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Review

Infrastructure disparities in rural India: With special reference to livestock support services and veterinary infrastructure

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The prosperity of a country depends directly upon the development of agriculture and industry, and the production of agriculture and industry requires irrigation, power, machinery, credit, energy and telecommunication facilities, marketing services, transport services which includes railway, roads, shipping and communication facilities etc. All these facilities and services which help in industrial and agricultural production constitute collectively the infrastructure of an economy. States of India have large disparities. One of the critical problems facing India's economy is the sharp and growing regional variations among India's different States and territories in terms of per capita income, poverty, availability of infrastructure and socio-economic development. Although, income inequality in India is relatively small (Gini coefficient: 32.5 in year 1999 to 2000), it has been increasing of late. Wealth distribution in India is fairly uneven, with the top 10% of income groups earning 33% of the income. Despite significant economic progress, a quarter of the nation's population earns less than the government-specified poverty threshold of $0.40/day. 27.5% of the population was living below the poverty line. This review paper is an attempt to find out the availability and accessibility of veterinary infrastructure in rural areas of India.

Key words: Livestock, veterinary dispensaries, animal husbandry, infrastructural facilities.

INTRODUCTION

With an improvement in infrastructure, the marginal cost decreases and given the market prices of output, a higher level of input is produced. The cost reduction occurs through the interaction of infrastructure with directly productive inputs of farms/firms. This may however come out in a variety of ways, such as reduction in transaction costs, improved diffusion of technology, new combination of input and output, all realises through infrastructural development. The positive effect of infrastructure development on economic development is articulated theoretically in several studies (Majumdar, 2003; Kundu, 2010; Rajshekhar, 2006) and substantiated empirically by many, that the development level of a region is substantially determined by the level of infrastructure

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Table 1. Infrastructure availability for veterinary services (Per 1,000 Livestock Population).

Region	Veterinary hospitals/polyclinic	Veterinary dispensaries	Veterinary aid centers (Stockmen Centers	No. of A. I. Centers (Under A.H. Dept)
Northern	168	157	144	411
Southern	47	245	289	891
Eastern	13	120	341	232
Western	33	147	116	252
Total	78	171	199	402

Source: Basic Animal Husbandry Statistics, 2010.

available therein different types of infrastructure affect different facets of development and the interactions between them are such that infrastructure is the leaderand development is the follower in most cases. Moreover, specific developmental stage of a region is also a crucial factor that determines the nature and magnitude of the association between different components of infrastructure and development level.

Researchers who have studied availability of infrastructural facilities in India and its regional variation include Shah (Shah, 1970; Shri Prakash, 1977; Gulati, 1977). The relationship between development and infrastructure has been studied by Tewari (1983), (1984), Majumder (2004). Most of them have concluded that the relation between them is positive and significant and a major part of the regional disparity in development can be attributed to regional imbalance in physical infrastructure. According to the latest NSSO data for the year 2004 to 2005, poverty level in India has come down to 27.5% as compared to 36.0% in 1993 to 1994. In urban area, the level fell down to 32.4% in 1993-1994 to 25.7% in 2004 to 2005, while in rural areas the poverty level came down from 37.32% in 1993-1994 to 28.3% in 2004 to 2005.

VETERINARY INFRASTRUCTURE IN RURAL INDIA

Animal husbandry and dairying form an integral part of the mixed farming system prevalent in the country. Dairy is a way of life deeply embedded in the rural culture and ethos of Indian societies. The promotion of dairy not only contributes towards national health building, but if properly organized and developed, it can be effectively used as an instrument of social justice, like bridging the gap between rural-urban disparities and other imbalances. Table 1 focuses on the infrastructure facilities available with the country. The efforts for creating infrastructure for cattle development began in the country during pre-independence period itself. It includes Veterinary Institutions/Hospitals, Veterinary Aid Centres, Veterinary Dispensary, Number of A. I. Centres, Semen Production Centre, Number of Cattle Breed Farms, Frozen Semen Production Centres and Milk Processing Units, etc.

Infrastructure availability for veterinary services

Presently, there are over 9527, 20897, 24482 veterinary institutes/hospitals, veterinary dispensary and veterinary aid centres in the country, respectively (Table 1). Infrastructural availability for veterinary services on per thousand of livestock population for the country is 78, 171, 199 and 402 and dominated by northern and southern regions. The availability of veterinary hospitals on per thousand of livestock population for southern, eastern and western regions are less than the national level, while on case of veterinary dispensaries and number of A. I. centres, southern region is dominating with the total availability of 245 veterinary dispensaries and 891 A. I. centres which are higher than the national availability (Table 1). Table 2 shows that Himachal Pradesh having the highest number (1256) of veterinary dispensary and in case of veterinary institutions/hospitals Punjab rank first with the availability of 362,000 livestock population. One of the North state, Uttarakhand having the poor number (8) of availability of A. I. centres against the national availability that is 402,000 livestock population.

Animal breeding health infrastructure

The regional distribution of AI centres is very uneven. Over one third of these service centres are concentrated in the four southern states of Andhra Pradesh, Karnataka, Tamil Nadu and Kerala, although these four states together accounts for only 18% of the breedable dairy animals. The facilities are far from adequate in relation to the size of the adult milch animal population in the states of Bihar, Jharkhand, West Bengal, in the east. Chhattisgarh, Madhya Pradesh, and Rajasthan in central and western India; Assam, Meghalaya and Nagaland in the north-eastern parts and the hill states of Uttarakhand in the north (Table 1).

Although, the country has perhaps the largest AI network in the world, considering the size of the country and its livestock population, the existing supporting infrastructural facilities like, Semen production centres (37), Frosen semen production centres (143), Liquid

Table 2. Infrastructure availability for veterinary services-best and poor States.

Region	Best States		Poor States	
	Veterinary hospitals/polyclinic	Veterinary dispensaries	Veterinary hospitals/polyclinic	Veterinary dispensaries
Northern	Punjab (362)	Himachal Pradesh (1256)	Uttar Pradesh (122)	Uttarakhand (8)
Southern	Kerala (320)	Kerala (1003)	Tamil Nadu (29)	Andhra Pradesh (170)
Eastern	Manipur (416)	Manipur (825)	Bihar (5)	West Bengal (88)
Western	Chhattisgarh (62)	Chhattisgarh (225)	Gujarat (3)	Gujarat (9)

Figure in parenthesis indicates number of available services per 1,000 Livestock Population. Source: Basic Animal Husbandry Statistics (2010).

nitrogen plants (130) and Cattle breeding farm (414) are far less in number to ensure adequate and timely availability of quality semen at the A I centres.

Households accessing veterinary services by distance

It is interesting to note that about 75% of farmers all over India accessed veterinary services within the village to 5 km radius, but 25% of farmers are still covering more than 5 km distance for accessing veterinary services as clearly depicted in Table 3. There are some states like Bihar (41.45%), Jharkhand (41.48%), Madhya Pradesh (48.22), Meghalaya (63.21%) and Nagaland (4.3%), where more than 40 per cent of farmers have to cover more than five kilometres distance for accessing veterinary health services as depicted in Table 3. The accessibility status (Table 4) showing that most of the northern and southern states of the country are falling under good accessibility status and the three states of north east Meghalaya, Arunachal Pradesh and Nagaland are falling under poor accessibility which implies that the farmers have to go outside the village for accessing veterinary services.

There may be various reasons for poor accessibility, like poor quality of services provided by the institution, non-availability of veterinary doctors in the hospitals, in other sense we can say that lack of availability of soft infrastructure within the village.

Farmers accessing information on animal husbandry

The public extension services have played a major role in technology and knowledge transfer in crop sector, but when we talk about dairy sector, extension services delivery has been very weak. The extension services related to dairy sectors by and large interested to the State Animal Husbandry Department. There are however; attempts by cooperatives, non-governmental/voluntary organizations, institutions under the National Dairy Research Institute, State Agricultural Universities, KVKs, etc. But the coverage and access to these agencies is limited. For instance, the accessibility of information regarding animal husbandry is 4.19% across the country. 23.2% of the farmers of Kerala are accessing information, while on the other hand, the farmers of Uttarakhand are poor in accessing the information regarding animal husbandry. Majority of the states of northern region of India are having poor accessibility that is less than the national average (4.19) as depicted in Tables 5 and 6. The farmers of agriculturally developed and rich state of Haryana are also not accessing information infrastructure regarding animal husbandry, only 3.2% of the farmers of Haryana are accessing this infrastructure facility.

Status of infrastructure

After looking at the regional variations in important indicators of infrastructural facilities for a wide range of infrastructural components, the summary status of its availability is captured through a composite at all-India and states level presented in Table 7. Aggregate infrastructure index has been computed by several studies for various time periods using different sets of variables and methodologies (Thorat and Sirohi, 2005; NCAER, 2006; Sirohi and Mittal PPI Index, 2008).

The states whose infrastructure availability (%) is coming lower than the national availability level are falling in the low status of infrastructure and the states whose infrastructure availability are above than the national availability level are coming under high status of infrastructure.

The infrastructure level of Kerala, Chandigarh, Punjab, Lakshadweep, Karnataka and Tamil Nadu is high. Their accessibility for the infrastructure is higher than all-India level. On the other hand, there are three states namely Jharkhand, Bihar and Orissa whose infrastructure level for all the infrastructure which is considered in this study is less than the national average. Infrastructure availability (%) is coming greater than the national availability level; which are coming in the high status of infrastructure level. The states which are showing poorer or higher infrastructure are chosen and then categorized into two category that is low and high infrastructure states.

Table 3. Proportion of households accessing veterinary services by distance.

States / Union territories	Distribution by distance	
	Within village to 5 km	5 km and more
Andhra Pradesh	75.59	24.41
Arunachal Pradesh	25.87	74.14
Assam	70.29	29.71
Bihar	58.54	41.45
Chhattisgarh	57.05	32.94
Goa	89.23	10.76
Gujarat	76.26	23.74
Haryana	91.14	8.87
Himachal Pradesh	85.44	14.56
Jammu and Kashmir	93.92	6.08
Jharkhand	58.51	41.49
Karnataka	74.4	25.61
Kerala	89.69	10.31
Madhya Pradesh	51.79	48.22
Maharashtra	70.28	29.73
Manipur	57.42	42.58
Meghalaya	35.79	64.21
Mizoram	94.99	8.53
Nagaland	46.17	45.3
Orissa	73.26	27.05
Punjab	92.64	14.12
Rajasthan	55.45	37.47
Sikkim	93.29	7.13
Tamil Nadu	85.89	13.7
Tripura	99.09	4.29
Uttranchal	73.99	23.35
Uttar Pradesh	72.19	28.12
West Bengal	84.47	14.49
A & N Islands	100.01	0
Chandigarh	66.06	33.94
Dadra and Nagar Haveli	79.04	20.96
Daman and Diu	100	0
Delhi	88.47	11.53
Lakshadweep	100	0
Pondicherry	100.02	0
Total	75.02	24.97

Source: Compiled from GoI (2006).

An overview of the availability of different forms of infrastructure; the inadequacy both in terms of its physical access, quality and the regional disparities in the spread of infrastructural facilities. The north eastern and some of the north states are poorly endowed in most of the infrastructure and that is one of the important factors contributing to their low economic development.

ISSUES

The concluding points focus on the critical issues in infrastructural development that need policy attention.

Issue in infrastructure development

Inadequate Investment

The aggregate investment in infrastructure over the Eleventh Plan Period was 20, 11, 521 crore at 2001-2002 prices. The sector specific requirement put this figure at a higher level of 20, 56, 150 crore. Nearly, 30% of this

Table 4. Ranking of states on the basis of accessing veterinary services by distance.

Ranking of States	Distribution by distance	
	Within village to 5 km	**5 km and more**
Poor accessibility (<50%)	NAG, MEG, ARP	NAG, MEG, ARP
Moderate accessibility (50% to <75%)	BHR, UP, UKD, RAJ, JHK, CHH, MP, ASM, MAN, CHND	BHR, UP, UKD, RAJ, JHK, CHH, MP, ASM, MAN, CHND
Good accessibility (>75%)	PUD, LAK, HAR, PUN, TN,MIZO, GOA, GUJ, HP, J&K, SIKKIM, TRP, DNH, DAM, DLI, WB, AND, KRL	PUD, LAK, HAR, PUN, TN, MIZO, GOA, GUJ, HP, J&K, SIKKIM, TRP, DNH, DAM, DLI, WB, AND, KRL
Overall accessibility (India)	75.02%	24.99%

NAG (Nagaland), MEG (Meghalaya), ARP (Arunachal Pradesh), BHR (Bihar),UP (Uttar Pradesh), UKD (Uttarakhand), RAJ (Rajasthan), MP (Madhya Pradesh), JKH (Jharkhand), CHH (Chattisgarh), ASM (Assam), CHND (Chandigarh), PUD (Punduchery), LAK (Lakshdveep), HAR (Haryana), PUN (Punjab), GUJ (Gujarat), HP (Himachal Pradesh), J&K (Jammu & Kashmir), TRP (Tripura), DNH (Dadar and Nagar Haveli), DAM (Daman), DLI (Delhi), WB (West Bengal), AND (Andman and Nikobar), KRL (Kerala), MIZO (Mizoram), AP (Andhra Pradesh).

investment is expected to come from the private sector. Since, improvement in infrastructure is crucial for broad based inclusive growth of the economy and for bridging the rural-urban divide, 4, 35, 349 crore, that is, 30.3% of the total projected public investment was targeted to be spent exclusively towards improvement of rural infrastructure in the Eleventh Plan Period. However, the investment requirement for developing them and several other facilities targeted towards rural masses would be massive and hence, financing rural infrastructure development is a critical issue over the year, rural infrastructure development has simply not received the kind of attention it need and deserved. It has not attracted due required level of investment, either from the public or private sector, whether it is road or telecom, water or power, warehousing or banking.

Ineffective governance mechanism

Even though there seems to be a paucity of funds in infrastructure creation, there has been shortfall in utilization of sanctioned funds for infrastructure development. The cumulative spending under the government ambition Bharat Nirmal Project Programme is expected to be 1,61,110 crore which is massive 8 per cent lower than the target fund utilization of 1,74,000 crore. The financial program of PMGSY which is 100 per cent central sponsored scheme showed that the expenditure incurred with respect to the value of proposal has been less than 50 per cent in most of the states. The target shortfall stem from lack of initial preparedness on part of states, bureaucratic and administrative delays in awarding contracts etc., and are hence, clear manifestation of the ineffective governance mechanism that exists in the economy.

Regional imbalance in public investment

The channelization of the funds has not been in accordance with availability gaps in infrastructure. The already better endowed regions have been able to corner proportionately larger share of the funds than the poorly endowed regions.

Low private sector participation in rural infrastructure

The rural infrastructure provision has limited private sector participation, primarily due to lack of appropriate financial incentives and tangible plan for PPP. The private participation in rural infrastructure is by and large limited to a contractor-client relationship, not a partnership for development is emerging in case of several urban infrastructure facilities.

Factors inhibiting private sector participation in rural areas:

a) Low financial return,
b) Inadequate logistic support.

Non-sustainability

One of the critical areas of concern in infrastructure development is poor quality of services that has its root in policy over-emphasis on construction rather than maintenance of the created facilities.

CONCLUSION

In the light of the ample empirical evidence that infrastructure is a pre-condition for development and that

Table 5. Percentage of farmers accessing information on animal husbandry.

States / Union Territories	Animal husbandry					
	Breeding	Feeding	Health care	Management	Others	Total
Andhra Pradesh	1.57	0.89	2.12	0.18	0.32	5.08
Arunachal Pradesh	0.00	0.00	0.00	0.00	11.12	11.12
Assam	0.67	0.37	2.46	0.07	3.35	6.92
Bihar	0.21	0.85	1.66	0.18	0.49	3.39
Chhattisgarh	0.00	0.00	0.00	0.29	0.00	0.29
Gujarat	1.28	1.69	4.33	0.86	0.32	8.48
Haryana	0.94	0.20	1.95	0.68	0.40	3.24
Himachal Pradesh	0.34	0.31	0.00	0.00	0.31	0.96
Jammu and Kashmir	0.98	0.04	0.46	0.20	0.57	2.25
Jharkhand	0.03	0.09	0.05	0.00	1.05	1.22
Karnataka	1.35	0.20	0.93	0.12	0.95	3.55
Kerala	6.41	4.72	7.39	1.46	3.14	23.12
Madhya Pradesh	0.14	0.17	0.50	0.29	0.05	1.15
Maharashtra	1.18	0.38	1.23	1.16	0.56	4.51
Manipur	0.79	0.26	2.39	0.94	0.95	5.33
Meghalaya	10.50	7.41	0.79	0.00	1.79	20.49
Mizoram	0.00	0.00	0.70	0.00	0.00	0.70
Nagaland	2.30	3.88	6.62	0.00	0.89	13.69
Orissa	0.58	0.00	0.02	0.19	1.37	2.16
Punjab	0.73	1.19	2.10	0.27	2.23	6.52
Rajasthan	0.31	0.07	0.52	0.00	0.00	0.90
Sikkim	1.14	0.14	5.52	0.00	2.14	8.94
Tamil Nadu	3.26	2.47	8.26	2.22	1.78	17.99
Tripura	0.02	0.00	0.14	0.00	0.07	0.23
Uttranchal	0.00	0.00	0.36	0.00	0.00	0.36
Uttar Pradesh	0.26	0.26	1.58	0.05	0.13	2.28
West Bengal	0.21	0.41	0.31	0.24	0.06	1.23
A & N Islands	6.52	0.00	0.35	0.00	4.03	10.90
Chandigarh	1.75	0.00	0.45	0.00	0.00	2.20
Dadra and Nagar Haveli	0.00	0.00	0.92	0.80	0.31	2.03
Daman and Diu	0.00	0.00	0.51	0.00	0.00	0.51
Delhi	0.00	0.94	0.00	0.00	4.63	5.57
Pondichery	9.22	14.01	20.47	0.09	19.58	63.37
Total	0.83	0.65	1.79	0.37	0.55	4.19

Source: Compiled from GoI (2006).

Table 6. Percentage of Farmers Accessing Information on Animal Husbandry: The Best and the Poor States of India.

Best States	Farmers (%)	Poor States	Farmers (%)
Kerala	23.12	Uttarakhand	0.36
Meghalaya	20.47	Mizoram	0.70
Tamil Nadu	17.99	Rajasthan	0.90
Nagaland	13.69	Madhya Pradesh	1.15
Arunachal Pradesh	11.12	Jharkhand	1.22
A & N Island	10.90	Uttar Pradesh	2.28
India	4.19		

better infrastructure leads to better development level. Instead the policy for infrastructure development should address the question of what, where, how much, how to finance new projects and how to maintain the operation of

Table 7. Infrastructure Status in Selected States and Areas of Policy Focus to Improve Infrastructure.

Status of infrastructure	State/UT	Road Conn.	Household electricity connection	Drinking water facility	Veterinary Institutes	Veterinary dispensary	Information on animal husbandry	A.I. centers
LOW	Jharkhand Assam Orissa Bihar Uttarakhand Chhattisgarh Rajasthan Uttar Pradesh							
	INDIA	**75.32**	**70.30**	**94.40**	**78.0**	**171**	**4.18**	**402**
HIGH	Manipur Tamil Nadu Haryana Punjab Maharashtra Kerala Karnataka Lakshadweep Chandigarh Mizoram							

Grey boxes denotes low level of availability (below all-India level) Road connectivity: % of connected habitation, Household electrification (% of rural households with access to electricity), Drinking water(% of household with access to safe drinking water),Veterinary Institution (number of veterinary institution per 1,000 Livestock Population), Veterinary Dispensary per 1,000 Livestock Population), Info. On animal husbandry (% of farmers accessing information), A.I. centers (number of A.I. centers per 1,000 Livestock Population).

the existing ones. The 'what' and 'where' of infrastructural projects has mostly been a 'top-down' decision, with government planning bodies at the centre and state levels deciding where to build roads, bridges, power plans, dams, schools, hospitals etc. Ideally the decision of creating and expanding infrastructural facilities should be based on the estimation of actual and potential demand and a cost-benefit analysis capturing both, tangible and intangible benefits of infrastructure development. Unfortunately, this has not been the case, often the projects do not reflect the local priorities in an economic sense, available resources are spread thinly over a plethora of projects compromising on the timeliness in completing the projects and their quality and there is considerable overlapping in fund allocation out of various schemes leading to more and more disparities in infrastructural development. To manage these problems, there must be a long-term plan regarding sequence of projects and list must be made public. The size, magnitude or expanse of infrastructure services should be based on actual demand. It is also important that there are workable synergies between various government projects for infrastructure development; else the net result is wastage of public funds without commensurate development of infrastructure. For instance, despite the elaborate guideline issued for joint convergence rural roads connectivity under PMGSY and NREGA the quality of road connectivity under NREGA is far from satisfaction. Under the scheme, only 40%

of the fund can be spent on raw materials and machines while the rest goes towards wages. Due to the constraint in spending, most roads under the scheme are not concrete which has given rise to issues related to durability. For tackling the governance issue in infrastructure development, the planning and implementation process must be decentralized with sufficient under and community participation. Ideally the rural infrastructure development programme should be implemented through Panchayat Raj Institutions (PRIs), They should be allocated the resources and asked to come up with plans regarding the projects to be initiated. As a result of the 'bottom-up' approach in preparing the perspective and annual plans in respect of each scheme, priority project will be chosen. Involving the PRIs in monitoring process include development of yardstick for monitoring through discussion at the panchayat level, introducing a system of peer review and consolidation of data relevant to a particular indicator. A system of initiatives and rewards (like the Nirmal Gram Puruskar) can be put into place for the panchayats achieving targeted level of success. Community participation will ensure speedy, efficient and cost-effective completion of projects and create a feeling of ownership among the users.

Conflict of interests

The author(s) have not declared any conflict of interests.

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