



Rural Roads, Sustainable Development and Maintenance of People in Desert Regions; Case Study: South Khorasan Province-East of Iran

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Abstract- Investment in rural roads is believed by many scientists and experts to be a solution to economic and social development problems in rural areas. This perception is indeed true as there is a link between transport and sustainable development that is not always acknowledged. In this article author sets out to show that investment in rural roads can be an effective approach for sustainable development. This is a possible if the engineers and planners at program and project levels meet certain preconditions. These preconditions are requiring engineers to review their design standards so as to allow the implementation of rural road infrastructure projects by more efficient construction methods. Inadequate rural transport infrastructure and lack of mobility pose important constraints to rural development in most of developing countries such as Iran. Since approximately 30 percent of people in Iran live in rural areas and are mostly engaged in agriculture, a solution has to be found to this problem, such a solution must be agriculture based. Poor transport conditions are generally regarded as one of the main constraints against rural development. Without access to jobs, health, education and other amenities, the quality of life suffers, and without access to resources and markets, growth stagnates and poverty reduction cannot be sustained. Since 1970, the World Bank has spent 13-16% of its total investment expenditure on transport investment with a marked bias towards the construction of rural roads. The exclusive focus on roads and motorized vehicles has recently come under criticism because it neglects the transport needs of the rural household. Many researches in rural transport services now believe that the plans, projects and existing policies in the transport sector do nothing or little accessibility to services and opportunities; as such investing in rural roads that provide basic access will always have a high economic impact. The challenge is to create an environment around these investments that will improve the income of the rural communities as well their employment prospects. Finally some recommendations on how policy makers and planners can meet this challenge are enumerated. Author finally present some approaches and alternatives for rural people in conditions of south-khorasan province in east of Iran.

Keywords- *Rural roads, sustainable development, maintenance, people, desert, south-khorasan province, Iran.*

I. INTRODUCTION

- A community without roads does not have a way out. A poor man, Juncal, Ecuador.
- If we get the road, we would get everything else. Community centre, employment, post-office. A young woman, Little Bay, Jamaica.
- Many of the poor communities are isolated by distance, bad road conditions, lack of or broken bridges and inadequate transport. These conditions make it difficult for people to get their goods to market and themselves to place of work, to handle health emergencies, to send children to school, and to obtain public services. Narayan et al. 2000

As we are aware that the majority of poor people in the world live in rural areas where the level of public infrastructure especially roads is low. The inadequate roads and poor road access put the high cost of transportation; reduce ability to use access high quality inputs; limit the uses of local markets to the sales of their produces, the purchase of consumer goods and opportunities for off-farm employment. Poor road access has put nevertheless constraints for rural poor in terms of access to other social infrastructures such as education and health facilities. (Syviengxay Oraboune. April 2008). Therefore, improvement of rural road seems to be a clear means by which large numbers of people especially rural people might acquire the opportunity to participate in the market economy and thereby raise themselves out of poverty. The question is, however, does it practice in the reality? (Golmohammadi, 2002, 2007, 2012).

Rural roads are roads that connect a village to other villages, to the main road accessing to markets, or to connect related production or service to particular centers. Due to the real situation of rural dominant of the country and most of poor people live in rural areas. Rural roads have been considered very important and play significant role in poverty reduction through linking rural farming to market, improve their productivity and increase income level. (Syviengxay Oraboune. April 2008). The social and

economic importance of rural roads which are obvious to ordinary folks and world leaders.

There is a close link between village connecting roads and poverty reduction through increase in income opportunities to rural people. All in all we could describe that the rural connecting road provides market access opportunities to rural farmers/people, which they can develop market linkage with other stakeholders in the economy. The development market linkage, in other word, network development helps them diversify their income sources as they have linked with more variety and functional livelihood value chain system. Through this, they can earn more income with stable sources. When income improved, their farming production improved through the increase of opportunity to improve technology and other relevant to their farming production in closer link to markets. This circulation ensures a stable income; improve living standards and that reduction of poverty (A. K. Sarkar 2007).

In short, roads are clearly a critically enabling condition for improvement of living conditions and quality of life in rural areas. Distribution of economic benefits can now be ensured to all sections through the creation of complementary activities for broadening livelihood opportunities to economically weak sections of the rural society.

It has been widely acknowledged that these roads have improved social, physical, financial and human capital of the population of the connected villages in Iran at present (A. Lahsaeizdeh, 2000).

II. POVERTY ALLEVIATION, HEALTH FACILITIES, SCHOOLS, AND ROLE OF RURAL ROADS

rural roads were needed to facilitate schooling, health services and many other social and economic needs. world economists must find ways to address these issues which are put on the table of most development affairs in developing countries such as Iran. without giving any weight to rural roads' immense social benefits in promoting education of girls (which has even impact on family planning and reduction of population growth rates later) and also general education, health facilities, and many other marketing and labor mobility aspects. While these benefits are quite obvious to world leaders and rural communities across the world.

Traditional and quantitative appraisal development project methods are blind towards them as these are difficult to quantify. As a result rural road projects were difficult to justify for policy makers and many official staff were reluctant to even to initiate such projects.

While many of policy makers and many official staff accept the value of rural roads from the totality of their crucial impacts on social and economic factors, and

therefore accord a high priority for investing on them, the traditional and quantitative methods of appraisal of rural roads was unrealistic as it looked at only the small quantifiable part of their benefits, and hence gave a very low priority to rural roads.

Many social benefits (such as health benefits, education) can be quantified in economic terms, at least partly, since they express themselves through some identifiable economic impact. reduced days of sickness and absenteeism from work; increased income due to higher education, etc.

The largest amount of benefits emerge when a region is getting its first access road, since first-time accessibility will open up the area to schools, health facilities and markets. However, even where present facilities exist, non-maintenance and neglect would gradually reverse the access benefits enjoyed so far, and a reverse movement of the area to lack of access to education and health facilities etc. will gradually result (A. Lahsaeizdeh, 2000).

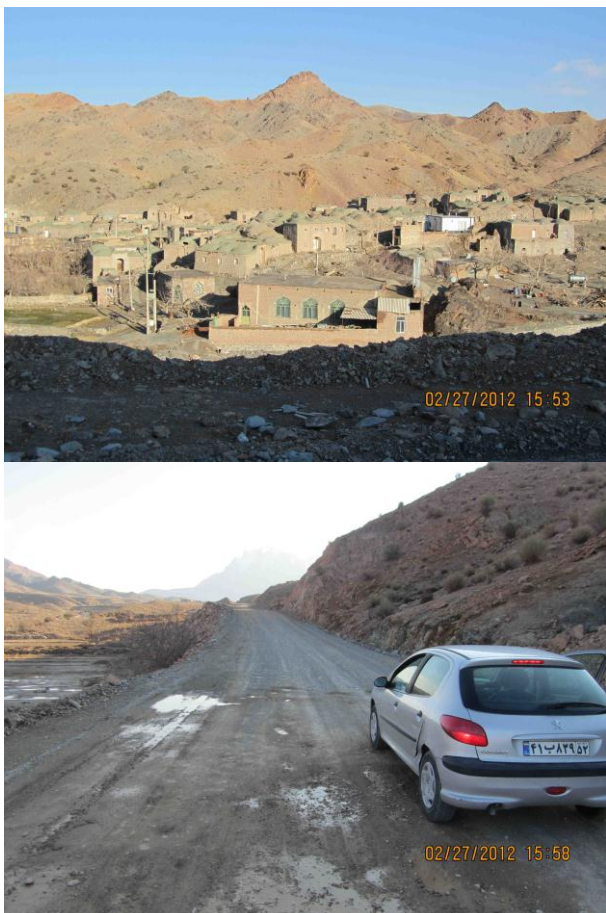
Where already roads have been developed to varying degrees, the social impacts are not as massive as from opening a new road, but still significant. A recent study in Iran (where road connections and connectivity of some kind exist in most regions) showed that the socio-economic development of areas, considering education, health, family planning, employment, income and other variables, were generally positively correlated with the type and condition of the roads. In other words, areas with poor accessibility were worse off compared to areas with better road access, the highest social and economic progress occurring in areas with established paved roads for a long time.

rural roads were so difficult to defend economically, and thought that we didn't count social benefits because they were additional icing on the cake.I would think it would be relatively straightforward to establish a rationale for investing in rural roads beyond the obvious benefits from lower transport costs and time savings. One line of argument could well be in terms of lowering the cost of investing and maintaining (as well as providing access to social infrastructure such as schools, primary health care etc...weighted by population served to come up with a systematic and sensible quantification of indirect benefits from expanding the rural road network and hence a prioritized rural roads program we could support.

A study in Iran showed that over a period of 30 years when education and health facilities improved, the growth rate of population declined substantially, producing tremendous economic impact. Roads had a definite role in facilitating the needed education and health inputs, and should receive part of the credit for this major social and economic benefit. Researchers should investigate ways of quantifying these benefits if possible.

some of these additional benefits from improved access to education, health, etc. should be quantified and a share

attributed to the road investments which helped facilitate or even cause the creation of these facilities. While making such estimates from additional income etc., appropriate steps should be taken to include the school and health care investments and expenditures also in the cost-matrix. In principle this makes the additional benefits to be result of joint investments including road and school investments; an apportionment of these additional benefits should be done on a proportionate basis or using some other yardsticks. Even if all road projects and school projects are not in the planning phase, a scenario can be designed where road access will be accompanied by other social investments, and along with them and other social benefits (A. Lahsaiezdeh, 2000).



Figures 1 &2. Rural roads in a disadvantaged rural region in semi- arid conditions that established in previous ten years in South Khorasan Province in -East of Iran (By author, Mar 2012).

Indeed reducing poverty and misery is a qualitative phenomenon, and its benefits may be hard to assess, beyond the measures on additional income from schooling, value of more productive days and savings in health care costs due to

better access to health care facilities. However there is scope for more thinking on how these poverty impact studies of rural infrastructure can be used to make a better, and more quantitative argument in favor of improving rural access.

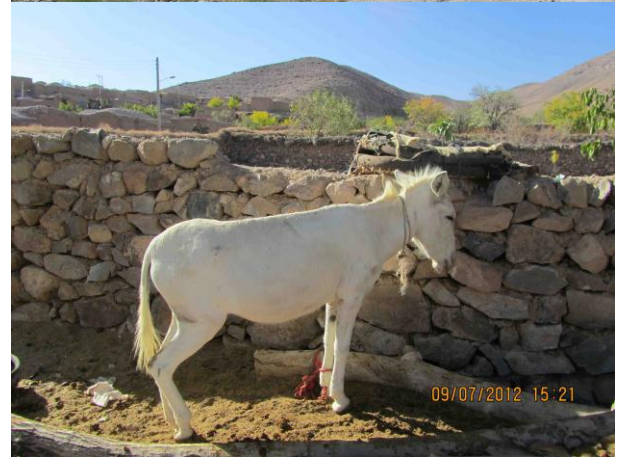


Figures 3 &4. Recently making new infrastructures for rural road in a disadvantaged rural region in semi- arid conditions in South Khorasan Province in -East of Iran (By author, Sep 2010 and Mar 2012).

In a study of impacts of rural road projects in Iran, includes a separate assessment of the agricultural impact (net value added due to the road) of the road project, in terms of an expected change in cropping patterns with a shift to more cash crops. The study uses reduced transport costs of inputs and outputs following the switch to new crops, in order to estimate the new agricultural value added. separately estimated transport cost savings due to the road, using some growth factors in passenger and commodity traffic. In order to avoid double counting, we excluded the agricultural commodities from the traffic projections and transport cost saving estimates. Otherwise, adding the “net

value added” from agriculture would have resulted in some double counting of transport cost savings (A. Lahsaeizdeh, 2000).

- 1) Increase in fast moving motorized vehicles;
- 2) Speeding and disobedience to traffic rules by most of the drivers of the motorized vehicles;
- 3) No road markings and sign posts;
- 4) Lack of education on road safety of the villagers.



Figures 5&6. A modern and great poultry farming and lines of electricity power that in recent ten years established because of rural road in a disadvantaged region in South Khorasan Province of Iran (By author, Mar 2012).

Figures 7&8. Livestock as a major transportation tool in a disadvantaged and traditional rural region in South Khorasan Province in -East of Iran (By author, Sep. 2012).

In results of a study by author in south Khorasan province in -East of Iran, we can summarize impacts on standard of living from improvement on rural roads as below:

- 1) Bringing outside Teachers;
- 2) Bringing outside Doctors;
- 3) Purchase of more fertilizers;
- 4) Expansion of cultivated land;
- 5) More seasonal work opportunities; and finally
- 6) Higher intensity of cultivation and higher earnings of farmers.

And also we can summarize the main reasons for insecurity on rural roads as told by the respondents were as follows:

III. NATURE OF SOCIAL AND ECONOMIC BENEFITS OF RURAL ROADS IN DEVELOPING COUNTRIES

Social and economic benefits are mixed to a large extent. As mentioned, many of the social benefits can be quantified as they express themselves through economic impacts/parameters. In addition to economic benefits such as increased profitability of currently marketed goods, incentives for larger production and greater diversity of farm and non-farm production, better access will promote:

- 1) Labor mobility and larger employment opportunities;
- 2) Improved access to health, more work days available due to reduced morbidity and sick days per person;
- 3) better access to schools and higher percentage of people with basic education and literacy, which has been

associated with better productivity and acceptance of change in farm and other production methods;

4) more girls receiving education with attendant benefits of improved, and healthier home management and better bringing up of children; greater acceptance of family planning which will subsequently reduce overpopulation;

5) greater personal transport and increased social mobility with transfer of knowledge, more opportunity for new businesses and entrepreneurship etc.

Above all, better access increases income and employment and also helps alleviate poverty in many ways. Raising people above the threshold of poverty is a major social impact. The Study in Iran showed these multiple sectoral benefits from improved rural access as increase in the level of KAP (Knowledge, Attitude, and Practices) of a community. This study makes a detailed analysis of these impacts through education, health etc., using survey data of several villages and households under different levels of road connectivity.

So this study made some rough estimates of some of the quantifiable social benefits: such as additional kids who will go to school and their future net additional income spread over the next years, benefits from reduced sick days and more work days due to better access to health facilities, and net additional income from agriculture due to switch to more marketable cash crops, etc.

The villages which were within about 0.5 day of walking distance from the nearest road had higher income, and higher school enrollment than the villages about 3-5 days walking distance from nearest road. During the road project study, it was estimated that about 95-120 additional kids will go to schools every year after the road is built in rural region in central desert yazd province in – center of Iran (since schools could now be located closer to these villages for which Govt.). Without the road, these kids would have remained illiterate, their income generally remaining at the level of farm labor, the minimum wage. Given the chance for school enrollment, many of them will go for higher education, and overall they will end up in better jobs through their life (A. Lahsaeizdeh, 2000).

It has been verified that apart from marginal increase in extension services and the use of more fertilizers and improved seeds, no significant agricultural investments in land improvements would be required to adapt to the expected switch towards marketable crops. The net incremental benefits from agriculture (after meeting all additional costs of farming

and transport) have been taken as benefits brought about by the road, since the absence of a road is the main bottleneck in producing more market-oriented crops in this area.

Rural road connectivity is a key component of rural development, since it promotes access to economic and

social services, thereby generating increased agricultural productivity, non-agriculture employment as well as non-agricultural productivity, which in turn expands rural growth opportunities and real income through which poverty can be reduced (F. Golmohammadi. 1995-1998 & 2012).

A study (Fan et al. 1999) carried out by the International Food Policy Research Institute on linkages between government expenditure and poverty in rural India has revealed that an investment of Rs 1 crore in roads lifts 1650 poor persons above the poverty line. Public investment on roads impacts rural poverty through its effect on improved agricultural productivity, higher non-farm employment opportunities and increased rural wages.

Improvement in agricultural productivity not only reduces rural poverty directly by increasing income of poor households, it also causes decline in poverty indirectly by raising agricultural wages and lowering food prices (since poor households are net buyers of food grains).

Similarly, increased non-farm employment and higher rural wages also enhance incomes of the rural poor and consequently, reduce rural poverty. This study estimated that while the 'productivity effect' of government spending on rural roads accounts for 24 per cent of total impact on poverty, increased non-farm employment accounts for 55 per cent and higher rural wages accounts for the remaining 31 per cent. Further, of the total productivity effect on poverty, 75 per cent arises from the direct impact of roads in increasing incomes, while the remaining 25 per cent arises from lower food prices (15 percent) and increased wages (10 per cent). Similar results are found in other developing countries. The study by the same institute (Fan et al. 2000) in China revealed that with every 10,000 Yuan (about \$1200) spent on rural roads eleven persons are lifted above the poverty line. Living Standard Survey in Vietnam in 2002 showed that populations living within 2 km of all-weather roads have lower poverty rates as noted in the draft Vision Document for Rural Roads, 2006 (MoRD, 2006). Statistical evidence apart, the link between poverty and lack of accessibility is quite apparent. Nearer home, a household survey (APERP, 1997) conducted in the state of Andhra Pradesh state in India indicated that the rural road improvements lead to substantial reduction in freight charges, increase in household income, more employment opportunities, and expansion of cultivated land (F. Golmohammadi. 1995-1998 & 2012).

Roads in India are classified under a time-honored system into National Highways (NHs), State Highways (SHs), Major District Roads (MDRs), Other District Roads (ODRs), and Village Roads (VRs), with well-recognized standards for construction and maintenance laid out in respect of each category. Generally speaking, there are clearly understood demarcations of responsibility in terms of governmental offices expected to deal with each category. However, while the activity mapping with respect to NHs and SHs is clear cut, with respect to MDRs, ODRs, and

VRs, these distinctions are blurred. In many states, though PRIs are assigned responsibilities with respect to ODRs and VRs, a plethora of agencies and line departments undertake formation and repairs of roads. Consequently, it is difficult, if not impossible, to assess the exact amount that is being spent for the maintenance and construction of ODRs and VRs. The overlapping of responsibilities and the fragmentation of funds between agencies for maintenance and development of roads is a source of inefficiency and confusion. Quite often, the only point where all these responsibilities and funds converge is at the level of the local implementing officer, the Assistant Executive Engineer, who is used by all agencies named above for implementation. This thinly spread management structure is inefficient; it does not ensure good monitoring or downward accountability and unnecessarily complicates planning (F. Golmohammadi. 1995-1998 & 2012 & 2002-2007).

IV. FOUR FORMS OF RURAL CAPITAL IN SUSTAINABLE DEVELOPMENT PROCESS AND SITUATION OF ROADS

In the integrated and sustainable development in rural regions especially in developing countries such as Iran we need all of the types of capital as mentioned below:

1) Human capital: is about people and their ability, individually, to satisfy human needs, such as technical knowledge and leadership skills.

2) Infrastructure capital: consists of human-created resources, those physical items created by individuals or groups to improve the community, such as roads and libraries.

3) Natural capital: encompasses the entire natural environment, including soil, water, air, and vegetation (S. Cartwright & T. Gallagher. 2002).

4) Social capital: that pertains to human networks, whether of two people or many. These networks typically are characterized by customs, laws, and institutions, and they often involve trust and an expectation of reciprocity. Examples include the family, civic groups, government, and a host of institutions, such as public safety, education, and health.

In this model all capital is contained under one of the four categories, and all communities have a mix of the four. It is the characteristics of that mix that give each community its character, and it is the balance, or imbalance, of the mix that creates needs. The total rural capital model provides a way of analyzing these needs and a way to look at directing investments to create a different and more valuable balance in a community, what we call "community development. Rural roads in this model are a part of Infrastructure capital that also can improve other types of capitals in various ways considerably.



Figures 9&10. Pickup truck as a major motorised transportation tool for mostly smallholders farming affairs in most rural regions in Iran (Picture from South Khorasan Province in -East of Iran. By author, Sep. 2012).

V. WHY COSTS OF MAKING RURAL ROADS VARIES ACROSS REGIONS?

A typical rural road consists of compacted sub-grade, granular sub-base, base-course with graded aggregate and thin bituminous surface course in the form of pre-mix concrete with a seal coat. In order to ensure the serviceability of the road throughout the year with safety, necessary cross drainage (CD) structures, side drains, road signs, and other road furniture should be an integral part of the rural road. the cost of construction into cost towards site clearance, retaining walls, CD structures, earthwork, sub-base, base-course, and surface course.

In results of a study by author in south Khorasan province in-East of Iran, the average cost of different components per km of the sample analyzed is presented in below:

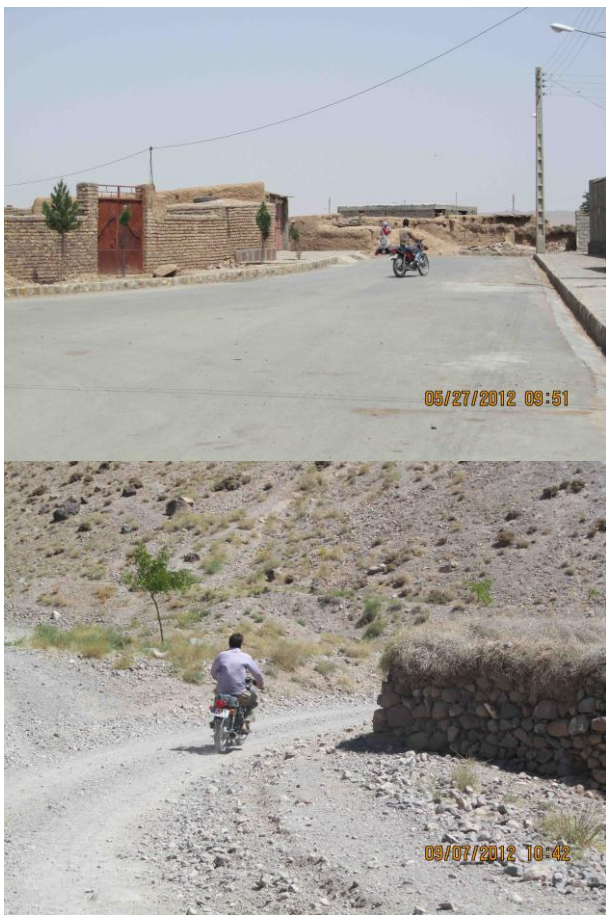
- 1) Total cost of construction is 45 per cent higher in hill areas than in plain areas.
- 2) On an average, the number of cross drainage structures required per km of road in plain area is 3, whereas

in the hilly region this requirement is 8. This explains the higher cost of CD works.

3) The cost of site clearance is a significant component of the total cost in hilly areas, whereas it is negligible in plain areas.

4) The haulage cost for bringing construction material is more in hilly areas, whereas it is negligible in plain areas.

This study also revealed that even within a state, cost variation can be significant across the districts owing to the site specific conditions. The findings of the study warrant greater attention to detailed site investigations and technology option study at the time of preparing of rural roads (F. Golmohammadi. 1995-1998 & 2012 & 2002-2007).



Figures 11&12. Motorcycle/ scooter as a relatively cheap & major motorised individual transportation tool in most rural regions in Iran (Pictures from South Khorasan Province in -East of Iran. By author, May & Sep. 2012).

VI. CONSTRUCTION AND MAINTAINING RURAL ROADS

In the context of rural roads, a higher degree of care is required at the planning stage to integrate connectivity needs of scattered settlements. The construction of a road

connecting a habitation must be augmented by means of transportation, enhanced by appropriate facility creation in health, education and so on. The utility of the network can be best appreciated with such integration of accessibility with social infrastructure (f. Rafipoor, 2000 & 2002)

The reasons for shortfall in targets as identified by the evaluation team included procedural impediments, new work practices that consumed more time, local officials not being taken into confidence, scarcity of skilled laborers, and prolonged monsoons in certain provinces in Iran. In order to achieve targets, author suggest augmentation of resources, provision of cash compensation for acquisition of land, speedier identification of unconnected habitations, periodic updating of on-line information, realistic fixation of up gradation target, complete involvement of local leaders, enhancement of time limit for completing projects, adoption of centralized tendering system, meticulous project preparation, avoidance of multiple agencies, utilization local labors, efforts for lowering of construction costs and constitution of a province level vigilance committee (f. Rafipoor, 2000 & 2002).

Rural roads need to be maintained at a minimum level of acceptable serviceability. Lack of adequate and timely maintenance is bound to accelerate the process of deterioration of the roads, which in turn results in loss of time, agriculture output, access, and eventually the asset itself. Further rehabilitation cost is high with increase in the vehicle operating costs. In case of loss of asset there may be isolation. Regular maintenance of rural roads is a critical pre- condition for sustaining the positive impacts that roads bring to rural communities. Routine minor maintenance is often neglected not only because of lack of funds, but also because there is little political capital, or mileage in maintaining roads regularly as the outcome is not highly visible. Instead, politicians prefer to authorize major rehabilitation or reconstruction after the road has deteriorated considerably. Though this is a universal phenomenon, it is time this issue of sustainable rural roads maintenance is taken seriously (f. Rafipoor, 2000 & 2002).

We must assure maintenance of the rural roads in the initial five years of construction. The problem on maintenance beyond that is still unresolved. The concept of project costs of maintenance may be thought of and the option of mobilizing funds for maintenance need to be studied, in order to keep up the sustainability of the rural roads.



Figures 13 & 14. Establishing and maintaining infrastructures for rural roads in a disadvantaged rural region in semi- arid conditions in South Khorasan Province in -East of Iran (By author, Sep 2010).

Strategies adopted in different countries enable us to entity and entitle the main requirements for ensuring sustainable rural roads as below:

Policy decision on maintenance and commitment of the government for the preservation of rural road assets deviating from the bias towards new construction.

There is an urgent need to projective the cost of maintenance at the time of planning the new construction itself, in order to achieve sustainability.

Development of Technical Standards for design and construction along with a streamlined Quality Assurance System as these have a bearing on subsequent maintenance.

Adopting suitable Maintenance Management System for planning, implementation for optimal use of constrained resources, with clear policy of prioritization and supported by well-defined documentation of database.

Institutional arrangements with clearly identified functions and functionaries.

A dependable funding mechanism for maintenance.

Capacity building for the institutions as well as contractors with necessary training for improvement of technical skills and adoption of innovative methods of executing the maintenance operations, in tune with the present day technology.

Involvement of local governments and community at the appropriate levels for undertaking maintenance of rural roads with a systematically designed awareness program bringing out the consequences of inadequate and deferred maintenance (see figs. 15 & 16).

Need based Research and Development (R&D) efforts (f. Rafipoor, 2000 & 2002).

Provision of proper shoulder for rural roads is very important, especially for one-lane roads. Besides providing lateral support to the pavement, it helps pedestrians and cyclists to travel on it and also the space is being used for overtaking and crossing operations of vehicles. Proper shoulders are sometimes not provided, and when provided, they are very often inadequate and not maintained properly. In some cases it has also been observed that the farmers encroach upon the shoulder thereby reducing the width causing structural danger for the pavement and also inconvenience for the traffic. In the absence of proper maintenance over a period of time a difference in level is created between the pavement surface and the shoulder, which is very dangerous especially for pedestrians and cyclists.

We must help the decision makers to quickly identify the stretches which require immediate attention for improvement to enhance the safety standards. It also helps to identify the parameters which need up-gradation and then steps could be suggested to ameliorate the situation.

Minimizing the mass wasting and to reduce the post construction landslides along the hill roads are very important to harmonize the road development with fragile hills. Thus mass balanced method of hill road construction, selection of optimal alignment, labor-based implementation of construction, phased construction approach, optimization of width of the roads, reuse of excavated material as construction materials, optimizing the drainage requirement, minimization of blasting for rock excavation and bioengineering works for road slope stabilization are the

major consideration to harmonize the road development in hills.

Policy of planned undertaking of road construction with labor-based construction method, participatory management of road construction, social mobilization support and technical support is required. Training to local people for transfer of know-how and their capacity building at local level is very important. After the completion of construction appropriate operation and maintenance management mechanism is to be established and adherence is required for its sustained use (f. Rafipoor, 2000 & 2002) & (P.K. Sikdar. 2006).

Since water is the main enemy of the sustainability of roads, roads constructed under such employment generation schemes were often not durable. Rural roads have suffered greatly due to lack of systematic planning. While rural road development plans provided for a network structure and target lengths of different types of roads, specific connectivity requirements of individual settlements (villages/habitation) and issues of regional imbalances were not adequately addressed. This led to more than one connection for the same village resulting in redundancy and development of a large unmanageable network. While constructing rural roads, adequate care was not taken in adopting need based designs, parameters for pavement construction, quality assurance, and quality control. Multiplicity of organizations involved in the rural roads development led to uncoordinated efforts, un-rational decisions, and a lopsided network structure.

A constraint for rural road construction is budget. While diversification of livelihood activities presents opportunities to earn from more income sources; and this shows how local people develop and link into livelihood value chain. The more livelihood activities develop, the more linkage into livelihood value chain and the more income be created. The linkage into livelihood value chain can be observed through the linkage of livelihood activities of rural people with other social and particularly economic stakeholders (individual or organizations) (MoRD 2000).

VII. CENTRALIZE OR DECENTRALIZE RURAL ROAD DEVELOPMENT AND MAINTENANCE

The debate is whether one ought to centralize or decentralize rural road development and maintenance. Protagonists of centralization assert that roads have certain special characteristics that make them different from other dispersed rural infrastructure. First, good roads require a reasonably high and uniform standard of construction and repair and second, roads are not necessarily used by the local residents alone. In the pursuit of standardization and adherence to norms, centralization can also be carried to extremes, putting wide powers in the hands of a few, totally eliminating scope for community participation and

flexibility for local initiatives and innovations. Necessary capital is provided by the central government of Iran to the responsible administration in provinces to build the road network as per the central government norms. The key issue remains of maintenance of this network as it is handed over to the state government after constructing the road. The responsible administrations in provinces are obliged to provide from their budgets for its maintenance (f. Rafipoor, 2000 & 2002) & (P.K. Sikdar. 2006).

In the other side, intensive community participation is being widely recognized as a major requirement for ensuring long term sustainability of investment on rural infrastructure. Participatory planning and management facilitates assessment of the needs of the rural households in order to create integrated utilities for them. Such approach also provides opportunities to the community to reinforce their identity as a key stakeholder and to exercise their choices and rights freely. This promotes a sense of ownership of the assets created and provides incentive for their participation in construction and subsequently, in the management of the assets. While designing systems for community participation and management, however, there is an important concern which needs to be properly addressed. When community management entails cash or labor contributions, the burden generally falls disproportionately on the poor households, since they may be forced to contribute free labor time leaving less time for them to engage in their primary productive tasks. This might adversely affect their ability to meet subsistence needs and food security. They may also be forced to contribute towards maintenance of infrastructure assets, which they rarely use. What we should really aim at in the involvement of the community is the assessment of needs and decisions regarding maintenance and management. This will ensure that community participation is inclusive and pro-poor, since the poor will develop a stake in using and maintaining the appropriate roads which serve their needs. Also while the poor households face fundamental deficiencies in their assets to capture benefits of the opportunities that a rural road may bring, one aspect of the rural road development, which benefits the poor directly, is the opportunity that construction and maintenance of these roads offer for employment when labor intensive methods are used. Experience from Asian and African countries reveals that the principal gains for the poor from rural road programs is through employment generated during the construction. Although employment on road construction is temporary in nature, this provides an opportunity for the workers to accumulate savings which can provide the necessary startup capital to invest in alternative livelihoods to cross the threshold of poverty. Labor intensive, intermediate technologies are expected to generate five to six times more jobs in construction of rural roads as compared to the highly equipment oriented methods used for the highways. Furthermore, adoption of labor intensive construction methods need not affect the quality of works adversely,

contrary to the popular belief. It has been successfully demonstrated in Cambodia and Peoples' Republic of China that the quality of works, using labor intensive methods, can be at least as good as that of the contractors using heavy machineries. There is, therefore, a need to incentivize and promote use of labor intensive techniques for rural road programs with a focus on poverty reduction (MoRD 2000) & (f. Rafipoor, 2000 & 2002) & (P.K. Sikdar. 2006). (See figs. 15 & 16).



Figures 15 & 16. Using locally materials and workers in establishing and maintaining infrastructures for rural roads in a disadvantaged rural region in South Khorasan Province in -East of Iran (By author, Sep 2010).

Rural roads, by their very nature, are small in size and are dispersed over a wide geographical area. Construction and maintenance of rural roads are, therefore, not easily amenable to centralized supervision and monitoring. Efficiency considerations weigh in favor of a decentralized system for maintenance and management of rural roads. Case studies of different developing countries have shown that regular maintenance of rural roads is a critical pre-condition for sustaining the positive impact which these assets generate for the rural community. Ensuring adequate

and timely maintenance, both routine and periodic, however, requires not only adequate availability of funds, but also major institutional reform. This is because the institutional responsibility for rural roads is often not very clearly established. In many states there appears to be lack of clarity, at least in practice at the field level, over who is responsible for maintaining which roads and also over the sources of funding their maintenance requirements. In the absence of proper institutional systems, very often there is no transparency and objectivity with regard to prioritization and selection of roads, maintenance and rehabilitation. The ability to get a road included in the annual maintenance program or a rehabilitation scheme, consequently, tends to depend heavily on the political strength and influence that the beneficiary community can exert. Poorer and more backward areas and communities are likely to suffer under such a regime since they are less likely to have the capacity and the power to lobby effectively for better roads. There is a clear case, therefore, to move towards an efficient system of decentralized maintenance of the rural roads by empowering local people. It is hoped that a clear road map for this purpose would be set out at least in the near future years.

It is a common perception that all-weather roads should be necessarily black topped. Black topping, no doubt, provides better riding quality and stability to the surface as well as pavement structure. It prevents water percolation and arrests the dust problem. However, black topping of fully constructed crust becomes necessary only on the roads carrying high traffic volumes. Investment of this type on roads connecting smaller habitations with low traffic volumes can be rarely justified on economic considerations. This calls for need based road construction keeping in view the expected economic returns from the investment.

In the other side, gravel road with necessary cross drainage and protection work as an all-weather road. Indeed a whole range of proven, cost effective pavement options are now available as alternatives to bitumen surface for low volume rural roads. Most of these paving options require relatively smaller capital investments and optimize use of local materials and use intermediate labor based technology. A policy and institutional framework needs to be developed to 'mainstream' these alternatives for rural roads. Providing all weather connectivity helps in promoting economic growth and alleviates poverty. The Jihad Agriculture Organization in Iran 1 (responsible ministry for agriculture and rural development in Iran) has accelerated works in connecting habitations all over the country and its impact on rural economy is perceptible not only in economic life of people but in social life as well. When funds are to be provided through the province or by the Jihad Agriculture Organization in Iran budget, works begin for the maintenance of rural roads (MoRD 2000) & (f. Rafipoor, 2000 & 2002) & (P.K. Sikdar. 2006).

There is little doubt that rural roads are vital to agro-based industry and rural development, to create jobs, and to make the country's growth more broad based. As all-weather road network through the Jihad Agriculture Organization in Iran is expanding we are witnessing social and economic change beyond our expectations. Though a watertight system to maintain this vast network is not in place, it is unlikely that village community would let it fall into disuse (MoRD 2000) & (f. Rafipoor, 2000 & 2002) & (P.K. Sikdar. 2006).



Figures 17 & 18. A gravel and an asphalt/ black topped rural roads in a disadvantaged rural region in South Khorasan Province in -East of Iran (By author, Sep 2012).

In recent years, most of gravel rural roads in Iran especially in south Khorasan province in -East of Iran in a time tabled program changed to asphalt/ black topped roads or will be changed in approximately ten years later.

VIII. MATERIALS AND METHODS

The present study has been done by author of this article during 2009 – 2012 years in a disadvantaged rural region in south Khorasan province in -East of Iran². All of the pictures of this article has been gathered by author in these years with personal attendance of him in desert and

disadvantaged rural region in south Khorasan province in -East of Iran. Also researcher made and used a questionnaire for gathering viewpoint of rural people about efficiency and effectiveness of roads that made for them in recent years and type of their participation in establishing and maintaining them. Another instrument for gathering viewpoint of rural people about roads that used by the researcher was interviewing with villagers in regions that project established. Also observation and participation of author were two important another important tools for gathering information.

IX. CONCLUSION AND RECOMMENDATIONS

The construction of a road and its maintenance requires major initial investments, followed by subsequent smaller routine and periodic maintenance costs. Two major aspects are important to note:

First, road connectivity is often only one of many factors that influence change in the state of development, social and economic, of a community. There are several other factors which are at work simultaneously (including resource endowment, political factors etc.).

Second and moreover, it is often not possible to establish a causal relationship between the road and the social and economic changes in its area of influence. Very often what a study can establish is simply that the road connectivity, along with other factors, are positively correlated with a given change. Multivariate analysis can be designed to indicate the extent of change due to road connectivity alone (Ashoke K Sarkar. January 2007).

Transport benefits have been estimated for the following four major categories:

transport savings on the normal growth of non-agricultural goods traffic assuming traffic levels without the road project (agricultural traffic is excluded since the benefits from transporting agricultural goods will be indirectly included in the estimate of incremental agricultural income);

transport savings on the induced non-agricultural goods traffic (additional non agricultural traffic induced by the availability of the road);

transport savings on the normal growth of passenger traffic (persons traveling in the absence of the new road);

transport savings on the induced passenger traffic.

In order to translate the vision of the policy makers and many official staff into reality, the author suggests the following solutions:

1) There should be clear acceptance that rural roads produce major social benefits which should be given weight in our evaluation, though they are difficult to quantify.

Spending huge amounts in estimating such social benefits in each case would be wasteful.

2) to simplify procedures and to capture their significant non-quantifiable benefits, include a correction factor in economic evaluation. One way is to give an arbitrary weight for social impacts, requiring the minimum threshold of economic return to be, half of what is currently required. This method would substantially correct the present anomaly, and would be better than ignoring these valuable benefits, leading to wrong investment priorities.

by attempting to carefully quantify the true economic costs of present transport bottlenecks (walking distance to nearest road, use of expensive mule haulage which cannot physically transport many items such as building materials for schools and health centers, and the abundant socio-economic benefits which the investment will bring to the project area in future, the inherent case for the project could be established in quantitative way. The use of realistic mule transport costs in the absence of the project, quantification of social benefits, and the use of realistic life assumption for the roads, have all contributed to the viable benefit estimate, in spite of high costs of the project. The life assumption for the project road was widely endorsed by experienced road engineers who reviewed the project, since it will be a well-built road with relatively less traffic and good potential maintenance standards based on the good road maintenance record in Iran at present. New accessibility criteria for village road were introduced and this plan suggested several approaches for rural road development. These approaches include preparation of long-term master plan for rural roads; stage construction in view of the low level of traffic in the initial stage of development of a rural road; integration of rural road development plan with the other rural development programs (F. Golmohammadi.1995-1998 & 2012 & 2011).

The geometric standards for rural roads must be improved over the years in Iran. The older roads constructed majority by gravel does not have excellent alignments, but gradually things have improved and many of them changed to asphalt/ black topped rural roads in Iran. In many cases proper alignments could not be provided due to land acquisition problems. An increase in the number of families rearing goats/sheep for commercial purposes was mentioned by beneficiaries in rural regions in south Khorasan province in -East of Iran. And also many families have bought cycles after the construction of the road to be able to carry dairy products for sale to nearby towns specially Birjand city in south Khorasan province in -East of Iran.

After the construction of rural roads in south Khorasan province in -East of Iran, an improvement in the employment situation in terms of more job opportunities, avenues for self-employment, and so on were observed. On-farm employment opportunities also increased due to shift from grains to cash crops and also multiple cropping.

More people are going to nearby towns and villages in south Khorasan province in -East of Iran, for odd jobs like selling woods, vegetables, dairy products and locally made items due to expansion of local industries, which in turn has generated employment opportunities.

There has been an overall improvement in access to health facilities for rural people in south Khorasan province in -East of Iran. Positive impact was observed on accessibility to preventive and curative health care facilities; better management of infectious diseases, and attending to emergencies by health workers.

Improvement in antenatal and post-natal care was observed by beneficiaries, thereby decreasing obstetrics emergencies in south Khorasan province in -East of Iran.

Road connectivity and an improved transport system enabled families to opt for institutional deliveries in hospitals outside the village. Decrease in infant and child mortality was reported.

there has been an improvement in the accessibility to education facilities. This has resulted in increased school enrolment and school attendance in all the villages in south Khorasan province in -East of Iran, especially, in the number of girls going to schools. Most parents mentioned that they were now more confident about sending their daughters to schools unescorted. Moreover, regular attendance of the teachers throughout the year is observed and greater willingness is evident among parents to send boys and girls for higher studies and college education outside their villages.

The road connectivity has increased the frequency of visits by government officials and grass root level functionaries like Village Level Workers (VLWs). There has been an improvement in accessibility to banks, and the Post offices, and quicker access to the police.

There has been an increase in ownership of bicycles and pickup truck and motorcycle and scooter by rural people in south Khorasan province in-East of Iran (see figs. 9&10&11& 12). Also, there has been an improvement in the public as well as the private transport systems in all the province.

An immediate and direct impact of providing rural road connectivity was observed in the quality of life as cooking gas became available in villages. The connectivity led to sudden escalation of prices of land adjacent the roads. This also led to an increase in the sale of land for commercial purposes (see figs. 5&6).

The roads, directly or indirectly have provided opportunities for on-farm and off-farm employments as well as self-employment. With the improvement in on-farm and non-farm employment opportunities, beneficiaries in all the rural regions in south Khorasan province in-East of Iran, reported increase in their average household income, thus, reduction in poverty.

Though it has been revealed through several impact studies that rural roads have multi-dimensional beneficial impacts on the rural community, these benefits may not be equitably distributed. Well-off households with better resource endowments, capabilities, and skill sets generally derive more benefits from the improved access as compared to poor households. This calls for prior in-depth analysis of the potential input from the major stakeholders with a view to devising appropriate mitigation measures to make this scheme 'inclusive' in terms of its benefits. Though rural roads provide accessibility, the assurance on transport availability and affordability must be looked into. For instance, a rural road serving as a means of transportation may permit people to use their own mode of transport, but unless public or intermediate public transportation is available, the benefit of the rural road will not reach all. Further, even when public transport service is available, the affordability to use the services may once again put the very poor at a disadvantage (F. Golmohammadi. 1995-1998 & 2012 & 2002-2007).

However, provision of village connecting road alone does not enough to ensure that rural people could gain benefit as much as they can. Provision of agriculture extension works including other relevant issues like agricultural market information, etc., is needed together with raising awareness of rural farmers/people of the benefits they could gain from the village connecting road in order to capture opportunity to increase their income and reduce poverty through improving their agricultural activities toward commercialization, diversifying their livelihood activities, and developing their proper market network system. Therefore, village connecting roads (rural roads) could also be developed from rural initiative by utilizing own capacity of rural people and gradually cooperate with relevant agencies toward upgrading into better quality to ensure proper functional utilization of the roads.

It is important to realize that infrastructure development, particularly rural road or village connecting road is crucially significant for poverty reduction. Hence, rural road development should be a supplement in the road sector development strategy and address in an appropriate way regarding the real situation of the country.

Some recommendations for the considerations regarding the development of rural road issues toward poverty reduction are as follow:

- 1) Although, development of national roads or other economic roads is urgently important for the country due to the real situation of poor countrywide infrastructure and budget constraints, but having a strategy to connect rural people to the main roads should also be considered and developed in conjunction with the national strategy of the sector development.

- 2) At national level, prioritizing development of rural roads where there have more potential or aspiring crops or

other livelihood activities that are in demand domestically, regionally and internationally, so that will help develop rural farming production in linkage with markets and that ensure a more stable income for rural farmers/people.

Economic growth and employment opportunities in themselves may not be sufficient to improve the living conditions of the poor. They need to be accompanied by measures which enhance the quality of life. As local bodies move over to more viable financial fundamentals, their capacity to mobilize resources from borrowings will improve. Local bodies have to demonstrate that they can function effectively within a hard budget constraint. They can then use a set of instruments to mobilize borrowings for long-term needs. Access to and effective control over resources is a critical component of this empowerment. The real issues of such access are knowledge and awareness of the needs of the people, legal rights, and availability and accessibility of social and economic resources. These changes in procedures and organizations have as yet not fully taken place as envisaged in the legislation. It also requires restructuring relationships, including looking at gender issues at both the micro and macro level. A culture of equality has to be evolved not only between men and women representatives but also between officials and non-officials manning the decentralized development structure. The involvement of the people in the planning process is necessary to take into account their felt needs, to mobilize local resources, to increase the speed of implementation by securing the people's cooperation, to increase the acceptance of the plan and projects and also to bring about a change in the power structure in people's institutions in favor of the poor. Strong leadership and political will are the necessary conditions for facing the challenge of enabling the local self-government institutions to become effective instruments of social and economic development of rural areas.

X. FOOTNOTES

- 1) The Jihad Agriculture Organization in Iran: This organization is responsible ministry for agriculture and rural development in Iran.
- 2) South Khorasan Province in-East of Iran:



Figure 19. Map of the South Khorasan Province in the East of Iran.

(Note: Number and name of cities: 7 cities: Birjand, Qaen, Ferdows, Darmiyan, Sarayan, Sarbisheh and Nehbandan, 20 towns, 18 districts, 48 rural districts, Number of rurals: 2223 small villages with inhabitants and 5549 vacant small villages.

The ultimate eastern Iranian Province, South Khorasan, has an area of 102460 square kilometers. This province is located between 57 -1' and 60 - 57' degrees of east longitude and the 30 - 32' and 34 - 36' degrees of north latitude and 6.22% of the whole surface of the country has been specified to it. The Province has about 462 kilometers of common border with the Afghanistan country from the east. The province's population is 636420 (2006), according to the last statistics. This amount comprises 0.9 percent of the total number of country's population. The survey of population distribution in rural and urban districts of the province shows that around 48.6 percent of the province populations are settled in rural areas and expanding regions of the border band and 51.4 percent live in the cities. Although the province region is of the dry and desert type, the existence of high and low districts has divided the climate into two parts:

A) Hot and Dry Region: includes deserts and smooth regions of center, west and south of the province.

B) Mild and dry region: includes northern high parts, northwest of the province and regions around Birjand.

The province annual average rainfall is 133 Millimeters. Raining are non- sequential and often in the form of rainstorm. Rainfall in the proximate regions of the desert is decreased to 50 millimeters and in the heights will be increased around 250 millimeters where the raining average in the province center (Birjand) reaches 160.6 millimeters).

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TABLE 1. LENGTH OF ESTABLISHED RURAL ROADS DURING 5 YEARS IN SOUTH KHORASAN PROVINCE IN -EAST OF IRAN (KM)

year	length of established rural roads before 2007	2007	2008	2009	2010	2011	Sum of theRural roads Made during 5 past year (km)
length of rural road	2441	318	324	296	395	153	1899

(Administration of road and house of South Khorasan Province - Iran. Annual reports. (Persian). 2010, 2011).

TABLE 2. ASPHALT/ BLACK TOPPED ESTABLISHED RURAL ROADS BEFORE 1978 (BEFORE ISLAMIC REVOLUTION IN IRAN) AND IN RECENT YEARS UNTIL PRESENT (2011) IN SOUTH KHORASAN PROVINCE IN -EAST OF IRAN (KM)

year	Before 1978	1978- 2002	2003-2010	2011
Numbers of rural that have Asphalt roads	5	323	671	688
length of Asphalt rural roads (km)	0	2395	4141	4340
Percent of rural regions that have Asphalt roads	2 %	72%	93%	94%

(Administration of road and house of South Khorasan Province - Iran. Annual reports. (Persian). 2010, 2011).