Economic Affairs, Vol. 68, No. 04, pp. 2309-2316, December 2023
DOI: 10.46852/0424-2513.4.2023.38

Case Study

Farm Access Roads: The Low Cost Convergence Model for Doubling Farmers' Income in India

Shelesh Nawal[1] and Dilip Kajale[2*]

[1]Lal Bahadur Shastri National Academy of Administration, Mussoorie, Uttarakhand, India
[2]Gokhale Institute of Politics and Economics, Pune, Maharashtra, India

*Corresponding author: kajaledilip27@gmail.com (**ORCID ID:** 0009-0007-8518-4943)

Received: 08-09-2023 **Revised:** 21-11-2023 **Accepted:** 02-12-2023

ABSTRACT

In agricultural sector, many policy reforms in India are introduced to achieve the target of doubling farmers' income. Most of the recent studies and policy focuses on rural roads, while the critical part, which is still unaddressed, is the farm access roads (Pandan or Dhuri roads). We did a study in Amravati district of the Maharashtra state on the farm access roads. Farms are becoming inaccessible because of absence of proper road. Farmer are not able to take high value crops, scheduled farm operations are getting distorted and sometimes bringing the harvest from farms to home or market becomes difficult. In addition, owing to accessibility issues, farmers are not able to cultivate land, which result in low productivity and low income, especially small and marginal farmers, who are the majority, have no capacity to pay for or build farm roads. We recommend a convergence "farm road access model" implemented in Amravati district, dovetailing schemes of the Mahatma Gandhi National Rural Employment Guarantee (MGNREGA), state funds and farmer's contribution or Corporate Social Responsibility (CSR) funds. The two types of roads under this model are as, low cost farm access road of ₹ 1,50,000 per kilometre and high cost road of ₹ 17,00,000 per kilometre. The impact of farm access roads is that farmers are able to get access to their land throughout the year and are able to do farm operations timely. Overall, it resulted in increase in farmers' income by one third. Therefore, we strongly suggest replicating the Amravati farm access road (*Har Khet ko Rasta*) model across the nation.

HIGHLIGHTS

- The rural roads have the potential to boost agricultural production and thereby contributes to poverty reduction, hence the policy document on doubling of farmers' income emphasizes on it.
- Farmers have to walk travel around four kilometres to reach their farm from usable village roads; various investments in farm will be futile if there is low access or no access to farms.
- The study recommends low cost and high cost farm access road models.
- This model will increase the farmer income by one third.

Keywords: Farm roads, MGNAREGA, doubling of farmers' income

Around 40 percent of the labour force in India is involved in agriculture (ILO, 2021). The Indian agriculture sector is characterized by lack of proper infrastructure facilities; which plays a vital role especially in a country like India, where a large percentage of the poorer section of the society depends on this sector for livelihood. Among agricultural infrastructure, road infrastructure plays a crucial role in boosting agricultural production and further adding to farmer's income. In India, most of the farms do not have road connectivity or the existing pathways are so narrow that it cannot

How to cite this article: Nawal, S. and Kajale, D. (2023). Farm Access Roads: The Low Cost Convergence Model for Doubling Farmers' Income in India. *Econ. Aff.*, **68**(04): 2309-2316.

Source of Support: None; **Conflict of Interest:** None

even suit bullock carts. Farm roads are essential means of transport for farm produce and farm requirements. To facilitate faster growth in the agriculture sector, the farm roads are to be provided so that it may add to the increase of agricultural output and overall farm income, which is the prime focus of the recent farm bills. The World Bank asserts that agriculture has the potential to reduce the poverty of the 80 percent poor. The various interventions have been taken to achieve the target of doubling farmers' income, which has once again put forth limelight on the reforms in the agricultural sector. In India, still around 60 percent of the population depends on agriculture (MAFW, 2022). While growth of the agriculture sector has been unpredictable as it increased from minus 0.2 percent in 2014-15 to 6.3 percent in 2016-17, then declined to 2.8 percent in 2019-20, and again jumped to 3.4 percent in 2020-21 (PRS, 2022). Gross fixed capital formation in agriculture decreased from 17.7 percent of Gross Value Added (GVA) in 2013-14 to 16.4 percent of GVA in 2018-19 (PRS, 2022). The contribution of agriculture to the GVA has decreased from 18.2 percent in 2014-15 to 17.6 percent in 2018-19, which was mainly due to a decrease in share of GVA of crops from 11.2 percent in 2014-15 to 9.4 percent in 2018-19 (PRS, 2022). Issues such as water conservation, yield improvement, market access, investment in agriculture, institutional credit and insurance coverage needs to be addressed immediately to achieve the target of doubling farmers' income in the stipulated period. Few East Asian economies could successfully integrate into the global economy because of the high-quality infrastructure (Gill and Kharas, 2007). In addition, regional imbalance and growth potential can be addressed by better allocation of infrastructure investments (Manasan and Chatterjee, 2003). Similarly, in agriculture, there is a significant positive impact of rural infrastructure on agricultural productivity (Gilberto, 2012; Majumder *et al.* 2021). Studies reported that an increase in public infrastructure investment can reduce the total cost of livestock and crop production (Mamatzakis, 2003). Rural roads are one of the important infrastructures, which influences the farm productivity and farm and non-farm employment, (Ali and Pernia, 2003; Yao, 2003; Majumder *et al.* 2021).

LITERATURE REVIEW

According to the Asian Development Bank (ADB), economic growth with socially inclusive development is one of the ways for poverty reduction (ADB, 1999). Inclusive development is possible through public policy reforms and investment in physical infrastructure (Ali and Pernia, 2003). Investments in rural roads have a great potential to reduce chronic rural poverty by around 36% (Dercon, 2009). Norman Borlaug, the father of Green Revolution, argues that inefficient transport infrastructure leads to higher input costs and low market prices (Borlaug and Dowswell 2002). Regarding agricultural production, in developing countries post-harvest losses can be around 20% (FAO, 2016; IIHR, 2014) and the key factor is the poor road infrastructure, which influences the market access and time taken to reach the market. The findings from various studies shows better road infrastructure influences adoption of modern technology related to farming such as improved seeds (Suri, 2011; Ali, 2011). Also, can bring more area under cultivation, increase-cropping intensity, increase agricultural output and increase the consumption of agricultural inputs, and employment generation (Ahmed and Hossain, 1990; Binswanger *et al*. 1989; Badatya and Nair, 2003). Provides easier access to technology and market, improve non-farm production and reduction in costs of consumption and production of goods and services and eventually better price realization (Khandker *et al*. 2009; Binswanger *et al*. 1993; Levy 1996; BIDS, 2004). The rural roads can increase small and marginal farmer's income by reducing various costs; input transportation to farm costs can be reduced by 40% and the transportation cost to market can be reduced by 23% (Nair and Kumar 2006), while change in cropping pattern alone can increase income around 3% (Nair and Kumar 2006). It was reported that farmers shifted from food crops to cash crops such as ginger, jute, sugarcane, sunflower and multi-cropping because of better road access (Mohapatra and Chandrasekhar, 2007) which eventually leads to increase in household income ((Leinbach, 1983; Benziger, 1996). Furthermore, it also helps to improve access to better education and health facilities, especially for girls and women (Bryceson and Howe, 1993; Levy, 1996; Nair, 2003).

The expert committee on doubling farmer income set by the Government of India, which submitted

the report in 2018, suggested that there is a need for road infrastructure connecting the farm gate. Schemes such as the Mahatma Gandhi National Rural Employment Guarantee MGNREGA and the Pradhan Mantri Gram Sadak Yojana (PMGSY) can be used for this (GoI, 2018). The World Bank Review Report (Banjo *et al.* 2012), suggests that to elevate the poverty the investment should be made on establishment of feeder roads, tracks and paths, which connects farms to the rural road. The policy suggestions for countries with weak rural road infrastructure are to use inexpensive measures to improve and expand roads with the help of government institutions and non-government organisations and for upgradation and maintenance of rural access roads, rural communities should be mobilized (Obare *et al.* 2003). Moreover, one of the important studies shows that in China the benefit cost ratio in GDP was four times higher in case of low quality poor roads than the better quality roads (Fan *et al.* 2005). So far, most of the literature and policies are focused on the rural roads connecting village habitats; however, a similar important aspect that has remained unaddressed is the farm roads, which connect farm to rural road. This connection has huge untapped potential to increase small and marginal farmer's income. To the best of our knowledge and literature reviewed, hardly there is a study examining the doable model of farm access road and its impact on farmer's income in India. The present article is an attempt to fill this gap.

METHODOLOGY

However, the state act puts the onus on the revenue department to provide access to every farm however with the available limited resources and due to lack of push from the government machinery, still a large number of farmers do not have formal access right to their farm. On this aspect, we have collected data from Amravati district. We have used mixed method for the study. The data collected is qualitative and quantitative. The data from government offices is quantitative and from farmers is qualitative and quantitative. We also collected data on the farm access road models, which were implemented in the district. We interacted with few farmers from different villages. Data from government office was collected on the aspects such as cost of construction of roads and length of the roads for three years 2018-19, 2019-20 and 2020-21.

RESULTS AND DISCUSSION

Farm Access Roads: Issues and Impact of Unavailability

The Vidarbha region is one of the agricultural distressed areas of Maharashtra state. However, it being the assured rainfall area (Amravati district - average annual rainfall is around 1000 millimetre), poor agricultural infrastructure and investment has made it dependent on vagaries of nature. While reviewing the reason for agricultural distress in various districts, one of the prominent reasons that have been noted was uncertainty to access farmland. Without assured access to farmers' own land any investment made in connecting the habitations, improving credit access, building irrigation assets and many more will turn out to be futile.

The farm roads are the traditional roads, which are called as "Pandhan" or "Dhurirasta" and are recognised on the basis of mutual understanding. The old village maps done during British times mentions about these traditional pathways but have not been updated quite frequently. Also with the division/fragmentation of land and transactions in land that has taken in past 70 years, there has been growing conflict about boundary demarcation and access rights. Though the land revenue codes and manual talks about the ways for demarcating farm roads in case they are not recognised under mamlatdar court act and Maharashtra land revenue act 1966, however the quasi-judicial process is not only tedious but also costly. Moreover, no matter whoever wins or loses, the other party exercises the never ending right of appeal and which makes the matter pending for years together.

The data revels that it takes around four km for a farmer to reach their farm from usable roads. There are over 4,300 pandhan roads with a length of 15,350 km in the district. This includes both the farm roads, which are recognised in the initial survey by the British and are in existence as easement rights. The issues related farm access roads from farmer's point of view are presented here. Mr. Amar Gudge, the farmer of Pala village said that without the farm road, it is impossible for him to access the farm in the rainy season and at night, he is not able to visit the farm for irrigation, thereby he is not able to go for high value crops. Another group of farmer from Sawali Datura village of Achalpur block headed

by Mr. Tukaram Prajapti mentioned that due to encroachment of farm road by some farmers they are not able to take truck to their farm. They also reported that they are not able to do pre and post farm activities on time and sometimes they have to pay rent to middle farmers to allow access to the farm. Farmers from village Nimbhora have submitted that due to mud caused by rains it is impossible to mobilise the farm implements and carry out farm activities. Similarly, farmers from village Charud have faced similar problems about road accessibility to their farm, which affects the nature of crops they have to take. Similar case of another village, Ambada Kandhari was noted where the group of farmers were not ready to allow access as it was not recognised on the map. The case has been pending in various courts from 2017 and now has even reached the high court. The gross value added in the agricultural sector hugely depends upon productivity and timely harvest. Due to lack of assured connectivity, the farmers were forced to take such crops that are sturdy and require less care rather than those crops that suit the soil type and are highly remunerative. For instance, in the above villages, despite some farmers' intention to diversify the crop, they are not able to do so due to lack of accessibility.

The encroachment on the farm roads are yet another problem that leads to the obstruction and restricts the movement. Also in the court of revenue magistrates, the boundary and access to farm feud take the centre point. In the year 2020-21, 1800 cases were pending at various levels in revenue administration in Amravati district. Apart from this, various land feuds over farm boundaries and accessibility are pending in civil court. This has an impact on not only out of pocket expenditure of farmers but also affects the overall area under cultivation and productivity as the court cases breeds uncertainty. The farm roads not only provide assured access but also clearly delineate the boundaries as this passes from the centre of two farms. Considering the heavy expenditure that has to be incurred for fighting the case in courts along with the intermittent uncertainty, which it breeds to decision about the nature of crop, which has an overall impact on income of farmers. Farmers who have advantageous position socially and geographically, have restricted assured access to farm for other farmers. Thus, over 33% of the farmland has direct and indirect connectivity issues and this is grave for small and marginal farmers, who cannot afford to fight a case legally. Thus, the farm connectivity has an impact on inequality and widens the rich poor gap in the village.

Farm Access Roads in Amravati District

One of the successful government programs related to rural roads was launched by the government in 2000 is the Pradhan Mantri Gram Sadak Yojana (PMGSY). As on September 2021, in different phases (PMGSY-I, PMGSY-II, PMGSY-III) around 1,64,873 roads are completed and 15,627 road works are in progress, the length of roads covered under this programme is 6,73,068 km (PMGSY, 2021) which is a great achievement. So far around ₹ 2400 billion were spent on this programme, and around ₹ 450 billion will be spent on PMGSY in 2021. However, the real impact of this will be realized only if the bottleneck between the village road and the individual farms will be addressed, i.e., the farm roads. Despite the budgetary announcement about the PMGSY, overall a district gets approx. 100 km roads. These are prominently village connecting roads and not farm connecting roads. In Amravati district, the total road length of national highway, state highway, major district road, other road and village road is around 7716 km. However, there are an equal number of farm connecting roads which may not require concretisation or tar connectivity but require at least metal and *murum* connectivity. However, no major effort or focus has been put on these roads which are the arteries and veins. Without farmers getting assured access to the field, the connectivity to the village might not be able to help much with the agricultural operations.

Farm Access Roads Model

Though one can argue that issues of allowing 15 to 20 foot of easement rights should not be an issue in rural areas, however the prestige issue along with decreasing size of land holding and increasing value of land has made the situation more complicated. One has to appreciate the fact that unlike the land acquisition matter in case of national and state highways where the density of road traffic is quite high, the financial viability of road construction with land acquisition is possible. However, in the

case of the farm roads, the capacity to pay by the user is very low. The economic rate of return is high but the financial rate of return is very less.

In order to resolve this issue, a Farm Road Scheme was formulated based on two pillars. One was identification of roads in every village, which provide access to each farm. These roads may include the existing recognised road and the new road that has to be recognised. The identification process was done in saturation form where every farmer if left out can have a say and can demand access. The other pillar was financing the roadwork. Considering the importance of connectivity of farm roads, the unique initiative has been implemented by bringing upon the convergence between the existing schemes, based on the low cost and participative approach, due to limited availability of funds and to evoke better participation from people and representatives, two broad models of work execution were taken up. The Model A, was to demarcate the road boundaries by digging trench on two sides and clear the 15-20 feet easement right and make *Murum* road. This requires an expenditure of around ₹ 1, 50,000 per km and ensures encroachment free road access. The Model B, requires around ₹ 16, 00,000-18, 00,000 per km expenditure which was to be funded under the MGNREGS, Member of Legislative Assembly (MLA) fund, state plan funds and people contribution. Wherever model A road work has been implemented successfully and considering the potential of crop and cropping patterns along with financials, the model B roads are executed.

The implementation of the farm road models was started in the year 2019-20. The details on the implementation of the models are presented in Table 1. Results presented the situation before the implementation of the model (2018-19) and also the first and second years of the implementation. In the second year the model was implemented on a mission basis. In the pre-implementation year only 5 km road was built. In the first year of

Table 1: Pandan Road Scheme Implementation in Amravati District

(A)	**Before Beginning of the Scheme: 2018-19**			
1	Type of Road	**A Model Road**	**B Model Road**	**Total**
2	Number of roads	2	2	4
3	Distance (KM)	3	2	5
4	Expenditure (₹ Lakh)	3.75	26.85	30.60
5	Per Road cost (₹ Lakh/Road)	1.88	13.43	7.65
6	Per Km cost (₹ Lakh /Km)	1.25	13.43	6.12
7	Average Road distance (Km)	1.5	1	1.3
(B)	**First Year of the Scheme Implementation: 2019-20**			
1	Type of Road	**A Model Road**	**B Model Road**	**Total**
2	Number of roads	365	15	380
3	Distance (KM)	367	16	384
4	Expenditure (₹ Lakh)	459.08	256.06	715.14
5	Per Road cost (₹ Lakh /Road)	1.26	17.07	1.88
6	Per Km cost (₹ Lakh /Km)	1.25	15.77	1.86
7	Average Road distance (Km)	1	1.1	1
(C)	**Second Year of the Scheme implementation: 2020-21**			
1	Type of Road	**A Model Road**	**B Model Road**	**Total**
2	Number of roads	541	256	797
3	Distance (KM)	928	333	1,262
4	Expenditure (₹ Lakh)	1,160.38	4,338.58	5,498.95
5	Per Road cost (₹ Lakh /Road)	2.14	16.95	6.90
6	Per Km cost (₹ Lakh /Km)	1.25	13.01	4.36
7	Average Road distance (Km)	2	1	2

**One Lakh = 100,000.*

implementation 380 roads of total 383.5 km length were constructed, out of this 365 roads of around 1 km length each were of the model A type road (15-20 foot. *murum* road), while the remaining roads (15 roads with a total length of 16.2 km) were of model B type (metal/WBM).

In the second year, the farmers immediately recognized the scheme and local public representatives, 797 roads of total 1261.7 km length were constructed, in which 541 roads of total length of 928 km were of model A type, and the total expenditure for these roads was only ₹ 11, 60, 00,000. The twin benefits of removal of encroachment and delineation of boundaries apart from providing access to farms brought a ray of hope among farmers for their long pending unmet demand. It was observed that once the roadwork was started in some villages, there was more and more demand to the MLA and Member of Parliament (MP) to shelve out there and state plan funds for construction of roads. This was because of visible benefits. We saw that over 60% of the MLA fund in three constituencies from Amravati district was sanctioned by the MLAs for saturating the demand. The details of the implemented farm road models are given in the table 1.

Considering the limitation for expenditure that can be incurred in MGNREGS, three funds were

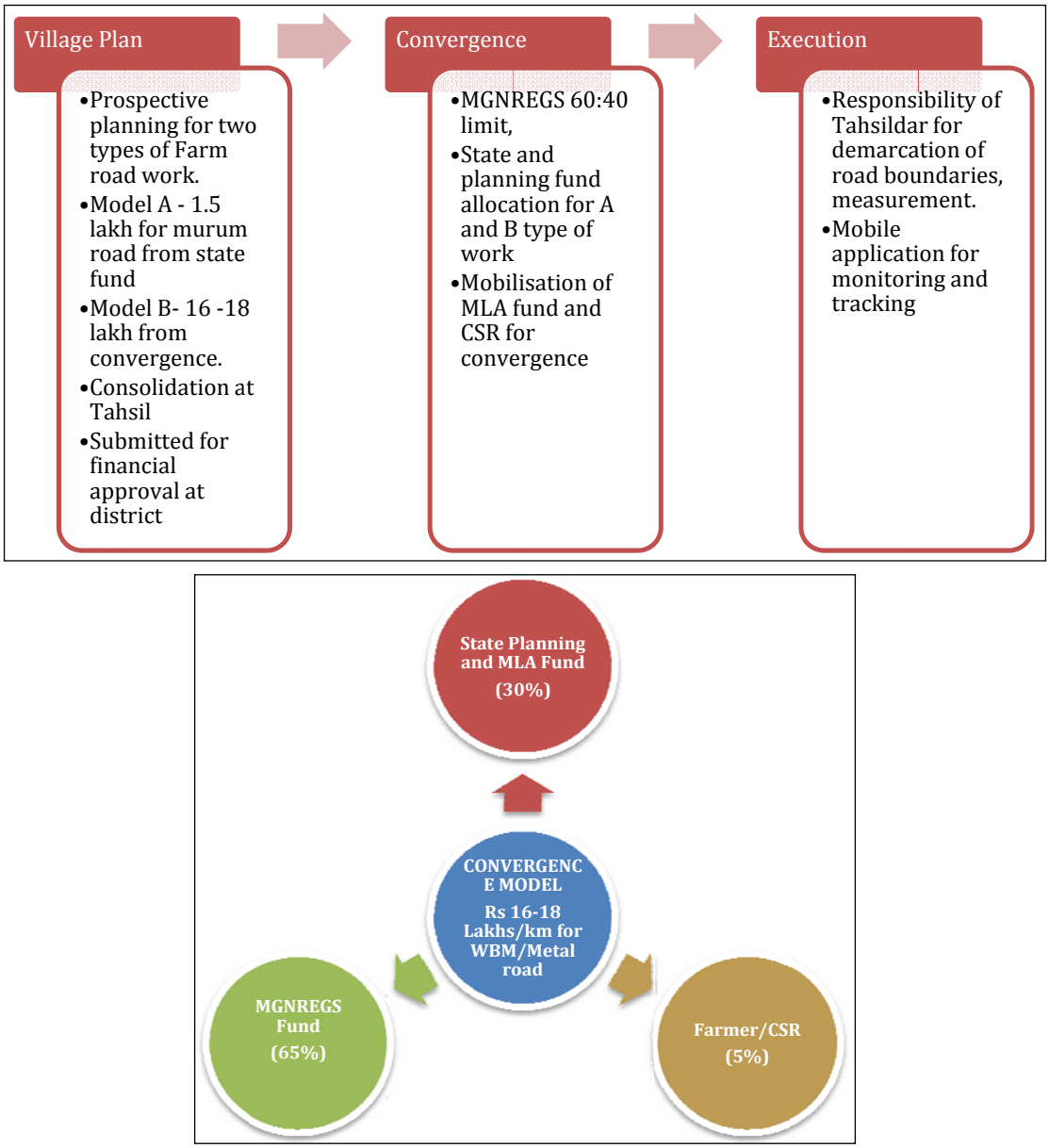

Fig. 1: Farm Road: Pandan Road Convergence Model

dovetailed. The total cost of 1km of metal roads was ₹ 16, 00,000-18,00,000. With 65% of funds utilised from MGNREGS, the remaining fund was raised from state planning and MLA fund. The model of developing farm roads that are the arteries and veins, which can power up the farm sector, this can be replicated across by converging upon the existing resources. It has the potential to not only reduce litigations but also freedom to choose the crop. The unused land parcels, which are stuck due to connectivity issues, can be brought under cultivation thereby improving the farm level income. The farm road scheme can unlock the potential and give a boost to the government efforts for doubling farmers' income.

Overall under this project 1295 km of *murum* roads (model A) and 349 km of metal/WBM (Model B) roads were built. The convergence expenditure was ₹ 25,50,00,000 out of the total expenditure of ₹ 62,14,00,000. Seeing the benefits, a 3600 km draft plan for implementation was approved reflecting the huge demand from the farmers as well as local public representatives. The government of Maharashtra took note of the implementation of this model and considered it as best practice. In addition, the state department accepted the convergence model for farm roads, and the government of Maharashtra recommended implementing the same for the entire state.

CONCLUSION

The farm road model (Pandan road) helped in removing encroachment and delineation of farm boundaries, thereby leading to amicable solution to long pending demand for farm access. Also farmers were happy about the execution of the road since it has ensured round the year connectivity and has also provided unhindered access at night for protection and watering the field. The improved access has increased the farm income by one third, as it has not only improved productivity but has also brought more area under cultivation. Thus by just providing the assured accessibility to the farm the income can be increased by one third in most of the areas. Apart from the increase in production, the mission being driven by the administration and is focusing upon the saturation of accessibility in each village, the unnecessary litigation expenditure of going to revenue or civil courts for land demarcation and road access are avoided thereby leading to increase in overall income levels.

The limitation of this study is that we have explored the benefits received by the farmers through interactions with them, while an in depth study with significant sample size will be more advantageous, despite this limitation, our study is having valuable policy suggestions. From the experience in the Amravati district, we suggest the farm road: Pandan road (Fig. 1).

To conclude, the farm road connectivity is of utmost importance and it has the potential of improving the overall net income of farmers by reducing their input and litigation cost and improving the overall production and productivity. The twin approach of saturating the demand at village level for demarcation through the revenue administration and supplementing this with financial outlay (either A or B pattern) will go a long way in meeting the long pending demand of the small and marginal farmers. We can call this model as "*Har Khet ko Rasta*".

REFERENCES

Ali, Ifzal, and Ernesto M. Pernia. 2003. "Infrastructure and Poverty Reduction What is the Connection?" *Asian Development Bank ERD Policy Brief Series*, Economics and Research Department 13 ADB.

Ali, R. 2011. "Impact of Rural Road Improvement on High Yield Variety Technology Adoption: Evidence from Bangladesh." *Working Paper, University of Maryland*.

Badatya, K.C. and Nair, G. 2004. "Infrastructure for Agriculture and Rural Development: An Impact Assessment of Investments in Rural Roads and Bridges Under RIDF." *National Bank for Agriculture and Rural Development*, Mumbai.

Banjo, G., Henry, G. and John, R. 2012. "Rural Transport: Improving its Contribution to Growth and Poverty Reduction in Sub-Saharan Africa." *Sub-Saharan Africa Transport Policy Program (SSATP) working paper-no. 93. World Bank*, Washington, DC. © World Bank. https://openknowledge.worldbank.org/handle/10986/17807 License: CC BY 3.0 IGO."

Benziger, V. 1996. "Urban Access and Rural Productivity Growth in PostMao China." *Econ. Dev. and Cultural Change* **44**: 539–70.

BIDS (Bangladesh Institute of Development Studies). 2004. "Poverty Impact of Rural Roads and Markets Improvement and Maintenance Project of Bangladesh." *Bangladesh Institute of Development Studies*, Dhaka.

Borlaug, N.E. and Dowswell, C. 2002. "Food Security and Agricultural Development in Sub-Saharan Africa: The

Challenges." *NEPAD & SSA Workshop*, Johannesburg, South Africa, November 18, 2002.

Bryceson, Deborah, F. and and Howe, J. 1993. "Rural Household Transport in Africa: Reducing the Burden on Women?" *World Dev.*, **21**: 1715–28.

Dercon, Stefan, Daniel O Gilligan, John Hoddinott, and Tassew Woldehanna. 2009. "The impact of agricul-tural extension and roads on poverty and consumption growth in fifteen Ethiopian villages," *Am. J. of Agril. Econ.*, **91**(4): 1007–1021.

Fan, S. and Chan-Kang, C. 2005. "Road development, economic growth and poverty reduction in China." Research Report 138, *International Food Policy Research Institute (IFPRI)*, Washington DC, USA. pp. 60.

Food and Agriculture Organization (FAO). 2016. "Indicator 12.3.1 - Global Food Loss and Waste" http://www.fao.org/sustainable-development-goals/indicators/1231/en/

Gill, I. and Kharas, H. 2007. "An East Asian renaissance: ideas for economic growth." *World Bank,* Washington, D.C.

Government of India (GoI). 2018. "Report of the Committee for Doubling Farmers' Income Volume VIII 'Production Enhancement through Productivity Gains." New Delhi. https://farmer.gov.in/imagedefault/DFI/DFI%20Vol-8C.pdf

Indian Institute of Horticultural Research (IIHR). 2014. "Post-Harvest Losses in Selected Fruits. And. Vegetables in India. (A Compilation)." *IIHR: Technical Bulletin*, **41**.

International Labour Organization (ILO). 2021. "ILO modelled estimates database" ILOSTAT. Accessed January 2021. ilostat.ilo.org/data

Khandker, Shahidur R., Zaid Bakht, and Gayatri B. Koolwal. 2009. "The Poverty Impact of Rural Roads: Evidence from Bangladesh." *Econ. Dev. and Cultural Change*, **57**(4): 685–722.

Lianto, G.M. 2012. "The Impact of Infrastructure on Agricultural Productivity." *The PIDS Discussion Paper Series No. 2012-12*, pp. 1–53. Makati City: Philippine Institute for Development Studies.

Majumder, S.H., Deka, N., Mondal, B. and Bisen, J. 2021. "Does rural infrastructure development affect agricultural productivity? Evidence from Assam, India." *Agric. Res. J.*, **58**(1): 125-129.

Mamatzakis, E.C. 2003. "Public infrastructure and productivity growth in Greek agriculture," *Agricultural Economics*, Blackwell, **29**(2): 169-180.

Manasan, R. and Chatterjee, S. 2003. "Regional development." *In: A. Balisacan and H. Hill (eds.). The Philippine economy: development, policies and challenges*. Ateneo de Manila University Press, Quezon City, Philippines.

Ministry of Agriculture & Farmers Welfare (MAFW). 2022. "Agriculture Infrastructure Fund." Press Information Bureau. https://www.pib.gov.in/PressReleseDetailm.aspx?PRID=1846522

Mohapatra, J.K. and Chandrasekhar, B.P. 2007. "Rural Roads." in *India Infrastructure Report*, New Delhi, pp. 109-138.

Nair, G. Gopakumaran and Kumar, A. 2006. "Impact of Roads on Rural Agriculture Economy: Evidences From Tamil Nadu," *Indian Journal of Agricultural Economics,* Indian Society of Agricultural Economics, **61**(3): 1-9.

Nair, G. 2003. "Rural Roads in Tamil Nadu." Evaluation Studies Series No. Chennai 15, *National Bank for Agriculture and Rural Development*, Chennai.

Obare, G.A., Omamo, S.W. and Williams, J.C. 2003. "Smallholder production structure and rural roads in Africa: The case of Nakuru District, Kenya." *Agric. Econ.*, **28**: 245-254.

PRS. 2022: PRS Legislative Research, https://prsindia.org/

Suri, T. 2011. "Selection and Comparative Advantage in Technology Adoption." *Econometrica,* **79**(1): 159–209.

Yao, X. 2003. "Infrastructure and Poverty Reduction – Making Markets Work for the Poor." (ERD Policy Brief Series No. 14). Mandaluyong: Asian Development Bank. https://www.adb.org/publications/ infrastructure-and-poverty-reduction-making-markets-work-poor