

Chapter 4

Impact of Rural Roads in the Project Area

4.1 Introduction

Until recently, hill economies remained remote, isolated, and self-sufficient. This was inevitable given the lack of transport infrastructure to connect the hill and mountain regions with the wider market network. As long as there was additional land available to bring under cultivation, hill agriculture was able to meet the rising demands of the increasing population. But with the diminishing possibilities of area expansion and population growth at a high rate, there has been a strong tendency to encroach upon marginal lands for cultivation. The result has been decreasing returns on the inputs used, decreasing agricultural productivity, and adverse effects on the environmental stability of the whole region.

Recent studies indicate that the cereal grain monoculture, which is most prevalent in hill agriculture, is unsustainable because other resources, such as forests, pastures, arable lands, and so on, are beginning to deteriorate rapidly. It is necessary to move to a more diversified pattern of agriculture that seeks to promote not only food grains, but also vegetables, fruit trees, forests, grasslands, and pastures on the basis of eco-environmental and eco-technological considerations. Moreover, the climatic conditions offer tremendous prospects for promoting high-value horticultural* development in the hills. Thus, alternative approaches to agricultural development in the hills need to be examined, because they can take advantage of not only the growing market system but can also exploit comparative advantages offered by the hills (ICIMOD 1993).

Complementarity between rural roads and the transformation process of agricultural development is not well understood in a traditional subsistence rural economy. While the visible impact of roads, such as ribbon settlement along the roadside and price rises for land along the roads, could be vividly seen, the more important invisible impacts, such as the process of social transformation from a subsistence to a marketable economy, with the account could be complex and difficult to understand. Studies indicate that even within one district the area of transformation is localised. In Ilam District, for example, only part of the district bordering on India has been transformed (Jodha & Shrestha 1993). Another study on eight districts of the Bagmati Zone concludes that, whereas environmental conditions are very favourable for expansion and development of horticulture, actual progress has been very slow on account of gaps in policies, programmes, infrastructure, and institutional support services (ICIMOD 1993).

It is difficult to isolate one factor, such as rural roads, and measure the impact on socioeconomic transformation. However rural roads, being a visible and a leading infrastructure, are

* Horticulture here refers to commercial vegetable and fruit farming — cash crop farming

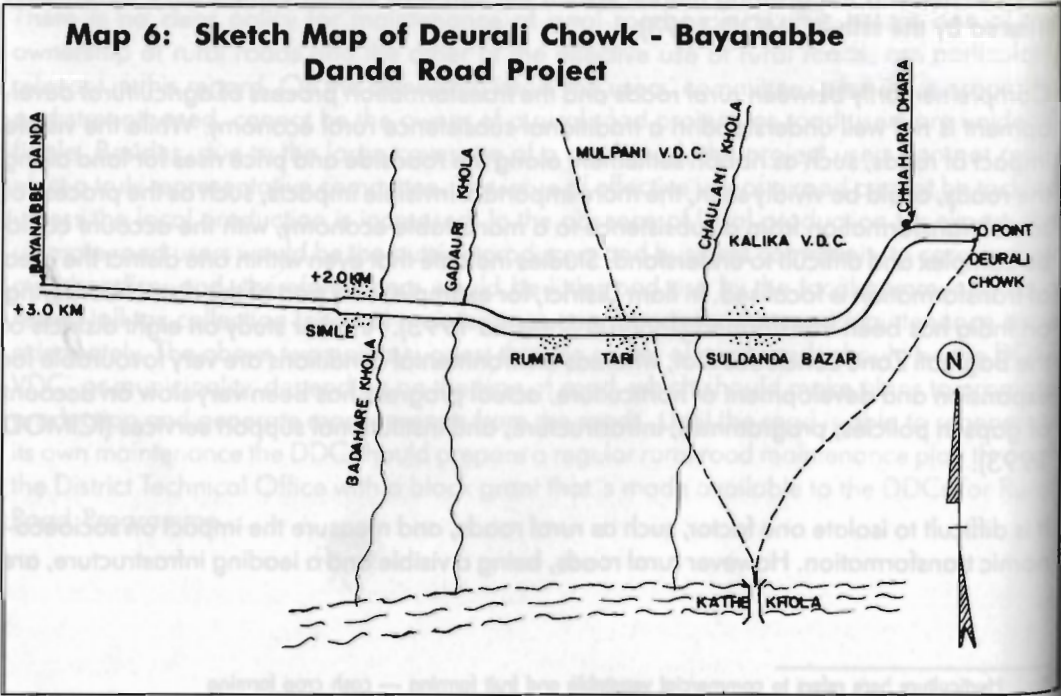
seen here as an entry point for bringing about other changes. It is, therefore, important that the economic use of rural roads for sustainable rural development should be addressed at the project level. The present Chapter attempts to assess the impact of roads on socio-economic changes in areas served by roads.

4.2 Profile of the Rural Roads' Projects

4.2.1 Deurali Chowk - Bayanabbe Danda Road Project of Baglung District

The project road starts from the western corner of Baglung Bazaar. The road follows the alignment of the main mule trail that links Baglung Bazaar with places in the western part of Baglung District such as Pala, Biu, Galkot, Kharbang, Burtibang, and Dhorpatan. The general setting of the existing trail is about four feet wide and stone-paved in difficult sections. There are several small Bazaar(s) along the way; the more notable among them being Suldanda, Simle, Dobilla, Biu Suldanda, Hatia, Deurali, Dahapani, and Rangini. Over 400 mule caravans and several hundreds of pedestrians pass by the road every day. A sketch map of the road is presented in Map 6 below.

The total length of the road project is three kilometres two of which have been completed. The road covers Kalika and Mulpani VDCs. This is the first section of a larger Baglung - Galkot - Hatiya rural motorable road project, connecting Baglung Bazaar with the western part of the district. The Asian Development Bank (ADB) has selected the larger portion of the project for construction. It was learned that ADB had made two alternative alignments: one from the top of Baglung Bazaar and the other along the bank of the Kathe Khola, near the Kali Gandaki Bridge on the Pokhara - Baglung Highway. The local leadership felt that both



alignments would bypass the Baglung Bazaar and affect its future growth. Therefore the DDC decided to construct the initial section of three kilometres from its own resources. The DDC alignment starts from the middle of Baglung Bazaar at a place called Deurali Chowk and ends at Bayanabbe Danda where both the alternative alignments of the ADB road meet. The cost estimate and expenditure for the DDC alignment for the three kilometres section are presented in Table 4.1 below.

Table 4.1: Cost Estimate and Expenditure of Deurali Chowk - Bayanabbe Danda Road Project

Project length	Total	3 km
	Completed	2 km
Fund Allocation	DDC Contribution	Rs 651,916
	People's Participation	Rs 1,688,776
	Total Cost	Rs 2,340,692
Expenditure	Expenditure	Rs 400,957
	Advance	Rs 150,000
	Total	Rs 550,957

Source: DDC, Baglung

It should be noted that, of the total estimated cost of Rs 2,340,692, the DDC provided 28 per cent and the rest was to be borne by the local community through contributions.

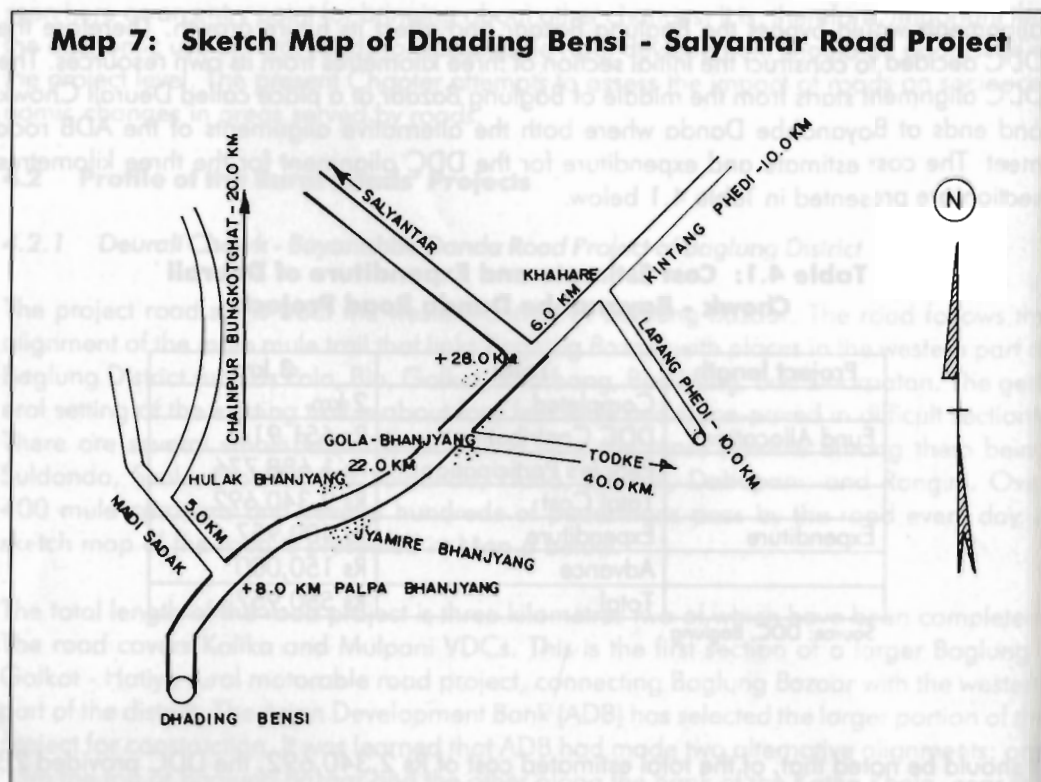
4.2.2 Dhading Bensi - Salyantar Road Project of Dhading District

The Dhading Bensi - Salyantar Road Project was started in 1988 by the Dhading Development Project (DDP) supported by the GTZ. The road links Dhading Bensi with the northern remote areas of Dhading and Gorkha Districts. It starts from Dhading Bensi in Nilkhantha Village Development Committee (VDC), the Dhading District Headquarters, and passes through Murali Bhanjyang, Jyamrung, and Tripureshwar VDCs to reach to Salyantar. The total length of the road up to Salyantar is 42km, of which most sections have been completed. The remaining sections are under construction. Map 7 gives a sketch of the road project area.

The alignment of the road was made around existing trails. So it connects a number of existing market centres such as Murali Bhanjyang, Palpa Bhanjyang, Jyamire Bhanjyang, Nigalpani, Gola Bhanjyang, and Arughat. After the road project, some of them, notably Jyamire Bhanjyang, Gola Bhanjyang, and Arughat have become large market centres for the northern region. It was reported that over 10 mini-truck loads of goods are transported from Dhading Bensi to Gola Bhanjyang and Arughat daily. These growing market centres have reduced the dependency of the upper region of Dhading and Gorkha districts on Dhading Bensi for their market needs.

The Dhading Development Project (DDP) required that the road project be technically sound, environmentally stable, and constructed by the people themselves with help from their local

Map 7: Sketch Map of Dhading Bensi - Salyantar Road Project



organizations. It also stipulated that local people should be responsible for future maintenance of the road. Accordingly, the basic model of the Local Road Improvement Programme (LRIP) of Palpa District was used. The model was based on a series of principles to address a broad range of technical, environmental, and socioeconomic issues. Some examples are:

- an approach phased construction using to allow for natural settlement and stabilisation,
- balanced cut and fill in order to make the road merge into the landscape,
- bio-engineering for slope protection,
- labour-intensive construction methods in order to use the underemployed, rural labour force, and
- use of indigenous skills, materials, and tools and a participatory approach to road construction and maintenance.

Table 4.2 shows that the construction cost of the road project was about one million rupees per kilometre, excluding the cost of supervision which was done by a private consulting firm based in Kathmandu.

4.2.3 Project-level Case Study: Nepalatar - Mangalbare Road, Ilam District

The Mechi Highway opened up a number of link roads, of which Nepalatar - Mangalbare Road is one. The road is 12.5km long and connects Nepalatar, the road-head of the Mechi Highway, with Mangalbare Bazaar, the main market centre in the western part of Ilam District.

Table 4.2: Expenditure per km of the Dhading Bensi Salyantar Road

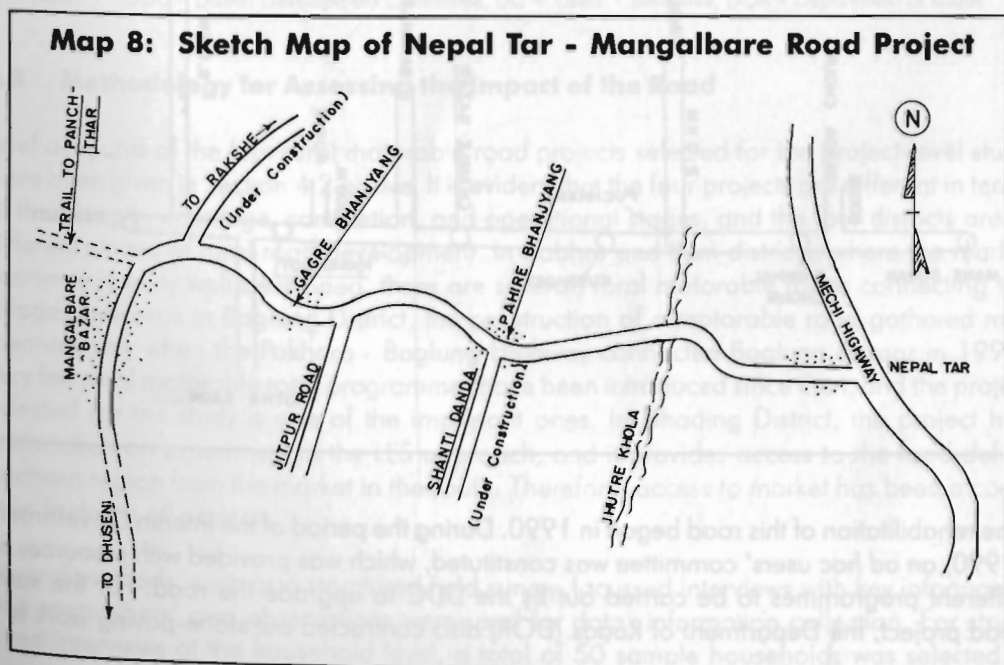
Total length of the project	42km
Cost per km (supervision cost not included)	Rs 1,007,000

Source: RIDP Final Report, ARD 1994.

tract. Mangalbare Bazaar has around 80 houses, among which are hotels/restaurants, wholesale/retail shops, tailoring shops, and public institutions and offices such as two high schools, two banks, agriculture/livestock service centres, two cooperative societies, two health posts, a post office, a police post, and a VDC office.

Road access to Mangalbare Bazaar was always given high priority. In 1959, the then Badahakim, Mr. Santa Bir Lama inaugurated the Ilam - Phutuk - Mangalbare Road, but due to lack of proper maintenance, the road remained non-functional and later disappeared. When the Ilam - Phidim portion of the Mechi Highway was under construction in the 1980s, the construction of an access road to Mangalbare from Nepal tar began. All the VDCs benefitting from the road constructed a section of the road with voluntary labour. A track road was completed, though it remained non-functional until it was taken over by the Department of Roads (DOR) in 1990. The road has been functional since 1992, and it has been continuously upgraded by the Rural Road Programme through the users' committee since 1993. Map 8 gives a sketch of the Nepal tar - Mangalbare Road.

The budget and expenditure for the Nepal tar - Mangalbare Road project is given in Table 4.3.



Thus, each year there is a separate budget allocation for the project. The DDC regards each allocation as a separate project, not the continuation of the same project. Therefore, the unspent balance from the previous year is not accumulated and a new users' committee is formed, although the same persons might be included in the new committee.

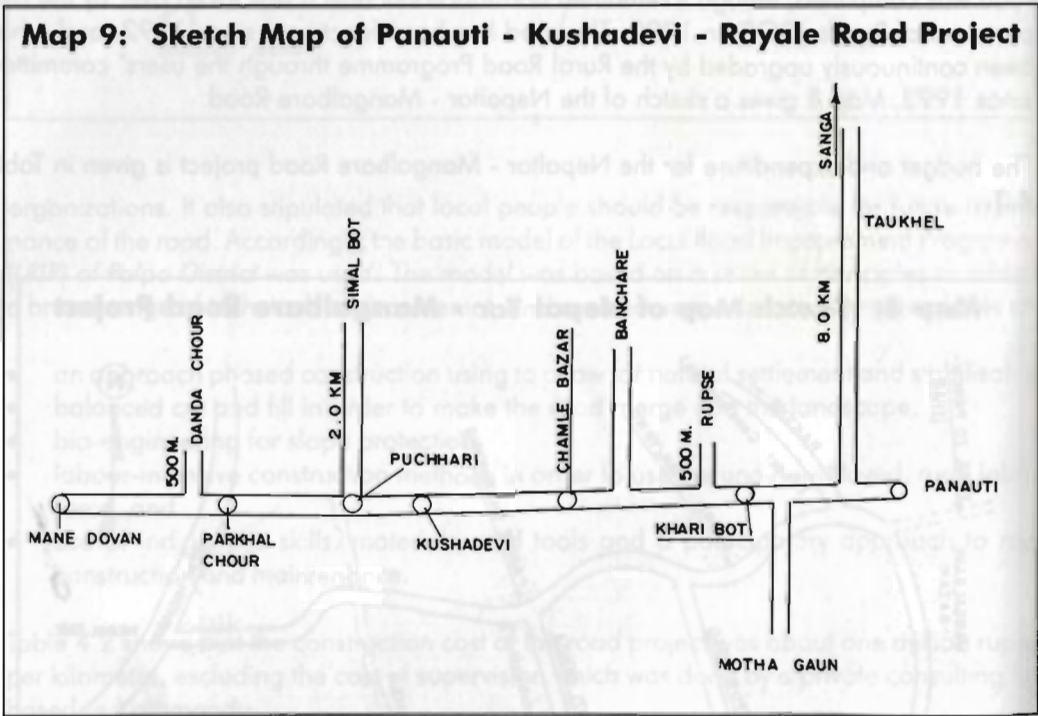
Table 4.3: The Budget and Expenditure for the Nepaltar-Mangalbare Road Project

Year	Budget	Expenditure
1993	400,000	394,016
1994	400,000	342,395
1995	400,000	319,884
1996	700,000	126,900 (running)
Total	1,900,000	1,183,195

Source: Mangalbare VDC

4.2.4 Panauti - Kusadevi - Rayale Road Project of Kabhre District

The Panauti - Kusadevi - Rayale road is 11 kilometres long. It was first constructed in 1955 but, due to the lack of regular maintenance, it remained closed until 1990. The road was used as the trail to link Panauti with Lalitpur. A sketch map of the road project is shown in Map 9 below.



The rehabilitation of this road began in 1990. During the period of the Interim Government, (1990) an *ad hoc* users' committee was constituted, which was provided with resources for different programmes to be carried out by the DDC to upgrade the road. For the same road project, the Department of Roads (DOR) also contracted out stone-paving work to a

private contractor. The users' committee (UC) and the VDCs along the road complained to the DDC that the DOR should have given the work to the UC. The UC argued that had the project been implemented through the UC, there would have been twice as much progress. In 1995 the DOR provided Rs 12,00,000 to upgrade the road project. A new users' committee was constituted under the chairmanship of the *Ilaka* Member of the DDC. The progress is given in Table 4.4.

Table 4.4: Work Progress of Panauti - Kusadevi - Rayale Road Project

Year	Available Resources	Work Progress
1990	The DDC provided Rs 25,000. People contributed Rs 30,000	The UC hired a bulldozer to widen the road from Panauti to Kusadevi
1990	The DOR contracted out stone-paving work in Rs 440,000	Stone-paving work on 600m from Panauti to Kalimati was completed
1992	The DDC provided 25 bags of rice through the 'Food for Work' programme.	Constructed a culvert in Bokse Dhara
1993	The DDC provided Rs 300,000 through the Rural Road Programme.	Stone-paved 1.5 km of the road
1993	The DDC provided 45 bags of rice through the 'Food for Work' programme	Drainage system cleaned, upgraded and stone paving extended
1994	The DDC provided Rs 200,000 through Rural Road Programme	Bulldozer hired to extend the road from Kusadevi to Rayale (3 km)--stone paving extended further
1995	The DOR provided Rs 1,200,000 to upgrade the road.	A new UC formed--stone paving completed up to Kusadevi Bazaar--three culverts completed

Note: DDC= District Development Committee, UC = Users' Committee, DOR= Department of Roads

4.3 Methodology for Assessing the Impact of the Road

Brief accounts of the four rural motorable road projects selected for the project-level study have been given in Section 4.2 above. It is evident that the four projects are different in terms of their length, coverage, completion, and operational stages, and the four districts are at different stages of rural road development. In Kabhre and Ilam districts, where the market economy is fairly well developed, there are several, rural motorable roads connecting the villages, whereas in Baglung District, the construction of a motorable road gathered momentum only when the Pokhara - Baglung Highway connected Baglung Bazaar in 1994. Very few rural motorable road programmes have been introduced since then, and the project selected for the study is one of the important ones. In Dhading District, the project has undertaken an experiment in the LES approach, and it provides access to the food-deficit northern region from the market in the south. Therefore, access to market has been a common factor in all projects.

Several methods, such as a structured field survey, focussed interviews with key informants, and researchers' own observations were used for data\ information collection. For structured interviews at the household level, a total of 50 sample households was selected in

each project area, of which 25 were selected from along the road, while 25 were selected from locations that were off the road but dependent on it for market access. While selecting respondents along the road all the households were counted on each side of the road and every fifth household from each side was selected for interview. For off the road locations, local teachers and VDC officials were consulted about areas half an hour to one hour's walking distance from the road alignment but dependent on the road for access to the market. After identifying such a location, the village setting was mapped on paper with the help of local teachers and residents. After mapping the study area, every fifth house was selected for interview. The rural roads' projects selected for project level study and the field survey locations are shown in Table 4.5 below.

Table 4.5: Field Survey Location

District	Name of the road project	VDCs covered by the road project	Field survey location	
			On the road	Off the road
Baglung	Deurali Chowk-Bayanabbe Danda	Kalika, Mulpani	Suldanda - Bayanabbe Danda	Piplebans, Thapathar hamlets in Singana VDC
Dhading	Dhading Bensi-Salyantar	Nilkantha, Murali Bhanjyang, Jyamrung, Tripureshwar, Salyantar	Murali Bhanjyang - Jyamrung	Sunkhani hamlet in Chainpur VDC
Ilam	Nepaltar - Mangalbare	Sankhejung, Shanti Danda, Mangalbare	Shanti Danda - Mangalbare	Pungfung hamlet in Mangalbare VDC
Kavre	Panauti - Kushadevi - Rayale	Panauti, Taukhal, Kushadevi, Malpi, Rayale.	Thapagoun - Parkhal Chaur	Simal Chaur hamlet in Kushadevi and Rayale VDCs.

Source: Field note

The main characteristics of the respondents are shown in Table 4.6. Most of the respondents were small farmers. In terms of land holdings, there were more small holders in Baglung and Kabhre districts than in Ilam and Dhading districts. The educational status was higher in Kabhre and Ilam districts than in Baglung and Dhading districts.

Questions asked in the structured survey covered economic aspects such as time and cost saving, production and marketing pattern, price changes, and so on; social aspects such as the impacts on education, health, and social awareness; institutional aspects such as access to extension services, participation, local institutions, and so on; and environmental aspects such as landslide, pollution, and so on. The main findings of the survey are presented in this Chapter.

Table 4.6: Characteristics of the Respondents

District	Along the Road						Off the Road					
	Land holding		Gender		Education		Land holding		Gender		Education	
	<2 0	>2 0	M	F	Il	L	<2 0	>2 0	M	F	Il	L
Baglung	22	3	15	10	10	15	23	2	20	5	6	19
Dhading	15	10	19	6	13	12	17	8	17	8	13	12
Ilam	13	12	19	6	5	20	11	14	21	4	7	18
Kavre	22	3	20	5	4	21	22	3	19	6	7	18

Source: Field survey

Note: 1. Landholding expressed in *Ropani* (one ropani = 508.5 sq.m)

2. M = Male, F = Female, Il = Illiterate, L = Literate

For focussed interviews with key informants, such as local teachers, VDC Chairpersons' members and respondents from the road users' committee and officials working in different offices, a checklist was prepared and used as a reference point for discussion. Researchers' own observations on, among others, road conditions, environmental damage, and market- ing structure have also been used to supplement the findings.

One of the fundamental limitations in examining the impact of rural roads was the problem of accounting for the benefits of a particular road in isolation. Because, in the road network, several roads are interconnected and interdependent, the impact of a road makes sense only when the benefits are also seen from a total perspective. For example, access to a better hospital for patients from Mangalbare Bazaar in Ilam District makes sense only when the Mangalbare - Nepaltar Road is connected with the the Mechi Highway and, in turn, with the Mahendra Highway in Jhapa District in order to reach better health facilities. Similarly, market access for milk from Kushadevi VDC in Kabhre District can be possible if the Panauti - Banepa road is connected to the Arniko Highway. This is true also the case of Mulpani and Singana VDCs in Baglung District, where the combined benefits are more attributable to the Pokhara - Baglung Highway, as the Deurali Chowk - Bayanabbe Danda Road, during the present study, was closed due to severe damage to the road by landslides. This limitation has been kept in mind while analysing the impact of rural motorable roads.

4.4 Economic Impact

4.4.1 Reduction of Travel Time and Cost

The case of Baglung District is unique in the context of reduction in travel time and costs, as the study area is just an hour's walk from Baglung Bazaar. Even when the road was operational (it was closed due to a number of landslides along the road at the time of our study), the mode of transport for household goods, such as rice, salt, kerosene, clothes, and others, from Baglung Bazaar to the study area was the same. Of course, a number of shops has also opened along the road selling various household items; people also buy retail household items locally. For items that are not available locally, they just walk to the Bazaar and carry the goods back themselves. When the road was operational, vehicles transported construction materials and other goods in bulk for shopkeepers, mostly tractors. After the

temporary closure of the road, porters and mule caravans were carrying goods even in bulk. However, in spite of this scenario, there has been a dramatic reduction in travel time and cost due to the presence of the Pokhara - Baglung Highway that was built in 1994. Before the Highway, most of the people in the households in the study area also walked to Pokhara or Naudanda to sell farm products such as ghee, fruit, honey, and handicrafts. They purchased household items such as salt, kerosene, clothes, and rice, and they were carried back by mule caravans, porters, or by themselves. The average time taken was three days and the cost was enormous.

After the opening of the Pokhara - Baglung Highway, almost every commodity became available in Baglung Bazaar. People can sell their products in Baglung Bazaar also. The price differential between Baglung and Pokhara for purchasing and selling items is less than before. Therefore, if the impact of the Pokhara - Baglung Highway is also combined, as the people from the study area also used walk to Pokhara or Naudanda before the highway was built, the travel time decreased from three days to three hours on an average. Moreover, the mule caravans, which used to ply the Pokhara\Seti Dovan - Baglung trail, have shifted to interior regions such as the Baglung - Galkot - Dhorpatan Trail and the Baglung - Myagdi Trail (Box 5). As a result, the transportation time and cost have decreased to some extent in the interior region as well. Furthermore, as more goods are available in Baglung Bazaar, more roadside retail shops have opened, therefore many goods are now available even at the retail shops on mule trails.

Before the construction of the Dhading Bensi - Salyantar road, people from the northern region of Dhading and Gorkha Districts, which is characterised by difficult mountain terrain, harsh climatic conditions, low fertility of land, and, therefore, a net food importer, were dependent on Dhading Bensi and Malekhu Bazaar for purchasing household commodities such as salt, kerosene, medicine, rice, clothes, and fertilizer. A journey of several days to Dhading Bensi\Malekhu Bazaar was required to purchase these items. Many of them carried these commodities by themselves, while others hired porters. With the opening of the road, people from the northern region have quick and easy access to market centres.

Now, except for three months during the monsoon period, there are regular mini-bus and mini-truck services from Dhading Bensi to Salyantar. So one can reach Dhading Bensi within a few hours. Second, with the opening of the road, almost all household commodities are available in local markets such as Arughat, Salyantar, and Gola Bhanjyang, with minimum price differences from prices in Dhading Bensi. Moreover, several local market centres such as Palpa Bhanjyang and Jyamire Bhanjyang, are developing along the road and many household goods are available. Therefore, people go to Dhading Bensi only if the item required is not available in the local market. Third, after the opening of the road some items are being produced locally. Chickens and eggs are good examples. There are 12 poultry farms in Murali Bhanjyang VDC, and these were established after the opening of the road. Interestingly, instead of supplying their products to the southern areas, e.g., Dhading Bensi and Malekhu, they supply to the northern remote areas, which is said to be more profitable. On the other hand, the southern part of Dhading district, which has fertile low land and warm climatic conditions and therefore a potential for cash crop production, has increased market access as a result of rural roads (DDC 1994).

Box 4: Story of a Mule Caravan Owner



Mr. Karna Bahadur Roka of Argal VDC, Baglung District, dropped out of school in Class 8 because his family could not afford the school expenses. His brothers and sisters are still attending school. Rather, his father withdrew Rs 140,000 from his *Dhukuti*, a traditional joint saving scheme based on mutual trust, and bought nine mules for him. Each mule can carry a load of 60 to 80kg. He runs his mule caravan on the main trail as well as in the interior region of Baglung District. The charges for each destination are shown below.

From	To	Rate per kg
Baglung	Muskat	Rs 3
Baglung	Tara	Rs 4.50
Baglung	Hile	Rs 4
Baglung	Argal	Rs 3.50
Baglung	Hatiya	Rs 3.25

Apart from his labour, the operating costs are as follow. Feed for the mules: one *Pathi* (5.3kg) of maize at the rate of Rs 35 per mule per day and some grass, say Rs 50, all told per day. If he is in Baglung Bazar, Rs 10 is charged per day for the mule stand, but en route if he purchases maize in the same shop, the stand is free. There is also a road tax of Rs 5 per mule in Khahare.

His net earnings are Rs 1,000 to 1,500 per week, which is not sufficient to pay back the *Dhukuti* into which his father has to deposit Rs 6,000 per month for 35 months. In 35 months many of the mules might die. Therefore this is not a profitable business, compared to the risk and labours involved. It is only a method of employment.

There are about 400 to 500 mules working in the interior region of Baglung District. There is too much competition. One has to be good and reliable for merchants to hire one's animals. The merchant usually makes an annual contract. Transportation during rainy season is difficult.

Karna Roka does not think that the construction of a road from Baglung to Dhorpatan will have an adverse effect on his business. According to him, having a road would increase the production and they would have more cargo to/from the road head and to/from the interior villages. The main problems for mule caravan owners are as follow. First, there is no local breed of mules. All are imported from India via Nepalganj. It takes time for these animals to adjust to the local climate. Some of them die. Since there is no risk-sharing mechanism, such as an insurance policy, investment in this business is very risky. Second, the mule caravan owners have no bargaining power with the merchants who always have the upper hand. The merchant always picks out one unfortunate episode to judge the performance of a whole year.

During the field survey, however, all respondents in Dhading District said that the road had not saved transportation costs. For example, the bus fare for one person and truck freight for 40kg from Dhading Bensi to Jyamire (13km), which is a two-hour walk, is Rs 35. Therefore, those without luggage prefer to walk. There is also an administrative problem in (Section 3.3.6) that the road has not yet been cleared by the Department of Transport Management, therefore the district authority cannot regulate the bus\truck fare.

In the case of Ilam District, before the opening of the Nepaltar -Mangalbare road, goods were purchased\sold either in Ilam Bazaar or in Sanischare Bazaar in Jhapa District. The average time taken to Ilam Bazaar was between six to 10 hours. In the case of Sanischare Bazaar, villagers from the same hamlet used to group together after the winter harvest, when the rivers had dried and short trek routes were opened, and carried their stocks of chickens, piglets, honey, ghee, oranges, and bamboo mats to sell in the market. In return they would purchase salt, kerosene, and clothes with the cash. The journey used to be of from five to seven days. With the opening of the road, people sell their produce either to middlemen at home or to wholesalers in Mangalbare Bazaar. All items for sale, such as fertilizers, rice, salt, kerosene, and so on, are bought at retail prices from Mangalbare Bazaar. The time taken to travel to the market is approximately one to two hours, depending on the respondent's village. Therefore, the transportation time and costs have been reduced substantially.

For the shopkeepers of Mangalbare Bazaar, the road has reduced time and cost in three ways. Firstly, before the road, goods were purchased in Birtamod, transported to Ilam Bazaar by truck, unloaded and stored in Ilam Bazaar, and then porters carried them from Ilam Bazaar to Mangalbare Bazaar. The whole operation used to take almost a week and the damage to goods in transit was considerable. Now, goods are purchased in Birtamod and transported to Mangalbare Bazaar by truck on the same day. The reductions in transportation time and cost have been dramatic. The transportation time for one truck load of goods has been reduced from one week to one day and the cost from almost three rupees per kg before the road to one rupee per kg after the road, from Birtamod to Mangalbare. Secondly, the whole operation has been very convenient and the loss of and damage to goods on the way have been reduced to the minimum. Thirdly, the scale of business in Mangalbare Bazaar has increased as a result of the road. Now there are about 12 wholesalers in Mangalbare Bazaar who buy cash crops such as ginger, potatoes, cardamom, broom flower, ghee, and so on and export to bigger markets.

In Kabhre District there is no regular bus service on the Panauti - Kusadevi - Rayale road. People still prefer to walk, as usual, which takes one to one-and-a-half hour's time from Panauti to Kusadevi or Rayale. If people have loads, they travel by truck, and this is not comfortable due to the quality of the road. Therefore, the road has not really reduced travel time. But there has been a considerable reduction in the transportation time and cost of several imported and exported items as described below.

Firstly, the scale of hay imports from Bhaktapur has increased several fold, because it has become convenient and cheap to carry a truckload. Previously, one labourer carried a load of hay in six to eight hours' time at a cost of Rs 50. Now, a mini-truck can carry 60-70 loads of hay at a cost of Rs 20 per load. Generally, one buffalo need 30-40 loads of hay per year, which is supplemented with feed and grasses. It was estimated that about 500 mini

truckloads of hay were imported to the Kusadevi - Rayale area during 1995. The sharp rise in the scale of hay imports is correlated to a rise in the scale of milk production.

Secondly, the purchase of household goods, livestock feed, and fertilizers has become very convenient, quick than before, and less costly. Before the road, was built these items were purchased in Banepa or Panauti and transported by porters. It took almost three to four hours and cost about one rupee per kg. After the road, a number of retail shops and dealers has opened near milk collection centres in Parkhalchaur, Kushadevi, and Thapagaun. They provide all household goods, e.g., soap, sugar, salt, and tea, as well as animal feed and fertilizers, on credit. On the 15th day, the credit is cleared when money is received from the milk collection centre. Thirdly, after the road, there has been a considerable increase in the use of imported construction materials to build houses along the road. The new houses are built in urban style. Now Kushadevi is almost like a *bazaar* area, having houses on both sides of the road. Finally, there has been a sharp rise in the scale of exports such as milk, *lapsi* (*Choerospondia axillaris*), and timber from that area.

However, some respondents, from Mangalbare Bazaar in Ilam District, also argued that the road had spoiled the walking habits of poor people. For example, the walking time from Mangalbare to Ilam Bazaar from the old trail and the bus time on the new motorable road are almost the same. But, even a poor person, not in hurry, now tends to wait for a bus rather than walk and save money.

4.4.2 Change in Production and Marketing Patterns

All four districts under study, particularly Baglung and Dhading, are characterised by a large food deficit. On non-irrigated *bari** that form a large part of the arable land, the main items of production are subsistence food crops such as maize, millet, and pulses, and, on the irrigated *khet*, there are paddy, wheat, and maize. Vegetables and fruits are also produced for home consumption. Almost all households have a small stock of animals such as cattle, buffalo, pigs, and poultry. Cropping intensity is high on *Khet*** in the lower region where irrigation facilities are available and the climate is warm. In the upper region, where non-irrigated *bari* predominate and the winter is severe, the cropping intensity is low.

In the study location of Baglung District, agricultural production has undergone a considerable change during the last few years. First, after the establishment of the Out Station Research Station (OSRS) of Lumle Agricultural Farm in Singana VDC in 1991, new varieties of seeds have been introduced for subsistence food crop production, and these have increased the yield and the total production. Secondly, production of fresh vegetables, off-season vegetables, plantation of fruit bearing and fodder trees, and breeding of improved varieties of livestock animals have gone up in Singana area, in which the OSRS has the main role. Thirdly, with technical support and market assurance from the KOSHIVEG, a vegetable seed production programme of Koshi Hill Area, the vegetable seeds' production has gone up considerably. For example, a single vegetable seed grower from Singana VDC sold about Rs 100,000 worth of vegetable seeds last year.

* *Bari* refers to rainfed cultivated land

** *Khet* refers to irrigated rice land

While the production of these items has increased and has the potential to increase further, the local market is not prepared to respond because most agricultural products are perishable in nature. For many items, such as vegetables and fruits, their freshness adds value in the market. Therefore, before increasing production, an efficient and direct linkage has to be established between the production area and the market point. Unless organized support is provided by the government and NGOs, especially in the areas of infrastructural development, market research, and the development of marketing channels, increasing production of perishable high-value crops is not feasible.

In Dhading District no substantial production of marketable agricultural cash crops is reported along the Dhading Bensi - Salyantar road, except for small quantities of vegetables, fruit and milk products in a number of nearby market centres that have appeared along the road side. The export quantity of local products is low. A Traffic Survey by the DSR calculated 2,383 tons of imports and 262 tons of exports through the road during 1994 (DDC1994). A local teacher commented that a truck goes to Salyantar with a full load, but returns with empty bottles of beer and jute sacks.

In Ilam District, the production pattern has been undergoing considerable changes over the years from subsistence food crops to marketable cash crops. The main changes are as follows. Firstly, the marginal steep wet lands on the banks of local streams are covered with cardamom and tree plantations, as both have high commercial value. Secondly, the tops of hills, which were used for grazing animals, are covered with tea plantations. In about 153 hectares of land, tea has been planted in the surrounding VDCs of Mangalbare Bazaar, and 510 small tea growers from the private sector are involved. Thirdly, steep marginal dry lands and the edges of terraces are covered with broom grasses, the flowers of which are sold, the grass is used for animal feed and the stems are used as fuel. Fourth, livestock products, such as milk, ghee, goats, pigs, chickens, fish, and honey, and cash crops, such as ginger, potatoes, garlic, and oranges, are important sources of income in almost all households. In the field survey, all respondents (except one in 50 households) had income from at least one source mentioned above. There are many farmers (Box 6), who have made intensive use of their limited land for multiple crop production.

The scale of production of the above-mentioned items has gone up considerably with the opening of the road, as these can now be marketed locally. The scale of production of some of the cash crops in the surrounding VDCs of Mangalbare Bazaar, which uses the Nepalgarh - Mangalbare road for export, is estimated in Table 4.7. This estimate was made by Mangalbare VDC, based on the experience of the previous year's sales and, in the case of potatoes and ginger, the sale of seeds in the local market.

The Kabhre District has access to markets, particularly to the Kathmandu Valley, on one side and Khasa, Tibet, on the other through the Kodari Highway for its horticultural and livestock products (Box 7). The Panauti - Kushadevi - Rayale rural road has extended the market-led agricultural production system to the interior region. In the study location, although most parts of the irrigated lowland have been used for subsistence crops such as rice, maize, and wheat, along with potatoes and some other vegetables, there has been a big change in the livestock subsector, especially in milk production, after the opening of the road. In all farm families, livestock are among the main components. The road has contributed to the in-

Table 4.7: Estimated Production of Cash Crops in the Hinterlands of the Nepaltar - Mangalbare Road in 1996 (in quintals)

Items	Estimated marketable production
Ginger	10,000*
Cardamom	1,200
Broom flowers	3,400
Tea	230
Potatoes	2,000
Beans	30
Goat	80,000\number\year

Source: VDC, Mangalbare.

Note: * After germination, the ginger seeds can be harvested, they are called *Budi* or *Mau*. The average production of ginger is about five times the amount of seed harvested. The estimate is based on the sale of *Budi* in Mangalbare Bazaar.

crease in milk production. Before the road, few porters carried milk from this area to the chilling centre in Panauti, and it now exports over 13,000 litres per day.

The marketing network for milk is well developed in Kabhre District. There are a number of Milk Producers' Cooperatives that have 22 milk collecting centres in Kushadevi and Rayale area providing a convenient and assured marketing point for milk producers. There is a that use a simple technical procedure for measuring the fat content in milk. The price of milk is fixed on the basis of fat content. Each milk producer has a passbook in which the quantity of milk along with the fat contents are entered every day.

The milk is then collected in a big jar which is carried to the Panauti Chilling Centre by private mini-trucks. The milk has to be chilled before noon to avoid curdling. So far, the biggest and most convenient buyer of milk from the Kushadevi - Rayale area is the Nepal Dairy Development Corporation (NDDC), although a number of private companies have been opened. The NDDC pays every 15 days. On that day farmers go to the milk collection centre with their passbooks and collect their dues according to the quantity and the fat content mentioned in the passbook. Farmers are very clear about the whole procedure.

The vulnerability of the milk production sector was vivid during the field study, when the anti-Mahakali Treaty activists suddenly blocked the road from Banepa to Kathmandu in Bhaktapur town. The chilling centre in Panauti was already full and refused to collect more milk from the Milk Cooperatives. As a result, 1,060 litres of milk were thrown into the river. It was interesting to note that even the farmers did not have larger containers to keep or process additional milk, so they fed it back to their buffaloes.

People in this area prefer the high-breed variety of buffaloes rather than cows because milk is measured on the basis of fat content and buffalo milk contains high levels of fat. Buffaloes are also easy to dispose off after the productive age because they can be slaughtered for meat consumption. Respondents, however, complained that private traders import the high-breed varieties of buffaloes from the Terai and it takes time for the animals to adapt to the

Box 5: Integrated Farming: A Success Story



Five cash crops that start from the Nepali alphabet "A" such as Aolan (Milk), Amrisho (Broom), Aduwa (Ginger), Aalu (Potato), and Alaichi (Cardamom) are said to be the main instruments that changed the income levels of many of the farmers in Ilam District. Mr. Sunil Shrestha, a local school teacher from Mangalbare High School, is one of such farmer who has increased his income mainly through the production of these five cash crops. Mr. Shrestha, aged 30 and educated up to S.L.C. level, is a resident of Chitre hamlet in Mangalbare VDC, about 30 minutes walking distance from the motorable road.

He owns 20 ropanies (one hectare) of land, of which about 10 ropani are Khet (low irrigated rice land) and 10 ropani is Bari (up land). He has also rented in about the same amount of land on crop-sharing basis. The main cereal crops for subsistence are rice and wheat on Khet and maize and millet on Bari. In addition, he produces a number of cash crops. He also owns a number of livestock animals. One cow, one buffalo, 12 goats, two rabbits, and 25 chickens. The production and sale of main cash crops during 1995 are shown in the following table.

Items	Area	Production	Quantity sold
Ginger	2 Ropani	400kg	400kg
Cardamom	8 Ropani	80kg	80kg
Garlic	1 Ropani	80kg	80kg
Broom Flowers	6 Ropani	400kg	400kg
Potatoes	2 Ropani	2800kg	1600kg
Milk		14 litres/day	10 litres/day

He has a family of six which includes his parents, wife, and two children. The daily working routine of his family is as follows. He gets up at 5 o'clock in the morning, cleans the cattle shed, collects grasses and fodders, and takes his morning meal before going to school, a 30-minute hike up the hill. His wife equally shares in the task of cleaning the cattle shed and collecting grass and fodder in the morning. His father delivers milk to Mangalbare Bazaar and sells to individual houses and teashops, since there is no milk collection centre. His mother prepares the morning meal for the family. During the day, his family members, except himself during school days, work in the fields. On Wednesday, which is the market day for Mangalbare Bazaar, his family carries household products to the Bazaar for sale.

local climate. Many of them do not give milk to their full capacity for certain lactation cycles. The intensive care needed was visible in almost all households where buffalo sheds were

Box 6: (a) Chillies from Kabhre Attracting Money from Khasa



Kabhre, Kuntadevi (July 16, 1996). Mandan, Mahadev Sthan, Jyamdi Jaisithok, Deupur, and Naya Gaun in this district are the main horticultural production areas. Horticulture was first extended to these areas from Panchkhal and has now surpassed Panchkhal, especially in tomato and potato production. Mr. Keshav Koirala of Mandan Ranitar says that about 85,000 bags of potatoes (80 kg/bag) and about the same quantity of

tomatoes is annually exported to Kathmandu from Chakhola Phedi Bazaar alone. He recalls that they had collected Rs 75,000 a few years ago, when they levied one rupee per bag for the construction of Panchkhal Campus.

During the early 1980s, sugarcane was the main cash crop in Mandan. But, as the sugarcane required a lot of labour and fuel for processing, farmers preferred potato cultivation. Tomato production on a commercial scale first began in Jaisithok around 2040 B.S., and this was later extended to Mahadev Sthan. But the production was crippled due to the lack of a wholesale market in Kathmandu. The farmer had to carry the produce to the Indrachowk and Vedashing areas for sale. With the opening of a wholesale vegetable market in Kalimati in Kathmandu, and also with the availability of a transport, packing trays, sprayers, and vegetable seeds through the assistance of JICA, farmers are now encouraged to go in for mass production. Mr. Keshav Koirala reported that he bought tomato seeds from Panchkhal in 2040 B.S. for the first time. Now tomatoes are produced on over 50% of his land. Tomatoes are mostly produced in rain-fed areas, whereas on irrigated lowland, staple crops followed by more valuable vegetables such as potatoes, garlic, and onion are preferred.

Over the past few years, chillies have been the most popular cash crop in the Mandan area. The current market price of chillies in Khasa (Tibet) is Rs* 1,160 per *dharni* (a little over two kg). Due to the road connection with Khasa from Dolalghat, farmers around that locality are said to be earning over one hundred thousand rupees per household from chillies alone. Mr. Ganesh Nepal, a schoolteacher from Mandan Kamidanda, said that his sister earned over Rs 45,000 from chillies during the last year from just one *ropani* of land.

News item in Kantipur, a Nepali National Daily, Saturday, 17 July 1996

* There are currently Rs 67.37 to a U.S. dollar.

(b) Kabhre Crossed Producing of Over 100,000 Litres of Milk Per Day

Banepa, Kabhre, 19 November 1996. In B.S. 2009 (1953), 500 litres of milk was brought to Kathmandu from Nala Tusal village of Kabhre District for pasteurisation, for the first time. Mr. Deepak Prasad Paudel, the Chairman of a Milk Producers Cooperative, said that after 44 years Kabhre District dairy cattle are producing over hundred thousand litres of milk per day. The production of milk has increased by 22% per annum. At present Nepal Dairy Development Corporation collects 50,000 litres of milk from Banepa, Panauti, Panchkhal, Sipaghat Chilling Centres and Nagarkot Cheese Factory. Other small and large private dairy and individual businessmen purchase over 20,000 litres of milk from different collection centres. The rest is sold and consumed locally.

After the establishment of Nepal Dairy Development Corporation, more farmers were encouraged to engage in dairy farming. In 2048 (1991), when the Cooperative Act was promulgated, Milk Producers' Cooperatives were organized to provide organized support for milk production. Now there are 148 Milk Producers' Cooperatives, through which training on cooperation, safe milk production methods, etc are provided to dairy farmers. The future plans of the Milk Producers' Cooperatives are the establishment of a milk processing factory, opening of technical training institute, development of other modes of transportation, such as ropeways or pipelines carry milk from the remote hill areas, and the establishment of additional chilling centres.

Several other agencies, such as the Agricultural Development Bank, District Livestock Office, and Nepal Dairy Development Corporation have provided enough support to the farmers. However, due to the lack of coordination among themselves, farmers are not receiving services in an integrated manner.

News item in Kantipur, a Nepali National Daily, 19 November 1996

made like houses to protect the animals from cold. In many houses, buffaloes are kept on the ground floor, and the family stays on the first floor. This system, though adopted by farm families, is unhygienic and can have far-reaching effects on human health.

The Panauti - Kushadevi - Rayale road has opened up markets for *Lapsi*, which was not considered a marketable product earlier. Before the road, it was collected and carried by porters to Panauti and sold at the price of Rs 25 per container (about 15-20kg). After the opening of the road, merchants themselves gathered the fruit and, paying Rs 132 per container. Now almost everyone has at least one *Lapsi* tree on his or her land. The *Lapsi* trees are planted on wastelands. A few processing plants, to make *Mada** from *Lapsi* have also been established. Apart from this, the production of oranges and the sale of timber from private forests have increased over the years. The export of some important items from the Kushadevi - Rayale area in 1995 was estimated to have been as follows.

Several problems related to increasing production of the above-mentioned items, reported during the field survey in all four districts, are summarised below. Firstly, in food deficit areas,

* The raw material for a popular sweetmeat called 'titanda'

Table 4.8: Estimated Quantities of Items Exported from the Study Area

Items	Quantity
Lapsi	100 mini truckloads\year
Milk	13,000 litres\day
Timber	500 truck loads\year
Oranges	100 mini truck loads\year

Source: Open discussion, Kushadevi

such as the northern regions of Baglung and Dhading districts, the first preference of farmers is to produce subsistence crops. To produce cash crops, sell in the market, and buy food items with the cash in return is a complex process, with which farmers are not accustomed, and needs reliability of input supplies, extension services, and markets. Moreover, small land holdings and the lack of irrigation facilities in most areas have limited the scope for winter crops.

Secondly, there is a lack of manpower, especially in Baglung and Dhading districts, in almost all farm families. Seasonal and long-term migration to cities, the *Terai*, and abroad for employment opportunities are common features of almost all farmhouses. In the study locations of both districts, in most households at least from one male member to a maximum of four members from one family have left for employment as labourers, watchmen, security guards, and to join the army in cities, the *Terai*, or abroad. They have left their wives at home with parents and children, so the women are busy looking after the old, sick, and the children of the family along with the farm. Therefore, they have no time and energy to increase production.

Thirdly, in order to start a market-oriented production culture, farmers need infrastructure and management support such as storage, transportation, and marketing, from government and public institutions. The few individual farmers who produce fresh vegetables and fruits on a marketable scale also have considerable difficulties in transporting to the *Bazaar*, storing perishable vegetables, and marketing to the middleman at fair prices. Therefore, the road is an essential but not a sufficient condition for socioeconomic transformation.

Fourthly, although the road has contributed to an increase in production in Ilam and Kabhre districts, a number of problems was reported concerning the sustainability of market-led agricultural development. One, the market mechanism for agricultural commodities is unreliable, particularly in the volatile market. For example, in Ilam District, despite new wholesale markets at the road head and weekly markets in many locations, there is a lack of knowledge about the projected size of markets for different commodities. Farmers need marketing knowledge for at least three to five years for short-term crops, and five to 10 years for long-term crops such as tea, cardamom, broom flowers, and so on. Without market knowledge, they face an unknown future. Some respondents recalled that about 10 years ago there was a bumper production of ginger. The wholesalers in Ilam *Bazaar* refused to buy even at two kg per rupee. A large quantity was thrown out as the price did not cover the cartage to Ilam *Bazaar*.

Two, considerable price fluctuations were experienced during the past few years. Nobody knows who controls the price and why it fluctuates. For example, one wholesaler in Mangalbare Bazaar in Ilam District commented that the price of agricultural commodities in Ilam Bazaar changes every day. As a result, the local wholesalers keep considerable margins to cover the risk of price fluctuations, and as a result farmers do not get a fair price. The price fluctuations of some of the cash crops in Ilam District are presented in Table 4.9, which shows that the prices of some commodities were reduced more than twice in one year.

Table 4.9: Price Fluctuations of Cash Crops in Mangalbare Bazaar

(Price per kilo)

Items	Maximum price in 1995	Price in 1996	Change in %
Cardamom	Rs 142.5	Rs 130	-9.6
Ginger	Rs 27.5	Rs 10	-175
Amrisho	Rs 32	Rs 10	-220

Source: Field survey

Finally, there is a social dimension to the production process. Not all communities have the same degree of industriousness for and interest in agricultural production, nor similar endowments of productive resources such as land and water. The *Limbu* community in Ilam District and the *Tamang* community in Kabhre District are examples of those who have lagged behind in the development process of the district. Earning from non-agricultural activities such as stone masonry work, joining the army, and so on has been common in these communities. In the study area, it is mainly these communities that have supplied the labour for the production process and transportation of products to the Bazaar or road head, but their involvement in terms of investment in and benefits from production as such have been minimal.

4.4.3 Change in Prices

The price indices for buying and selling items, as well as the land prices are shown in Table 4.10. The year 1991\92 in all four districts is regarded as a 'before the road' situation and taken as the base year.

The Table shows that in spite of the reduction in transportation time and cost and less damage to goods along the way, prices of all goods have gone up in all four districts. Reduction in prices was seen only in the case of salt and kerosene in Baglung District, because of the Pokhara - Baglung Highway. However, even in a situation in which prices have increased over a period, one could argue that the price would have increased further had there not been a road network. First, after the construction of the road, even when the road was not operational as in Baglung District, a number of retail shops opened along the road and more goods were available on the doorstep. The Table shows that the price of buying commodities rose more in off-the-road locations than in on-the-road locations, which sug-

Table 4.10: The Price Index for Buying and Selling Commodities in the Project Area

(Base year 1991 - 92 = 100)

Items	1995\96							
	Baglung		Dhading		Ilam		Kavre	
	On	Off	On	Off	On	Off	On	Off
Buying items								
Rice	148.7	167	181.9	190.5	156.4	148.7	174.8	218.7
Kerosene	80.9	83.3	173.8	163.7	146.3	165	146.6	162.9
Salt	94.5	100	172.4	218	182	213	171.4	200
Fertilizers	291.9	233.6	196.5	217.9	194.5	223	200	215.3
Construction materials	177	200	-	-	159	266	162.8	163.4
Selling items								
Cardamom	-	-	-	-	159.5	159.5	-	-
Broom flower	-	-	-	-	326.6	343.9	-	-
Ginger	-	-	-	-	250	250	-	-
Potatoes	-	-	-	-	-	-	277.5	283
Lapsi	-	-	-	-	-	-	288	222.7
Milk	200	-	-	-	172.7	266.6	167	177
Ghee	-	-	-	-	200	176.9	-	-
Land prices								
Homestead land near road	213.9	-	416	-	291	-	363.6	-
Khet	215.9	179.9	266.6	330	319.7	214.3	389.5	390
Bari	233	204.4	247.3	252	302.7	236	306.6	306.8

Source: Field survey

Note: On = On the road, Off = Off the road

gests that the presence of the road has made a difference in prices. In the case of fertilizers, the price increased as a result of government policy. But the price in off-the-road locations was generally higher because of the additional transportation costs.

Second, on items sold by farmers, although there is no definite trend in a number of items, the price of off-the-road locations is lower, as they need further transportation to reach the road head. However, a note a caution should be given in that, apart from the proximity from the road, there are other factors such as quality and quantity of goods and selling period that equally determine the price of items on sale. Finally, in all districts, it was reported that the price differential between goods at the market centre and the road head has decreased after the road. For example, the price differential between Dhading Bensi and the road heads of the Dhading Bensi - Salyantar Road such as Gola Bhanjyang, Salyantar, and Arughat have declined. During the three months' monsoon season, the price again rises because the road is closed to vehicles and porters transport goods at a high cost. In Ilam District, the price differential in trading between Mangalbare Bazaar with the larger market centres, e.g., Ilam Bazaar, Birtamod, and Sanischare, has declined, therefore people do not

spend an inordinate amount of time travelling to Ilam Bazaar or Sanischare Bazaar to sell their stocks and purchase household goods.

In the case of Kabhre District, the price differential in essential items such as cattle feed, fertilizers, construction materials, and so on used to be at least one to two rupees per kg between Panauti and the local road head market. This has decreased after the road. If goods are bought in bulk, such as chickens or cattle feed, the traders in Panauti, Banepa, or even from Bhaktapur City provide transport to the road head inclusive in the price. Similarly, while selling goods in bulk such as live chickens, potatoes, and *Lapsi*, whole-sellers pay the Panauti price at the road head. This suggests that the price discrepancies between the market centres and the motorable road heads in rural areas decreases when goods are transported in bulk by vehicles.

In order to compare the price rises in the project area with the general price index, the urban consumer price index in the hills in the corresponding period is presented in Table 4.11. Although there are no data available on all items covered by the study, one can see the general trend from the items given here.

Table 4.11: Urban Consumer Price Index: Hills (Base year 1991\92 = 100)

Year	Overall Index	Pulses	Food & beverages	Rice	Wheat & flour	Vegetables & fruits	Meat, fish, & eggs	Milk & milk products
1991\92	100	100	100	100	100	100	100	100
1992\93	107.3	97.67	105.9	105	107.8	102.7	112.7	104.2
1993\94	114.1	95.9	112.6	111.4	108.8	120.8	123.4	113.8
1994\95	123	131.1	122.6	122.3	117.9	131.5	131.3	117.2
1995\96	132.8	160.8	135	137.8	117	162.5	142	122.9

Source: Computed from the Economic Bulletin 1995\96, Nepal Rastra Bank, Kathmandu

Table 4.11 shows that although the general price index for urban hill areas has increased over the years due to inflation, the incremental rate has been much lower than in the project area. One of the reasons for the discrepancy with the price index of the Nepal Rastra Bank (NRB) could be the difference in sample locations; the sample location of this study being a rural area. Even then the discrepancy is quite substantial. The main reason, perhaps, could be that the saving in transport cost of the sellers was not passed on to the consumers but added to their own profits. Therefore, even when a substantial transport cost saving was made as a result of the road, the price level remained unchanged. The inflation could have added to the already high, base-level price.

Regarding land prices, Table 4.10 shows that the price has increased two to four times during the past five years in all districts. The main reason given for rises in land prices in all districts is an increasing demand for land as a result of population pressure. The homestead land along the road has been more expensive, and the road has a direct effect on it. One important factor for the rise in price of farmland in Ilam District is the prospect for higher economic returns from cash crop production. The sharp increase in the price of farmland

near the roadside in Ilam District could be due to the locational advantage of closeness to the Bazaar. Moreover, in Baglung District, some of the persons employed overseas bring a lot of money on their return or during home leave, and they tend to buy land at a high price. This has also caused the price of land to rise.

4.5 Social Impact

4.5.1 Impact on Education

The impact of roads on education should be seen along with the government policy on education, changes in the economic status of the people, local leadership, and social awareness through mass media and NGO activities. In this context, the road has also contributed, among others, to uplifting the standard of education in the following ways. First, in Ilam District, the road has changed the feeling of isolation and remoteness in the area, therefore more educational materials and text books are available and teachers are willing to stay longer in the area. In Kabhre District, as the area became accessible, good teachers from outside started to come to local schools, because easier became convenient for them to go to Kathmandu and also make occasional visits to their homes. As a result, the standard of general education in local schools has improved. Similarly, in Ilam and Kabhre districts, the road has also stimulated local school graduates to go for college education in town by reducing the travel time, on the one hand, and also reducing the cost of living in town by making it convenient to carry home-grown rice and vegetables in vehicles on the other. In Kabhre District, several college students also travel by bicycles.

Second, the road has made some contribution to girl's education. Although many of the respondents were of the opinion that their own experience coupled with mass media propaganda such as TV, radio and newspaper — involvement of NGOs, and gradual social awareness about girls' education are the main factors in the rise in the number of girls going to school. One women respondent from Ilam District said *"More than anything else, my own suffering led me to educate my daughters"*. Nevertheless, some of the respondents commented that the issue of a girl child's education has been reinforced by the increased social contact with educated women from outside. Girls' enrollment in high school in the study area of four districts, shown in Table 4.12, indicates that the percentage of enrollment of girl students in every class has increased during the past five years. Parents in the interior region were also encouraged to send their daughters to colleges when the travel time decreased and it became convenient.

Third, in Ilam and Kabhre districts private sector English Boarding Schools have opened along the road during the last five years. In Ilam District, almost all teachers and over 25 per cent of the students in three Boarding High Schools of Shantidanda and Mangalbare Bazaar are from outside the area. All three High Schools are reported to be running reasonably well. The road was one of the stimuli for these schools and also helped to bring in teachers and students from outside.

However, in Dhading District, although a number of schools is adjacent to the road, no qualitative change in education is reported as a result of the road. For example, availability of qualified and good teachers, vocational education, and good results in SLC have not

Table 4.12: Ratio of Girls' Enrollment of High Schools in the Study Area of Four Districts

Class	Baglung		Dhading		Ilam		Kavre	
	1992	1996	1992	1996	1992	1996	1992	1996
6	35	56	25	24	40	47	30	44
7	38	53	21	27	51	42	33	37
8	34	30	27	35	37	50	37	36
9	28	48	-	36	36	51	22	34
10	27	49	-	39	32	41	22	50
Total	32.4	47.2	24.3	32.2	39.2	46.2	28.8	40.2

Source: High School records

Note: High Schools covered were as follow: 1. Mulpani High School, Baglung; Chandeshwari High School, Dhading; Bhanubhakta High School, Ilam; and Kushadevi High School, Kavre

been observed in local schools after the road opened. The school dropout rate is high (21 boys and 11 girls in the 50 sample households). The main reasons reported in the field survey were poverty, household work, cattle rearing, and fodder and firewood collection. It seems to be the norm that, in most households, the male members are working outside, other family members, including children, have to share responsibilities for household work. The road also has not changed the mode of transport for students travelling to school. There is no preference or concessions for students in buses or trucks. It has become rather inconvenient for children to go to school because of the dust pollution on the road. No private boarding schools have opened in the area. At present, using the road to travel to institutions of higher education in Dhading Bensi is also not feasible, because of the unreliable transport system and expensive fare (Rs 35 x 2 = Rs 70 per day in the study location).

4.5.2 Impact on Health

In the study location of Baglung District, there is no health post. People have to go to Baglung Bazaar for all medical services. However, the impact of the road is also closely linked to the road networks. For example, in Baglung District the presence of the Pokhara - Baglung Highway has made a considerable difference in the availability of health services in Baglung Bazaar and in providing access to better services in areas where they are not available locally. For example, as the hospital in Baglung Bazaar is not well equipped with doctors, medicines, and equipment, the road has provided the alternative to go to other places such as Pokhara and Kathmandu for X-rays, surgery, and other services. Moreover, quite a number of patients, especially emergency delivery cases, still die on the way to health posts in the interior region. When the rural roads connect the interior region of Baglung District with the Highway, they make convenient for patients to come to the hospital in Baglung or beyond. In areas where motorable roads are not connected, it was suggested that the trek and mule trails, which link villages from the road head, should also be extended so that patients can be carried on stretchers.

In Dhading District there is a health post in Salbas in Chainpur VDC. This health post caters to the basic health and immunisation needs of the adjoining VDCs. After the road, two private medical halls opened up in Hulak Bhanjyang and Gola Bhanjyang and medicines and check-ups by a compounder are available. For hospital services people have to go to Dhading Bensi, the district headquarters. The road has made it easier for people to reach the hospital in Dhading Bensi in two ways. Initially, there was an ambulance service, though that has stopped because of an accident. Requests had to be made word of mouth, of course, in the absence of a communication network. Nevertheless, it was relatively easy and quick. In the sample survey of 50 respondents, none had ever used ambulance services though they cited examples of other users in the locality. Most respondents carried patients either by bus or the other transport services that are now available. The second advantage is that the road has made it easier to carrying a patient on a stretcher even at night.

In Ilam there has not been a visible change in the health services in Mangalbare Bazaar after the road. There were already two health posts: one allopathic and one Ayurvedic. The availability of health workers and medicines has not changed much after the road. But the road has effected the health sector in three ways. First, as the level of income has increased, the demand for better medical services has also increased. Apart from Ilam, people have also started to go to Biratnagar or Bhadrapur for medical check-ups, as the Mangalbare - Nepaltar rural motorable road is linked with the Mechi Highway. Second, although there is no ambulance service, patients have managed to travel by bus or truck. Previously, a contingent of porters was required to carry a patient on a *Doli* (like a stretcher) or in a *Doko* (bamboo basket). Such methods were time consuming and expensive. Third, rural roads have helped the immunisation programmes achieve greater impact. For example, one health worker commented "*In the last polio immunisation programme, the polio drops ran short in Jitpur camp. Had there not been a road the camp would have had to close. But the polio drops were made available within hours and the camp was continued.*"

In Kabhre District, there is a health post in Kushadevi Bazaar and a dispensary in Rayale Parkhal Chaur. There is also a private medical clinic in Kushadevi Bazaar. For primary health services, people in this locality go to these health posts and, for hospital services they go to Banepa Hospital. Respondents in Kushadevi/Rayale areas felt that the road had provided better and more reliable access to the hospital in Banepa. During the day, a patient can ride on the milk truck. In the case of an emergency at night, they can call an ambulance and reach hospital. Although none of the respondents have ever used the ambulance service, there is a feeling of confidence among the people that they can call an ambulance in the event of need. Second, transportation of hay by road has brought positive consequences to the health of women, because they no longer have to carry hay from Bhaktapur for seven to eight hours per day all through winter.

Regarding family planning, the road has contributed in three ways. First, in Ilam and Kabhre districts a pick-up and dropping service is provided as far as possible for patients having operation to reach them to the road head. This has encouraged the use of permanent family planning methods. Second, more village workers, from both GOs and NGOs, are now available for regular visits to the village. With the intensive visits to the villages, the general feeling that the vasectomy operation weakens the health of men has been reversed. Now male members are also accepting surgery. Moreover, there are more post-operative

follow-up visits for unsuccessful cases, and this has also helped to instill confidence. Third, with the opening of the road, more NGOs are visiting with demonstration materials on family planning, and this has encouraged more people to use family planning methods.

4.5.3 Social Awareness

In respect of social awareness, the indicators used are reading newspapers, political meetings, and use of the toilet. The findings are presented in Table 4.13 below.

Table 4.13: Impact of Road on Other Social Indicators
(Yes in %)

Area of impact		Baglung		Dhading		Ilam		Kabhre	
		On	Off	On	Off	On	Off	On	Off
Reading newspapers		36	48	36	16	52	48	52	44
Involvement in political rallies		20	16	28	16	20	16	76	84
Use of the toilet	Open	28	-	48	60	4	-	28	4
	Pit	44	88	52	32	52	96	4	80
	Water sealed	28	12	-	8	44	4	68	16

Source: Field Survey

Note: On = On the road, Off = Off the road

Generally, there is no regular supply of newspapers or newspaper stalls in the study locations in any of the four districts. Reading newspapers is only occasional when one goes to the district headquarters. Generally, there are more newspaper readers along the road, except in Baglung District. Political meetings and rallies are seasonal and take place only during election periods. On such occasions, political rallies pass by on the road and meetings are organized in several places. Respondents support their groups. Interestingly, people felt reluctant to admit to participation in political rallies, as it is not generally looked upon positively. In Kabhre District, however, respondents were quite frank in stating their involvement in political rallies and meetings in which more respondents from off the road participated than those along the road; the case was just the opposite in the other three districts.

Regarding social consciousness about safe sanitation practices, it was found to be poor in the study location in Dhading District. Building toilets is not a priority. A majority of the people, more from off the road locations, are still using open spaces in nearby farm or forest areas. A few economically well-off and industrious farmers have water-sealed toilets, to which septic tanks are added and the human waste mixed with cow dung for biogas production. Women's development groups in Murali Bhanjyang VDC are running a programme about building toilets and raising awareness about sanitation. The success, however, is modest.

In Ilam, as Table 4.13 shows, pit latrines are common in the study areas. Recently, especially after the road, the use of water-sealed toilets combined with biogas plants has increased. The government policy to provide financial aid through ADB/N and access to the road for transporting construction materials have led to the establishment of a number of biogas plants in the area. However, such toilets are found more in the homes of higher income

groups along the road. In Kabhre District, 80 per cent of the respondents on the road used water-sealed toilets. In fact, there are a number of NGOs, such as the Red Cross Society, Water Aid, etc, who have provided a lot of support for small water supply and sanitation programmes in the project area. The Red Cross Society alone has given support to 11 water supply projects and 425 water sealed toilets in the project area. For building toilets, a household is asked to contribute 50 per cent of the cost of materials, and the Society provided materials, transportation, and technical support. The situation was similar in off the road locations in Baglung District where the Mothers' Club has helped 150 households build toilets on a cost-sharing basis. Though, in both districts, there is no direct relation between sanitation the road, it was reported that the road had contributed to raising awareness and about the problem and also made it possible to transport construction materials.

4.6 Impact on Input Delivery and Extension Services

Agricultural and livestock development are the main activities in the study area. The role of institutions in these activities is reported to be marginal and ineffective in all four districts. The JT/JTAs, who were posted to Agricultural Service Centres as the main extension agents, rarely visited the programme areas. In the field survey, very few of the respondents in all four districts reported that they had met a JT/JTA during the past year. One respondent from Dhading District jested, *"We listen to the JT/JTAs on the radio with Budi Ama, but not in the field."* The area-specific agricultural packages, such as 'mini-kits' were reportedly distributed to relatives and friends. On the livestock side, though the progress is impressive, especially in Ilam and Kabhre districts, the fodder development, distribution of high-breed animals, and so on were carried out mostly by households on an individual basis or by private traders.

In focussed discussions in Dhading District, people argued that extension workers seemed to be responsible only to their line agency, but not to the people. Some admitted that it was their fault also for not demanding their services. A JT/JTA, who is responsible for a number of VDCs, cannot go from door to door and ask whether services are needed. JT/JTAs could have, at least, provided information, through VDC Offices, on the availability of inputs, credit, and seeds. On the other hand, in Ilam District people commented that the JT/JTAs should have showed up in the area. Then only would people have been encouraged to learn and try something new. For example, Pakhribas Agricultural Centre, Dhankuta, has a field programme in Mangalbare, Ilam District, and Lumle Agricultural Centre has a field programme in Singana, Baglung. Their field staff make frequent visits to the programme villages and thus create a demand for their services.

The main reason for JT/JTAs not visiting the programme areas is the lack of supervision by their superiors. They get field allowances for which they are supposed to visit field areas for certain days. In reality, they visit only on paper. If they can get field allowances without field visits, why should they visit? Although the accessibility of the area has increased as a result of the road, neither have the JT/JTAs increased their field visits nor have the supervising offices monitored their activities. Moreover, their salary structure is so low that they cannot bring their families to the field, and this could have ensured a longer stay in the working area. Consequently, most of them, who are not local, stay alone and make frequent visits home.

In Kabhre District, respondents said that Kushadevi - Rayale area is endowed with good quality soil and water for irrigation. The road has connected the area to the market also. Now people want know-how about alternative cropping patterns to take advantage of the situation. The Agricultural Service Centre, located in Kushadevi, has a programme only for subsistence crops, as in any other district. However, the JT/JTA working in Kushadevi felt that the people in this area were not industrious that they did not grow crops requiring a lot of labour and continuous care. The JT/JTA thought milk production was popular because it gave them an opportunity to travel to the collection centre and gossip with others in the teashop the whole morning. They seemed to be satisfied with the present level of income.

On the livestock side, although Kabhre District is famous for milk production, the Livestock Development Office does not have any supportive programme activities. For example, there is a great demand for well bred buffaloes that are mostly imported from the Terai by private traders. It takes a considerable time for these animals to adapt to the local climatic conditions and become productive. But there is no breeding centre at the local level. Although the Livestock Office has distributed a few male buffaloes for local breeding, this has had only a marginal impact in relation to the level of demand. Likewise, there is no risk-sharing mechanism such as animal insurance. If an animal dies at the beginning of the lactation period, it is indeed difficult for a typical small farmer to recover from the debt trap. A mechanism exists, but with complex bureaucratic procedures, for ADB\N to support livestock husbandry. But such mechanisms do not cover the animals, purchased privately which constitute the majority in the area.

On the credit side, although there is not much of a problem about access to institutional credit it was argued that ADB\N should act as a development banker. For example, it gives production credit for a number of items on the assumption that all factors are within the control of a farmer. But, in reality, the supporting agricultural institutions are ineffective at providing inputs and extension services on time, there is a marketing problem for the goods produced, and the price fluctuations are very high. With due regard to its security concerns about credit, the Bank should also have some concern about these aspects.

Among other institutions, the Mothers' Club has evolved as a powerful instrument for developing community awareness in the areas of health, sanitation, and gender issues. In Singana VDC in Baglung District, the club is involved in water conservation, water tap construction, conscientisation about the need for toilets, and tree plantation in erosion prone areas.

Regarding the effect of the road on local artisans such as tailors and blacksmiths, it was found that they have maintained their traditional relationships with the community. Although in most cases, they live within the same hamlet, they are *Pani Nachalne** (untouchable) castes. They are affiliated with the *Bista* (client) families through a *Bali* system, by which they receive foodgrain annually. For the tailors, the *Bali* (amount of grain) is fixed based on the number of family members while for blacksmiths the amount is fixed on the basis of operational land holdings. The main work of both tailors and blacksmiths is to make new items and repair the old ones in the *Bista* houses. At first glance, the road does not seem to have affected the traditional artisans as they are continuing with the old relationship. Unless the

* *Pani nachalne* means 'higher' castes will not take water from them or eat what they touch.

technology of local artisans is improved and necessary support provided to help them compete with the market, they will be affected when cheap readymade items penetrate the interior villages through the road.

4.7 Environmental Impact

In the field survey, two questions, one on soil erosion and landslides and an other on smoke and dust pollution were asked about environmental aspects. The response is presented in Table 4.14 below.

Table 4.14: Environmental Impact of Road as Perceived by the Respondents

(Yes in %)

Area of impact	Baglung		Dhading		Ilam		Kavre	
	On	Off	On	Off	On	Off	On	Off
Landslide	92	76	52	20	52	20	40	68
Pollution	48	52	96	88	24	44	52	-

Source: Field Survey

Note: On = On the road, Off = Off the road location

In Dhading District, the environmental aspect, which was mainly defined as landslides and mass wasting, was given a lot of consideration in road construction. Several measures, such as phase-wise construction, labour-intensive methods, use of bioengineering techniques, and so on, were taken to reduce adverse environmental effects on the road. After construction, the road is closed for three months a year during the rainy season to reduce the damage caused by vehicles on the soft earthen road. Although more respondents along the road felt that the road had caused landslides, no such evidence of serious landslides was visible during the field survey.

On the question of pollution in Dhading District, respondents from both sides said that there is a high level of pollution due to the road. It was reported that during the dry season, there is a lot of dust pollution caused by the road. An area of about one kilometre in radius from the road alignment is covered by dust during that period. All the respondents along the road complained that they have to close their doors and windows to minimise dust pollution inside the house. One old man related an incidence of buying millet flour in a *Dalo* (bamboo basket). He went to graze the animals for the day. On his return in the evening, the flour was beneath a thick layer of dust because the doors and windows were left open. Several examples of dust pollution were cited during open discussions. The dust factor is so intense that one respondent said that one could not recognise oneself when one reaches Dhading Bensi! Almost all respondents complained that the dust pollution could have a severe effect on health.

The effect of dust pollution was also reported on grasses and fodder trees. Livestock — do not eat grasses and fodders covered with dust. On fruit trees, such as mangoes, dust pollution has reduced yield by effecting the pollination process. One respondent, who owned a

fruit orchard, said, "In fact a 'green road' was conceived to preserve the greenery around the road. Tree plantation on both sides of the road was also part of the programme which, however, did not materialise. At the end, the soil was exposed to the sun and the road turned out to be a 'dust road'."

In Ilam District, more people along the road felt that there were more landslides due to the road. Some landslides along the road were natural in weak and steep topographic sections, while others, perhaps the majority, were due to the lack of necessary supporting structures such as retaining walls and drainage, as shown in the photograph below.

It was reported that landslides are related to the construction method use for building the road. Until 1992, the DOR used to construct district roads through local contractors. However, after the local elections for VDCs and the DDC, the local political leadership in Ilam District felt that the work could have been done better through the users' committee. Accordingly, the DDC Ilam wrote to the MLD with the following arguments.

- The DOR used contractors for road construction, so there was no scope for people's participation.
- If the available resources, along with people's free labour, could be used for earth excavation, vehicles could ply on the road. Structural work could be completed on a phase-wise basis.

Since 1993, when the rural road projects were handed over to DDCs, the project under study has been implemented through the users' committee. As the users' committee did not have technical manpower, no detailed survey was carried out and no technical profile of different sections of the road was prepared before construction. People's free labour contributions were mobilised for road construction and priority was given to constructing road surfaces so that vehicle movement could commence as early as possible. Consequently, there were more landslides along the road. Earlier, when the road was constructed through the DOR, although a large sum of money was misused to the contractor's profit and because of corruption, the DOR had enough technical manpower for an alignment survey and preparation of a profile of the total road project before construction began. Therefore, depending on the availability of money, structural work on selected sections was carried out.

Even then, landslides and soil erosion were reported to be comparatively less in the road area in Ilam than elsewhere in Nepal due to the use of several fast-growing species such as *Uttis*, Broom grass, Bamboo, etc. These species have contributed to controlling soil erosion along the road.

Regarding dust and smoke pollution, it is interesting to note that more respondents in off-the-road locations felt that it had increased due to the road. There are two explanations. First, it was felt during the survey that people along the road had accepted dust and smoke from the road as necessary trade-offs for achieving greater benefits from the road. In other words, the benefits they have gained from the road have more than off-set the cost of pollution, while those off-the-road had to accept the dust without any benefits from the road. Second, some respondents along the road said that, due to the low traffic volume, there was no pollution. Yet if traffic volumes increase, the pollution might also increase.



In Kabhre District, although the road has passed through a relatively flat area, and was, in fact, constructed by extending the existing trail, some landslides were visible along the road. Nearly half of the respondents, more in the off-the-road location, felt that such landslides had occurred because of the use of the bulldozer to extend the road destabilising the land around the road alignment and also making the slopes of mountain sides almost vertical. Similarly, only the surface of the road was extended with soft soil, without supporting structures such as retaining walls, drainage, etc. On agricultural land, through which the road alignment passes, landslides are usual, because the soil of the roadbed is wet with water most of the time. The *Khet* around the road remains covered with crops most of the time and is not given time to stabilise by means of tree plantation.

Regarding pollution, half of the respondents along the road said that both dust and smoke pollution had increased after the road. They explained that on a rough road, there is more vehicular emission than on a 'finished' road. Moreover, many of the vehicles that ply the road are old and naturally emit a lot of smoke. Likewise, as the road is not well surfaced, there is a problem of mud deposits during the wet season and dust during the dry season.

4.8 Conclusion

In all four districts, visible changes were observed in the study locations in all spheres of life. It was found that the road had reduced the feeling of isolation and remoteness among the population and had inculcated a sense of 'connected tree' through the road with the mainstream development process such as markets, social services, and development institutions. Moreover, the decisive control of traders in frontier locations over hinterland trade had been

The Use of Bamboo on Roadsides Controls Soil Erosion



weakened as a result of the road extension beyond the frontier market. For example, in Dhading District, the traders of Gola Bhanjyang, Salyantar, and Arughat import directly from the larger market in Kathmandu and Narayanghat, instead of depending on the local traders of Dhading Bensi. Similarly, in Ilam District, the control of trade by Ilam Bazaar over the hinterland market centres, such as Mangalbare Bazaar has weakened as the latter deal directly with larger market centres such as Birtamod and Biratnagar. Moreover, transport cost, time, and damage to goods in transport have decreased considerably, and the volume of business in the area influenced by the road has increased significantly.

However, the prices of essential goods, except for salt and kerosene in Baglung District, did not decrease in spite of the savings in transport costs because of the roads in the study area. In fact, prices increased everywhere, the road was a factor reducing the price differential between the main markets and area although served by roads. The road did contribute to an increase in the availability of merchandise in areas connected by road and to a decrease in price differential between the larger market centres and the road head. However, as the price did not fall below the base level set before the road was built, but increased over a period of time, it suggests that the benefits from savings in transport costs are not always passed on to the consumers. Thus, on the whole, the net beneficiaries were the transport owners and retailers, rather than those who donated land for the road free of cost and contributed free labour for the 'development project'.

The scale of production has increased, although with considerable variations throughout the study areas. Many of the locally available, non-marketable items, such as *Lapsi* in Kabhre District and Broom flower in Ilam District, also became items commercially profitable items.

Production of valuable cash items with low shelf value, such as vegetables and milk, benefitted from the roads, especially in Ilam and Kabhre Districts. It was observed that the potentials for increasing production existed in all study locations. But serious limitations were noticed in terms of input supplies, technology transfer, marketing networks, pricing policies, and risk sharing mechanisms. Important factors among these constraints are described below.

First, although rural roads are expected to bring about economic transformation in the areas connected by roads by increasing local production and export, there are no supporting institutions to help achieve such a goal. The existing institutional setting is not designed to play a supporting role to a market-led economy. Each line agency at the district level is implementing targets set by its parent agency in Kathmandu. The administrative culture and values are traditional and bureaucratic. Therefore, it is natural that the front-line extension agents in agriculture, the JTs and JTAs, see themselves as office workers to whom the needy should come to request help rather than extension agents for change. Those who are working extensively in the field are also found to be motivated more on the basis of individual quality and capacity rather than on the basis of institutional incentives and values. The gap between demand for and supply of technology, inputs, and extension services is enormous. Some activities, such as importing well-bred varieties of buffaloes from the Terai to Kabhre District, breeding jersey cows in Ilam District, or importing mules in Baglung District, have been taken over by private traders or on a farmer-to-farmer contact basis. But the private sector is more motivated by profit than by area development. It is, therefore, important that, in order to achieve transformation of these areas from isolated subsistence economies to market-led integrated economies, the official institutional mechanism should be revamped and NGOs also involved in developing such mechanisms.

Second, the marketing mechanism for agricultural commodities is unreliable, particularly in the volatile market. In spite of the fact that the wholesale market has extended beyond the front-line market as a result of the road, there is a lack of knowledge about the size of the market for different commodities over a period of years. Without market knowledge farmers cannot use land on which they farm subsistence crops for longer-term cash crop production. It is interesting to note that, on the one hand, the government has been pursuing an agro-led development strategy, which may have wider distributive effects on the rural economy, and, on the other, agricultural producers are unable to procure a reliable market for their produce. Farmers, such as Sunil Shrestha (Box 5), claimed that they could have produced more had there been prior knowledge of an assured market. In order to bridge the gap between producers and the market, the government could use the District Agricultural Office which has a nationwide institutional network for collecting and updating the market information for different types of agricultural products and inform farmers through JTs and JTAs.

Third, considerable price fluctuations have been experienced for agricultural products. For example, in Ilam District, prices of some commodities have declined more than twice in a year. Nobody knows who controls prices and why they fluctuate. As a result, local wholesalers keep a considerable margin to cover the risk of price fluctuations, and, therefore, farmers do not get fair prices.

Finally, there is no risk-sharing mechanism in the agricultural and livestock sectors for crop failure, price fluctuations, and death of animals. In Kabhre District, most of the buffaloes are

imported from the Terai and in Baglung mules are imported from India via Nepalganj. It takes time for these animals to adjust to the local climate. Some of them die. Since there are no risk-sharing mechanisms such as insurance policies, investment in these businesses is very risky. It was alleged that ADB\N gives full consideration to the security of its credit, while overlooking other risks, such as crop failure and price fluctuations, which a farmer may have to face in the production process. For ADB\N-supported livestock animals, an insurance mechanism exists, but it has very complex procedures. There is no insurance policy for privately purchased animals, which constitute the majority in the area.

In other sectors, such as education and health, the road has made a positive contribution, although the road is not the sole contributor to change. In education, the road has reduced the feeling of remoteness and isolation, therefore, good teachers from outside have also moved in to teach in local schools. In the health sector, the road has made it possible to get patients to better hospitals quickly.

Regarding environmental impact, two conclusions can be made. First, in the 'green road' concept of Dhading District, tree plantation on both sides of the road was also included in the programme but, however, did not materialise. One of the problems in enforcing tree plantation on roadsides is that the road occupied land donated freely, therefore the right of way cannot be effectively demarcated and trees planted. If the land occupied by the road is purchased by the public authority it can control the road better as well as have right of way, and people would not feel that they have given something for nothing. Therefore, in order to make tree plantation a part of the road project, the land occupied by the road and the right of way should be procured through compensated to the owners. Second, for DDC\VDC managed roads, the available resources, along with people's free labour, are used for excavation of earth in order to enable vehicles to ply the road as soon as possible. This ad hoc approach to road building, as discussed in Chapter 3, has had serious effects on the environment. The road policy of the DOR has prescribed five stages for road construction (Section 2.3) in which Stage I must precede all stages with detailed engineering design, costing of construction\upgrading a road project, and planning the construction process. This policy should be enforced at the project level. For rural motorable roads, appropriate technologies, such as the LES method which has shown positive results in minimising environmental damage, should also be incorporated in the policy and enforced.