarakhand), Desert Areas (as identified in the Desert Development Programme), Tribal (Schedule V) areas, and Selected Tribal and Backward Districts (as identified by the Ministry of Home Affairs and Planning Commission)(Mantri, n.d.).

Roads

Regarding road infrastructure development, there has been consistent growth. The focus for the 2021-22 fiscal year was on district roads, in line with the state's priorities and plans for enhancing the innovation and industrial capacity of districts other than Bengaluru.

Table 1: The Road lengths in Karnataka (In Km)

The Road lengths in Karnataka (In Km)			
Category of Road	2020-21	2021-22	2022-23
National Highways	7652	7652	7652*
State Highways	28985	28985	27880*
Major District Roads	55474	55474	56115*
Municipal Roads & Other Roads	40487.59	43964.01	43964.01**
Rural Roads	198500.80	194438.02	197282.83***
All Roads	331099.39	330513.03	332893.84

Source:(https://des.karnataka.gov.in/storage/pdf-files/KARNATAKA%20ECONOMIC%20SURVEY%202021-22-M2_ENG_FINAL.pdf, n.d.).

Chief Minister Gram Sadak Yojana

To provide all wither connectivity to rural habitations in accordance with design standards and to maintain the same in accordance with the standards required for their overall social and economic development. By the year 2021, the state government has it in their plans to build 5,600 kilometers of road as part of the Gram Sadak Yojana. In the current fiscal year, the Central Government has allotted a total of Rs. 38,078 Crore for the execution of the centrally-sponsored programs in the state of Karnataka; the Central Government's portion of this total is Rs. 17,536 Crore. According to an official statement, this Center has distributed a total of 4,074 billion rupees thus far(Karnataka Govt to Develop 5,600 Km Roads This Year | Deccan Herald, n.d.).

Namma Grama Namma Raste Yojana

Rural Road Connectivity promotes access to economic and social services, increasing agricultural incomes, productivity, and productive employment in India, thereby ensuring sustainable poverty reduction. The Karnataka Department of Rural Development and Panchayat Raj started the Namma Grama Namma Raste Yojana in January 2010 to provide all-weather access to unconnected habitations. NGNRY is 100% state-sponsored. The NGNRY's main goal is to link eligible rural Habitations to all-weather roads with culverts and cross-drainage structures. Where all eligible Habitations have all-weather road access, the NGNRY will allow road upgrades. Rural road development projects worth Rs 3,658 crore in 189 Assembly constituencies across the state. One plan will build 20/30 km of rural roads in each of the 189 Assembly segments for Rs 42 lakh per km, including five years of maintenance. NGNRY phase I accepted 1400 works for 3714.65 km. which are finished(Prime Minister Gram Sadak Yojane (PMGSY) - Rural Development and Panchayat Raj Department, n.d.).

Table 2: Scheme wise progress of Rural Roads, RDPR department as on January 2023 (AVALOKANA) (Rs in crores)

Scheme Name	Allocation (BE+SE) Release Total Expenditure	Allocation (BE+SE) Release Total Expenditure	Allocation (BE+SE) Release Total Expenditure
Pradhan Mantri Grama Sadak Yojane - Road Maintenance	81.52	61.14	52.86
Namma Grama Namma Raste Scheme (NGNRY) and other Rural Road Schemes	120.00	90.00	94.57
Special Grants to Rural Roads (Mukhya Mantri Gramina Raste Abhivruddi Yojane)	242.44	68.72	119.07
Total	443.96	219.86	266.50

Source: (Economic Survey 2022-23, n.d.)

Issues & Challenges

The inter-district connectivity of National Highways and State Highways in the state's road network varies significantly. This disparity in connectivity must be rectified in accordance with Dr.Nanjudappa's report on Regional Imbalance redress. Consequently, a go-ahead has been issued for the upgrading of 9601 kilometers of state highways and 15510 kilometers of major district roads in 2020-21. Country Roads - Rural connectivity is essential to the state's overall development. Rapid road construction can have a multiplier effect on the overall growth of underdeveloped regions. Investment in transportation has one of the greatest effects on alleviating poverty and boosting total factor productivity. Approximately 23% of State Highways and 79% of Major District Roads have single-lane width. Depending on the vehicle density, the majority of state highways and some major district roads must be upgraded to two lanes to reduce traffic congestion. (Passenger Car Unit). (Widening of SHs are being taken up through KRDC and KSHIP on Core Road Network concept). From March 2021 to December 2022, the number of vehicles in the state increased to approximately 23 lakh. As of December 22nd, 295,000,000 vehicles are registered in the state. National Highways and State Highways must be widened to facilitate the expanding vehicle population. Currently, only 29 percent of national highways and 2.4 percent of state highways have four-lane carriageway dimensions. The Government of India, through the National Highway Authority of India, has undertaken the enhancement of National highways in the State. NHAI is implementing the construction of four- and six-lane National Highways. Currently, a total of Rs. 32,793 crore is being spent on the development of 1,885 kilometers of the National Highway.

CONCLUSION & DISCUSSION

It is common knowledge that roads play an essential part in the improvement of the social, economic, and cultural life of the people; access to a better road network in rural areas

significantly improves the socioeconomic status of the rural population and the quality of their living conditions. Roads and agricultural production have a symbiotic relationship, and the effect of increased agricultural production on rural people's income and living standards, as well as their attitudes and other activities, is directly related to the quality of the roads that connect them. For this reason, the government of India gave priority to the construction of rural roads by launching programs such as Pradhana Mantri Gram Sadak Yojana, Bharath Nirman, and the rural infrastructure Development Fund, amongst others. These programs provide improved infrastructure to the rural farm sector, but greater effect one needed to upgrade the rural road infrastructure to face life the life of rural peasants.

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