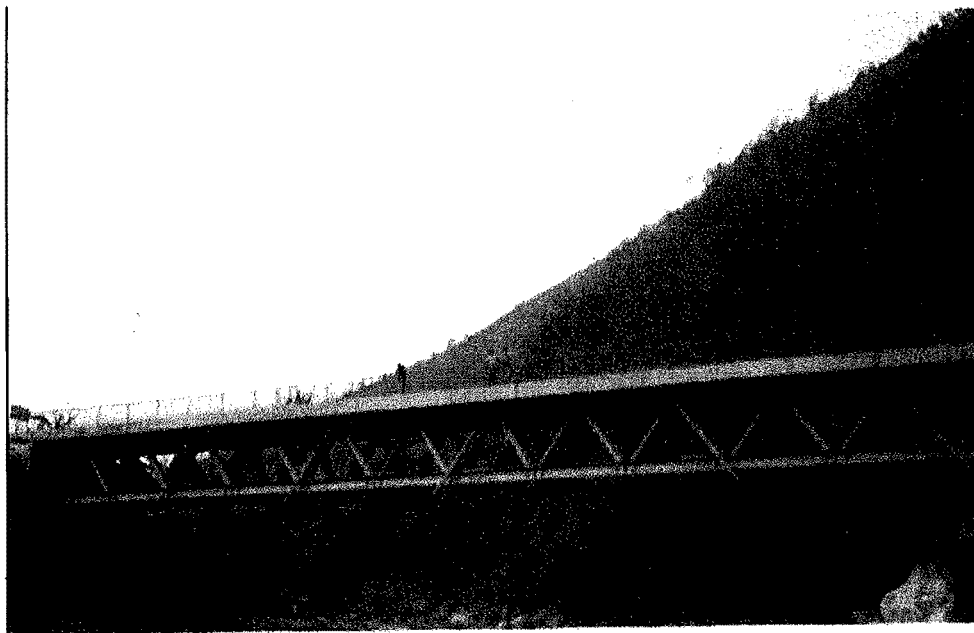


**Final Report**

**A STUDY ON THE EFFECTIVENESS OF INVESTMENT IN  
MALEKHU-DHADING ROAD PROJECT**



**SUBMITTED TO  
CENTRAL MONITORING AND EVALUATION DIVISION  
NATIONAL PLANNING COMMISSION SECRETARIAT  
SINGH DURBAR, KATHMANDU**



**SUBMITTED BY  
CENTRAL DEPARTMENT OF ECONOMICS (CEDECON),  
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**JUNE 2003**

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It is my profound belief that the findings and recommendations of the report will be very helpful in the planning and execution of similar road projects in the future.

Thanking you all,

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## EXECUTIVE SUMMARY

The Malekhu-Dhadingbesi Road traced in the late 1960s with the voluntary participation of the people in the concerned area, was financed by KfW for its upgradation to all weather bitumen road along with the construction of a new bridge over Thopal Khola and rehabilitation of the Trishuli River Bridge. It is supposed to be an environment friendly Green Road Project. The Swiss Consultancy ITECO carried feasibility study so as to upgrade it and made a cost estimate of NRs 650 million for the upgradation related construction and rehabilitation activities.

Central Department of Economics (CEDECON) at TU signed an agreement with National Planning Commission Secretariat to carry out the study entitled 'A study on the Effectiveness of Investment in MDRP' in 2003. The multidisciplinary study team at CEDECON through extensive household survey, focus group discussions, key informant survey and direct observation of the study area has come up with this report. The main objectives of the study were to assess the effects of the road on the economy, environment and society of Dhading and, consequently, provide policy recommendation to increase the socio-economic benefits due to the road, sustainability of the road and prescribing the guidelines that similar projects in future should follow.

The study has come up with very interesting results. The completion of the upgrading process has given a tremendous stimulus to the agrarian economy on the neighborhood of the road. The stimulus is primarily observed in a shift from traditional farming-for-subsistence practice into a cash-generating market oriented farming system. In addition, the reduction of transportation time and cost has immensely benefited the local populace. The local business, however small it may be, has also flourished.

The rise in income owing to the expansion in the volume of various economic activities has influenced social dynamics of the society. The social indicators selected by the study to serve its goals have demonstrated an upward revision in the magnitude of the indicators except for some qualifications.

The project has shown some sincere commitments to the environment also. Eventhough lack of proper monitoring and supervision have, in some instances, faded the effects of environment protection measures proposed by the planners and donors of MDRP, the environmental situation is still encouraging .

MDRP has come to its conclusion recently. A time of less than a year has elapsed since the handover of the road to DoR. The anticipated results are yet to be realized fully. The study

makes in-depth analysis of the facts and figures and, consequently, provides the policy recommendation so as to ensure larger benefits of MDRP in the future.

The major findings of the study are as follows:

#### ■ **Technical Aspects of MDRP**

The maximum speed that the design of the road allows is 25 km/h. But given the burgeoning of urban sphere in the Dhadingbesi, traffic is bound to increase rapidly in future. The road consists of potholes in several areas which have to be maintained to prevent its further deterioration. However, for heavy transportation vehicle the road is not appropriate due to the switchbacks at 0.1 km, 12.2 km and curvatures particularly at 12 km and 14 km. Another hindrance that has come about for heavy transportation lies at 3.5 km to 5 km, where the uphill slope comes as an obstacle for trucks carrying goods.

The immediate improvement to be made in MDR lies at 12 km away from Malekhu where a sharp bend is witnessed. There is a dire need to employ tributary training instead gabion walls). The two switchbacks at 12.2 km. have to be maintained by cutting it in a straight line. There are two landslides at 4.9 km and 13.1 km, which may stop regular flow of traffic particularly in the monsoon. The landslide can be controlled by removing the unstable masses since they have occurred due to plane failure.

#### ■ **Economic Impacts**

The blacktopping MDRP, allowing an easier and cheaper accession to the market, has stimulated the economy of its catchments and of hinterlands. The areas like, Nalang, Salang, Murali Bhanjyang, Nilkantha VDCs have witnessed such a tremendous transformation through agriculture that they export nearly the same amount of cash crops which Dhading District as a whole used to produce 8 years back. Provided the government agencies cooperate with the localities there by providing technical knowledge of modern agriculture and enabling them to find a secondary market to replace currently existing monopsonistic vegetable market, the economy in these VDCs will go for a great leap in near future.

Not only the people of the catchments are benefited, the people in the hinterland as well as the people of Gorkha residing in VDCs adjacent to Dhading District are benefited from the road. The number of people benefiting from the road is likely to increase significantly in near future.

#### ■ **Social Impacts**

Though the road has created a potential for social change and development, significant increase in levels of human development depend not only on improved access to existing facilities but also on accompanying developments in the non-road sectors. As such, following recommendations can be put forth to increase the level of human development.

- Improve the position of vulnerable groups like women and low- income households through the creation and stimulation of income generating activities.
- Increase awareness through different formal and non-formal education and provide improved access to education particularly to girl child.

■ **Environmental Impact**

The environment management strategies adopted by the project in different phases were almost successful. Therefore, there is no serious environmental hazard. However, some threats of caving in, soil erosion and land slides in near future can be anticipated. The situation calls for adopting the preventive measures at the most vulnerable parts of the road.

With these observations, the study team has suggested some strategies, measures and policies that will increase the benefits of the people if executed properly.

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## ACRONYMS AND ABBREVIATIONS

CBO	Community Based Organization
CBS	Central Bureau of Statistics
CMED	Central Monitoring and Evaluation Department
DADO	District Agriculture Development Office
DIRDP	Dhading Integrated Rural Development Project
DM	Deutsche Mark
DoI	Department of Irrigation
DoR	Department of Roads
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
FGD	Focus Group Discussion
FUG	Forest User Group
FY	Fiscal Year
GO	Government Organization
GTZ	German Technical Cooperation
HDI	Human Development Index
HMG	His Majesty's Government
ICIMOD	International Center for Integrated Mountain Development
MDR	Malekhu-Dhadingbesi Road
MDRP	Malekhu-Dhadingbesi Road Project
NBL	Nepal Bank Limited
NDP	Nepal District Profile
NGO	Non-Government Organization
NLSS	Nepal Living Standard Survey
NPC	National Planning Commission
NPCS	National Planning Commission Secretariat
NRs	Nepalese Rupees
RBB	Rastriya Banijya Bank
RESTUC	Research and Study Center
UNDP	United Nations Development Project
VDC	Village Development Community
WUG	Water Users Group
ZoI	Zone of Influence

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## CHAPTER I

### INTRODUCTION

#### 1.1 Background

Transportation is regarded as the principal catalyst in the dynamics of socio-economic transformation of a nation. Nepal's failure to develop social overheads is generally attributed to the Rana Regime that spanned for 104 years during which social-overheads were considered as peripheral issues. However, the introduction of First Five-Year Plan in 1956 and its execution is believed to be the first organized step towards the development of infrastructure in Nepal. Despite higher priority to the development of transportation through a nation wide road network, some district headquarters are still devoid of transportation facility due to the deficiency of the state's ability to make sufficient investment on roads.

The Malekhu-Dhading Road project (MDRP), located in Dhading district links the district headquarters of Dhading to the Kathmandu city via Prithvi Highway. The basic objectives behind the construction of the road were to provide Dhading district a linkage to strategic road network as well as economic sector to increase, the economic activities in the region. The construction of the road began in 1968/69 under the auspices of Dhading District Authorities by using volunteer labor at the local level. It was only in fiscal year 1975/76 that the government integrated this road into the national agenda. Consequently, the project was taken over by the Department of Roads (DoR). Later in 1987/88, the road was incorporated into the Dhading Integrated Rural Development Project (DIRDP). After this, a committee constituting of local leaders and government agencies was formed that took initiatives to construct a new road so as to improve the quality of the existing one. The construction process ended with the construction of a Bailey type Maybe Johnson Bridge over Trishuli River in 1993 under the technical and financial assistance of KfW via German Technical Cooperation (GTZ).

Feasibility studies were carried out with the financial assistance of KfW for the road in 1996 and for Trishuli Bridge in 1997. His Majesty's Government and KfW signed the first agreement to implement the project on March 9, 1998 in order to upgrade Malekhu Dhadingbesi Road, to rehabilitate Trishuli Bridge and to construct Thopal Khola Bridge. In 1999, total project cost was estimated to be 16.8 million Deutsche Mark (DM) that was later revised to be 16.44 million DM, equivalent to NRs. 608 million in 2000.

Usually, any infrastructure development project disturbs lands and settlements as well as exerts pressure on local resources and the ecosystem. Road projects disturb both the terrestrial and aquatic ecosystem and displace the people from their settlements and it also directly and indirectly influence social, economic, cultural, biological and physical environment. Moreover, some impacts could have residual effects for a long duration, and some adverse impacts could be realized only during the operation of the phase of the project

In Nepal where a high demand for roads is easily comprehended, the construction cost of roads is high and its ability to afford such costs is low owing to the dearth of resources. Efficient strategies on road construction are to be designed and executed so as

to derive optimal benefits in the economy. These efforts are inevitable to reduce the pressure over resources (financial, physical and natural) and their sustainability.

According to the projected figures of 2001 census the total population of Dhading district has been put to 326224, out of which 161940 are males while 164284 are females. The literacy rate for the district is 39 percent well below the national average of 53.7%. The economically active populations of male numbers to 82599, while 76014 are females (NDP, 2002)

Even though Dhading is a predominantly agrarian economy, there is a per capita food deficiency of 109 days. Out of 44383 ha of cultivated agricultural land only 6299 ha of land is irrigated. The major irrigation projects are funded by Department of Irrigation (DoI) and ADB/N. In the year 1999/2000, 539.700 tonnes of Urea, 189.026 tonnes of DAP, 3.750 tonnes of Potash were used in Dhading district. The major cereal crops grown in Dhading are paddy, maize, wheat, millet and barley. On the cash crop category oil seeds, potato, sugarcane, tobacco etc are grown (NDP, 2002).

Drinking water facilities for the district do not show any encouraging improvement. In the year 1999/2000 only 0.69 % of additional population was provided with drinking water facilities which originally stood at 35.01% in the previous year (NDP, 2002).

Settlement patterns in the project areas generally reflect the distribution of arable land and the development of market areas along trade routes. Accordingly, most of the areas exhibit a scattered settlement pattern, interspersed by a number of large settlements and bazaars/market places. Apart from their trading role, the larger settlements often have important administrative and service functions.

The district suffers from inadequate Secondary and Tertiary education facilities in particular. The Secondary school students comprised only 2.8% of the total student population. The same pattern is evident for other districts. The dropout rate is very high due to; household work burden of children, irregularity of school operation, household income poverty, physical distance to school low perceived relevance of education, and caste/ ethnic discrimination and neglect of mother-tongue in school.

With a huge investment in the road, one would naturally expect a significant change in the quality of life of the people in the affected area. An assessment of the economic and environmental impacts of the road will contribute a lot in formulating similar projects in future and mitigating the hazards of the projects.

In this context the effectiveness of investment as well as the environmental and economic impacts of the Malekhu-Dhading road is an important task. The road links the district headquarter of Dhading District with the neighboring capital city through Prithvi Highway. Even though Dhading is a district that adjoins the capital city, Kathmandu, the socio-economic indicators of the district are far from being satisfactory indicating that the quality of life in the district is very poor.

## **1.2 Objectives**

The objectives of the study are as follows:

- To assess the appropriateness and the relevance of the design, inputs and implementation arrangements as well the sustainability of benefits generated by the Project,
- To assess the impact of the Project in relation to movement of the people as well as the movement of goods and services, environmental benefits and identify the potentialities created for developing new projects,
- To assess the strengths and weaknesses of the Project by studying the targeted and actual facilities developed,
- To assess the effectiveness of investment on road in relation to creation of development opportunities and, thereby helping poverty alleviation, economic development in the localities and raising living standards of the people in the Project area as well as overall development of periphery,
- To assess the environmental impact of the Project along the Road and its affected areas,
- To assess the actual number of households benefited, participation and involvement of women, poor families and underprivileged castes, community participation and the level of participation of beneficiaries in the project activities including their attitude towards such projects and future perspectives, and
- To recommend the future course of action to be adopted by the Government keeping in view the factors such as sustainability, operation and maintenance cost, long-term and short-term national needs.

### **1.3 Rationale of the Study**

The constructions of roads have very important implications to the economy, environment and society- some immediate and some long term ones. Nepalese experience through observations and experiences thus far, has revealed this fact.

Among the economic consequences, construction generates employment during construction and propagates the expansion of future employment opportunities. The construction work carried out especially in economically deprived rural mountain settings contributes a lot. It develops small city centers that govern the local trade. These centers serve as the transit venues for goods imported from outside and locally produced goods. This ultimately increase the consumption of non-locally produced goods and also the export of locally produced goods increases because of change in value due to reduced transportation costs. Besides, it is likely to change the pattern of production in affected area.

Similarly, the social pattern, values and culture gradually change due to migration and communication with other parts of the nation. These generally produce favorable impacts. However, there are some negative impacts like cultural deterioration.

Environmental impacts are more serious. Construction of roads has severe damage to the environment through deforestation, landslides, loss of bio-diversity, blockage of water resources etc. Realizing this, DoR has prepared certain guidelines for environmental impact assessment. The practice of Environmental Impact Assessment, which was introduced by donor-funded projects, must precede all construction activities.

To overcome these, National Planning Commission Secretariat (NPCS) has been regularly carrying out studies on the productivity and effectiveness of road projects. The

proper understanding of the issues through such studies will help National Planning Commission (NPC) in planning road projects in future and maximizing benefits.

The country has faced a dearth of resources in financing social overheads since long. Although the need is recognized well, the investment in roads has been less than what would suffice the demand for it. The NPC, realizing this, has been commissioning studies on the effectiveness of investment and the development prospects in recent years so that future projects ensure sufficient returns.

The NPC has assigned the task of studying the productivity of investment on MDRP and the environmental effects of the project to Central Department of Economics. The study will help NPC in formulating its policies that will serve as the guidelines for similar projects in future.

## 1.4 Review of Literature

### General

The DoR strategy document states that it aims at development of road maintenance capabilities and support, maintenance and rehabilitation of the existing roads. Besides, DoR is gradually focusing on increasing the institutional, financial and private sector capacity to maintain and rehabilitate roads. Besides, DoR has set up the guidelines for environmental management in 1997 and environmental assessment in the road sector in 1999. These documents highlight the bio-physical features of mountains and plains, ridges, valleys, glaciers, lake and flood plains etc. and the conservation strategies to be adopted for the preservation of these in their natural order. However, these documents have come up with a severe limitation - undermining the dynamics of natural resources consumption propelled by the construction of roads.

Research and Study Center (RESTUC), Kathmandu has carried a study entitled *Potentials of Development Arising out of Pokhara-Baglung Road* for NPC. The study concludes that the economic effects are high and environmental management is at satisfactory level. The construction of the Road has really opened up a new avenue for local economy. Being the first infrastructural activity in the region, it is likely to produce results that are more favorable in the long-run. The study has recommended levying pay roll taxes to generate revenue so as to regenerate the costs under the *Users Pay Principle*.

Similar study has been conducted by Full Bright Consultancy in the year 2000. The study entitled *Effectiveness of Investment in Dumre-Besisahar Road*, however, has given little attention to environmental aspects. The study concludes that the completion of the road has established Marsyandi Valley as a new commercial venue, with Dumre being at the centre.

The inception report on *Assessment of Socio-economic impact and Monitoring of Environmental Impact of Strategic Road Development* has recognized the effects of a road development in three categories:

- i. Pre-construction Phase Effects: land acquisition, permits to fell trees, quarrying and some other construction activities, trainings, worksite surveys and additional load design.
- ii. Construction Phase Effects: vegetation clearance, retaining wall construction, excavation and embankment, drainage, topsoil and reuse,

- filling disposal, quarries and burrow pits, stockpiling, blasting, workforce camps prepared and controlled to their maximum tolerance limit.
- iii. Post-construction Phase Effects: re-vegetation, ancillary sites rehabilitation, roadwork maintenance and certification of work completed.

There is a wide variety of literature that focuses on the strategic importance of transportation sector, especially of roads. Nepal's landlockedness coupled with difficult terrain has imposed several challenges in the development of road network in Nepal. In her paper entitled *Some Aspects of Dependency Crisis in Nepal (1995)*, Suman Sharma makes very important observation. In Sharma's observation, the difficult terrain and the absence of roads (paved or unpaved) lead to high transport costs. The manner in which transport costs affect people's lives are: (i) the price of non-locally produced goods is raised and (ii) the price of locally produced goods is lowered as transporting it to other parts of the country, leaving aside for export to other countries, becomes too prohibitive. In addition to increased transport costs, access to roads is one of the principal determinants of developments (as measured not only by income but also by level of education, health and life expectancy) and therefore the absences of roads in many parts of Nepal has meant that large segments of the people remain deprived of even the most basic services. This is one of the primary reasons for the low human resources of the country because of which there has been and continued to be a large dependence on external sources for semi-skilled and skilled labor.

In their study on the relationship between geography and economic development, Gallup, Sachs and Mellinger (1998) have concluded in agreement with Nepal's experience, that high transport costs impose a steep price on a country's development effort. This finding supports Dr. Sharma's opinion.

The development efforts and their success depend upon the provision of transportation through roads because construction of roads facilitates the investment in other social overheads- by both public and private sectors. One of the significant reports by International Center for Integrated Mountain Development (ICIMOD) in 1997 groups the country's districts according to a Human Development Index (HDI) and arrives at similar conclusions. The HDI consists of human components such as longevity (as proxy health related capabilities), education (as a proxy for knowledge & information related capabilities) and income (as a proxy for capabilities to acquire a particular level of living) (UNDP, 1998:33).

The average life expectancy at birth in Nepal was estimated at 59.7 years in 2001. This represents an increase of some 18.2 years in life expectancy in the years extending through the period of 1976-1996. Factors contributing to this increase are: higher rate of immunization, control over epidemics such as cholera, small pox, measles (UNDP, 1998-97). Nevertheless, life expectancy remains low particularly in mountain and rural areas; the main factors responsible for it are limited access to health facilities and low level of quality of nutrition & sanitation (UNDP, 1998).

There are some more studies on the execution of some road projects and their socio-economic impacts. These studies focus on environmental aspects as well. The research team has reviewed such studies, an integrated part of the road construction project, during desk study.

The review of available literature reveals that the construction of roads has big prospects on the one hand and severe challenges on the other. The construction of roads

generates employment opportunities during the phase of construction and more employment opportunities after completion by providing access to transportation and market, which stimulates the economic activities. Since road is the most important social overhead that precedes others, construction of reviewed roads have profound impact in the related regions. Thus, what we learn from other studies is that roads are the backbone of development process.

All the studies reviewed thus far have revealed that the construction of roads produced positive impacts in health, education and economic status. In addition, there are several social and environmental problems. Migration, development of small city centers with cultural deterioration etc are the major social and cultural problems. The environmental problems are most severe and are likely to invite long run problem if remedial measures are not taken on time. Among the environmental problem, deforestation, loss of agricultural and residential land, blockage of drinking as well as irrigation waterspouts, landslide and inability to manage water are the major environmental problem. Even though, the reviewed literatures have given significant attention to vehicular air pollution, in the rural areas with sufficient scope for air mobility, the problem sounds to be minimal.

With these lessons learnt the study attempts at adopting proper methodology and measurement tools to capture the entire problem and evaluate their impact on the local society, economy and the environment.

### **Project Documents**

Most of the project documents related to MDRP was not available. However, the study team managed to get the Feasibility Report and Final Report prepared by ITECO.

### **Feasibility Study**

The Swiss consultant ITECO along with its Nepalese venture ITECO Nepal carried out the feasibility study of MDR in 1996 for the Department of Roads, His Majesty's Government of Nepal. The report of the study begins with the general feature of Nepalese Economy and the economy of Dhading along with the transportation sector.

The report has devoted the second chapter on the Development Policies and priorities in Dhading District. According to the Report, potatoes, oil-seed, sugar and vegetables were the major cash crops grown in the District and paddy, maize, millet, wheat and barley are the major cereal crops. The report cites that despite cultivating the cereal crops in 35630 hectares of land, Dhading imported 15000 tonnes of food grains in the year 1994/95. Cash crop was grown in 2755 hectares of land of which negligible part was exported. All of the 500 tonnes of fruits produced in Dhading was consumed locally.

In the year of 1994/95, Dhading imported 1500 tonnes of petroleum, additional 5000 tonnes of food and fertilizers, 46500 tonnes of building materials and 1500 tonnes of other materials. Dhadingbesi is the major market center for the northern and western Dhading.

The feasibility study has anticipated following development potentials as the consequences of blacktopping MDR for the Dhading District.

- Development of the carpet and garment industries at Dhadingbesi.
- Candy Production in Dharke VDC.
- Establishment of fruit processing industry in Charaudi VDC.

- Limestone mining in Charaudi.
- Copper mining in Valang and Sarang VDC.
- Slate mining in Sunaule VDC.
- Quarrying in Mahadev VDC.

However, the consultants doubts of the economic viability of such economic activities in Dhading District.

After discussing these, the report makes detailed discussion of the organization and structure of DoR and of the MDR in technical aspects along with the financial aspects of the Road.

The study has estimated a cost of NRs 650 million excluding contract tax. The economic analyses indicate that the Road would provide an economic return (EIRR) of 11% including agriculture and 8% without including it. The EIRR of Thopal Khola Bridge is 7% including only savings through delays at times of River floods.

### Final Report

The final report explains that the objectives of the Road were the improvement of Dhading District's access to the strategic road network and to economic centers through upgrading of the 17.5 km Malekhu-Dhadingbesi Road from gravel surface to blacktop as well as construction of new bridge over Thopal Khola and rehabilitation of Trishuli River.

The actual cost of MDRP was revised down to NRs 608 million from the estimated amount of NRs 650 million of which NRs 83 million was born by HMG and the remainder by KfW. In addition the report discusses the technical aspects of the road which is available in Chapter II.

## 1.5 Methodology

The Study Team adopted a participatory approach, involving both qualitative and quantitative methods in the socio-economic data collection and analysis of issues. The envisaged forms of data collection for the study were: (i) primary data collection through household survey and (ii) secondary data collection through a desk study and documents review. The main techniques include:

### Secondary Data

- a) **National level socio-economic data:** growth of traffic volume, both goods and services, index of district according to remoteness relating to health and education, density of population by types after the completion of the Project, number of households below poverty line, etc.).
- b) **Socio-economic data on zone of influence.**
- c) **Review of relevant study reports and literature.**

### Primary Data

The primary data was collected through the following procedures:

1. **Household level survey (sampling),**
2. **Focus group discussions (FGDs), and**
3. **In-depth interviews**

Focus group discussions and in-depth interviews were held in 10 different places in the zone of influence (ZoI) with household heads (including female-headed

households), Chief District Officer, Local Development Officer, professionals, Village Development Committee (VDC) representatives and community leaders.

### **1.6. Sampling Strategy**

The sampling of statistically significant number of households (cross-section sample of households) was conducted at the village and community levels that would allow drawing the conclusions of the impact of the road corridor's ZoI.

A structured questionnaire was developed in order to capture the information that serves the objectives of the study. Field survey was conducted with the aid of the questionnaire. The questionnaire was administered to appropriate households during the field survey. The survey was based upon the technique of random sampling. The information gathered from sampling was supplemented by a key-informant survey and 10 focus group discussions. Relevant statistical measures along with their diagrammatic representation are used for the presentation of the data.

### **1.7 Study Limitations**

The study team faced with several limitations during the study. The major limitations are:

- i. Limited study period did not permit room for collection of time series data.
- ii. Since transportation produces several impacts in the long run and as the construction works have been completed recently, time is not ripe yet for the road to produce significant impacts.
- iii. Some of the documents related to the project were not available due to their poor recording system even though some members of the research team went to the designated offices.
- iv. Lack of complete data base constrained the study in attaining entire targeted objectives.

## CHAPTER II

### ENGINEERING STUDY

#### 2.1 Introduction

The road entirely lies in the Dhading district in the Central Development Region of Nepal. The 17.5 Km long Malekhu-Dhadingbesi Road (MDR) runs north from Malekhu along Thopal Khola to Dhadingbesi. It connects Dhadingbesi Bazaar with Kathmandu –Pokhara Road (Prithivi Highway) (Annex 1).

The road passes through hilly forest area for around one third and through agricultural land for the remaining two thirds of its length. The hill slopes are generally steep with rock at or near the forest areas. The agricultural areas are generally flat or terraced.

#### 2.2 Road Alignment

The MDR leads off the Kathmandu-Pokhara road near Malekhu crossing the Trishuli River (Plate 13). The road then follows the Thopal Khola, crossing numerous side stream and it crosses Thopal Khola twice, at Bunchung (6.1Km) (Plate 12) and immediately before entering Dhadingbesi Bazaar (17.4 Km).

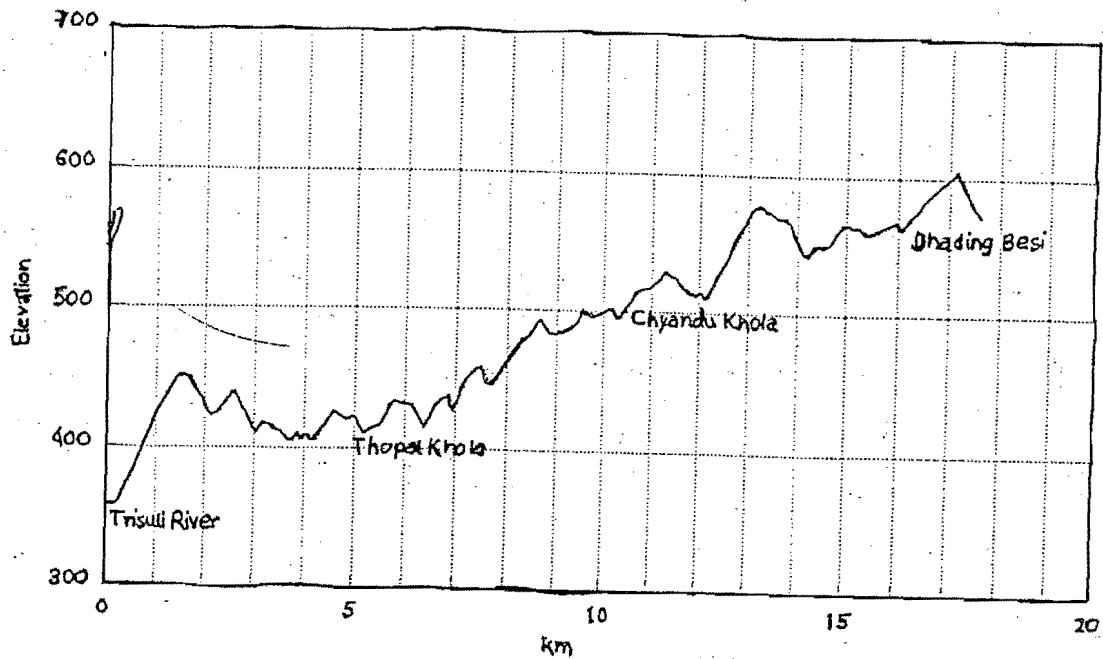
The road also passes through a number of small villages, i.e. Parewatar (1.2 Km), Phisphisetar (2.4 Km), Bunchung (6.2 Km), Baireni (8.4 Km), Kalidaha (9.8 Km) and Shashatar (14.2 Km) (Annex 1).

#### 2.3 Vertical Alignment

The road starts at 360 meter average sea level (asl) at the right bank of Trishuli river and climbs up to 600 m asl before descending to 570 m asl to Dhadingbesi Bazaar (Figure 1).

Generally the gradient is below 10%, a few sections have gradients up to 20% particularly at 0.1 Km and at 12.2 Km, which are the most difficult sections for traffic. The road also includes over steep section in the narrow curves and switchbacks (Figure 2).

**Figure No. 1**  
 Vertical Alignment of Malekhu-Dhadingbesi Road  
 (Longitudinal Profile)

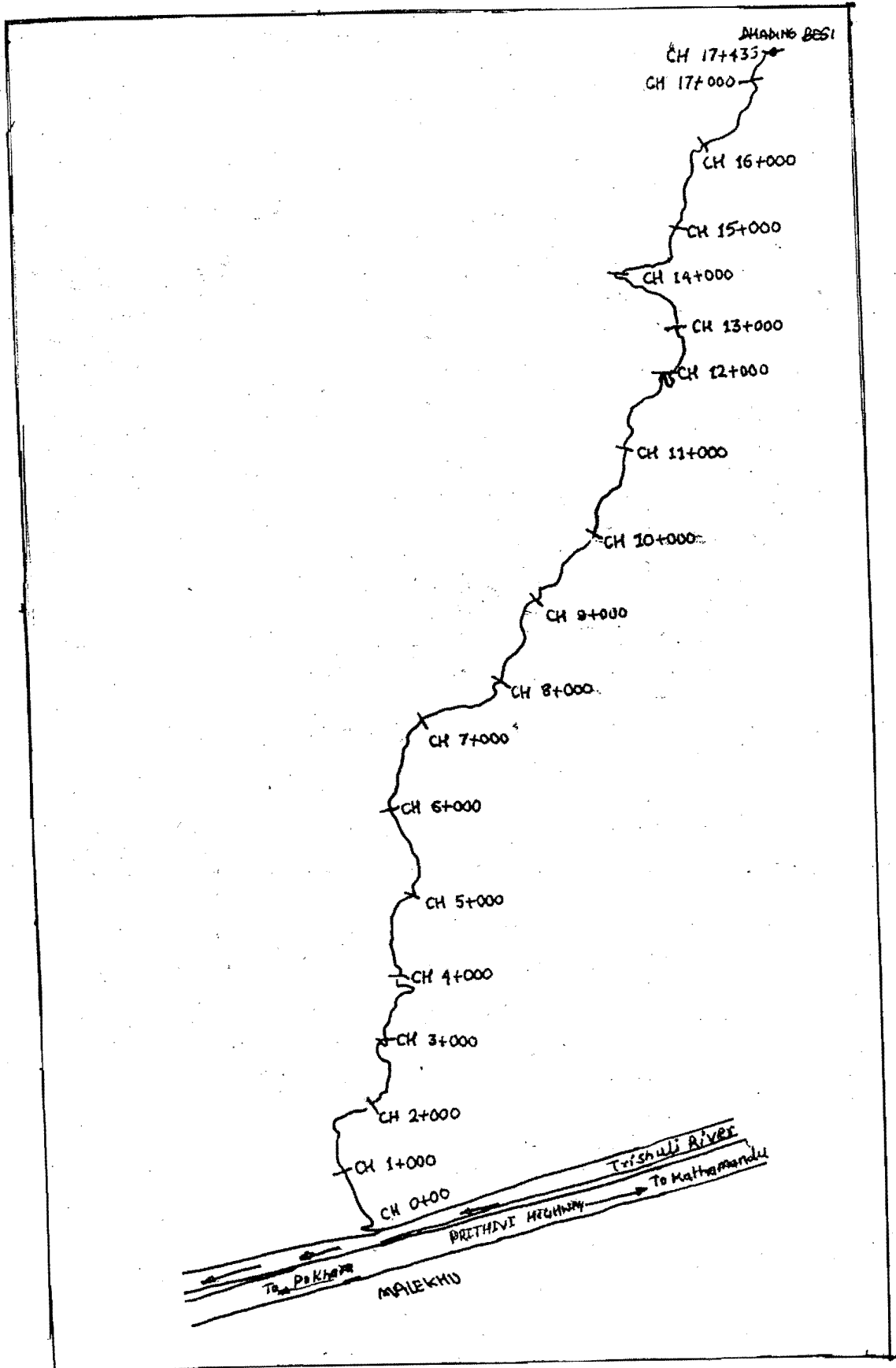


**2.4 Horizontal Alignment**

The road follows the bank of Thopal River and crosses the Thopal River at Bunchung (6.1 km) and near Dhadingbesi Bazaar (17.4 km). The horizontal alignment follows the undulating terrain resulting in the great many curves. However the curve radii are generally eight or above 12 meter though a few switchbacks have a curve radius of 9-10 m at 0.1 km and 12.2 km. The sharpest bend or the smallest curve is at 12 km in tributary, Chyadu Khola, having radius less than 9 m (Figure 2) (Plate 1, 2, 3).

Figure No. 2

Route Alignment Map of Malekhu-Dhadingbesi Road



## **2.5 Slope Protection**

Retaining structures and bio-engineering are practiced for slope protection.

### **2.5.1 Landslide**

Two measure slope failures occur along the road at 4.9 km and 13.1 km (Plate 4). Both are at uphill side. At 4.9 km., the landslide is plain failure and 13.1 km the instability is due to weathering and foliation plain failure. Both can be stabilized by trimming and removing unstable mass.

### **2.5.2 Bio-engineering**

Bio-engineering is also practiced along the road which is environmentally friendly way of slope protection. But the bio-engineering should have been practiced in proper way (Plates 5, 6, 7, 8). From some of the ineffective bio-engineering there seems to be erosion of soil mass, eventually, blocking the drainage system.

### **2.5.3 Retaining Wall**

A considerable number of retaining wall exists with a total of 2182 m. These include gabions wall, cement stone masonry and dry stone masonry structure with variable conditions. Some 13 locations have been identified where additional retaining walls are necessary for upgrading the road. Furthermore, cement stone masonry retaining wall would have been more effective than gabion wall in some places (Plate 9).

### **2.5.4 Drainage and Surface Water Management**

The road drainage is generally considerable. The whole section of the road has a cement stone masonry drain. There are 120 cross drainage and river crossing structures along the road, which are structurally sound.

Eight streams are crossed by flood ways. These result in blockage of road at times during the high floods. But these are limited up to one to three hours up to four times a year.

Discharge of high velocity storm water and diversion of spring water come during the monsoon to natural drainage channels and gullies result in overloading of natural drainage capacity that will instigate several erosion, few gullies formation, and several slope instability problems.

More than 86 pipe culverts cross the road at an average interval of 40 m to 300 m. Their diameter is between 0.45m and 0.6m along the whole section. Some culverts consist of single or double 0.3 m and single 0.6 m pipe which are also used for irrigation.

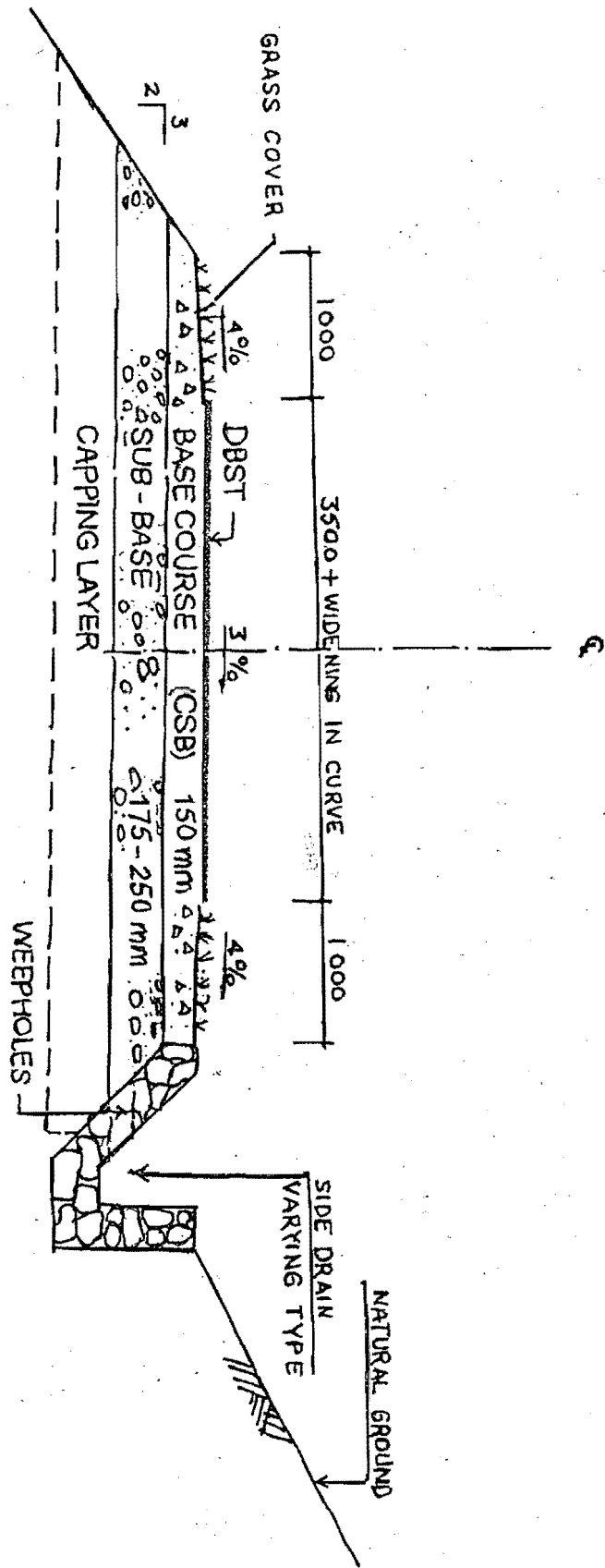
## 2.6 Road Standard

The standard for road design generally complies with DoR standards for Feeder Roads (All weather bitumen Road) which are applicable for the Malekhu-Dhadingbesi Road are summarized in the following table.

Table 1: Road Standard

Basic speed for design	25 Km/h
paved carriage way width	3.5m
Shoulder width	1.0 m, exceptional reduction in narrow sections, widening for passing place at suitable locations (approx. 3 placer per km on average)
Min. horizontal radius in curve	15m , 10 m for switchbacks ( except bent at 12 Km)
Max. vertical gradient	Generally <10%, 12% <5% in switchbacks
Min length of vertical curve	20m
Stopping distance	30 m (except switch backs)
Max widening in curve	2.0m
Super-elevation in straight	single slope towards hill
Super elevation in curve	towards inside of curve, max 7%

This differs from the DoR standard, which recommends a shoulder width of 0.5 m. However, the existing road width of 5 to 6 m allows a road width of 5.5 m without major widening except at some narrow locations. The typical cross section of the road is as shown in Figure 3.



Typical cross-section of MDR

Figure 3

## 2.7 Traffic Study

The inflow of traffic along the highway has been bolstered by the fact that regular bus services to and fro from Malekhu and Dhadingbesi have started. Furthermore, buses from Kathmandu also ply on the road towards Dhadingbesi.

The total number of buses that ply on the Malekhu-Dadhingbesi road numbers to about 32, and the total number of trips made by buses is around 64. Trucks also are part of the traffic in MDR. These trucks mainly carry goods from Kathmandu, Narayanghat, Birgunj etc. The number of trucks that ply on the road can be put at around ten in number. Mini-trucks now have been a part of the traffic in the MDR. These mini-trucks come to pick up vegetables and fruit mostly in Bungchung, Shashatar, and Kalidaha. Tractors are also one of the major vehicles that ply on the road. These tractors make their way to the local feeder roads from the MDR. The rough estimated Figure for the number of tractors can be put to about 15-25. However, most of these tractors come from Dhadingbesi. Negligible number of two-wheelers both from Kathmandu and Dhadingbesi also ply on the road.

## 2.8 Conclusion

Conclusively speaking the road does meet feeder road specifications as put forth by Department of Roads (DoR) with the exception of a few curvatures and switchbacks. The road alignments are also suitably located. The maximum speed that the design of the road allows is 25 km/h. However, even if the road is upgraded, the switchbacks and super-elevations do not permit the transport vehicles to go above 40 km/hr. But given the burgeoning of urban sphere in the Dhadingbesi, there will certainly be increase in traffic in coming years. Furthermore, the road consists of potholes in several areas, which have to be maintained to prevent its further deterioration (Plate 14). The road also consists of sharp bend at 12 km (Plate 1, 2, 3). In CH 12+00, Chyado Kholo has cut the edge of the road at both sides of the culvert (Plate 10, 11). The two switchbacks at 12.2 km. have to be maintained by cutting it in a straight line. There are two landslides at 4.9 km and 13.1 km, which may stop regular flow of traffic particularly in the monsoon. Even though bio-engineering have been practiced in several places, it does not seem to be effective (Plate 5, 6, 7, 8)

## CHAPTER III

### ECONOMIC IMPACTS

#### 3.1 Introduction

Dhading is a mountainous district with its connection to the national strategic road network. Moreover, the district headquarters of Dhading has been connected to the strategic road network with an all-weather road very recently with the completion of MDRP. The number of households in the influence zone of the MDR has been identified to be around 1,570 and 169 households were taken as sample after considering total benefited population. The road created had many economic impacts which are described in the following sections.

#### 3.2 Agriculture

Agriculture in the area of Malekhu Dhadingbesi Road (MDR) is comprised of cereals, vegetables, horticulture, herbal plants and livestock. The major cereal crops grown along the roadside are paddy and wheat in low lands and maize, potato, and lentil in uplands. The soil in the river valleys is fertile and crop yields are very high. The villages with direct access to Kathmandu have greatly increased production of vegetables as a cash crop. There has been growing trend for changing production of cereal crops into cash crops. Vegetables and fruits like mango, banana, citrus, litchi, jackfruits, papaya, and pineapple have become commercially attractive and are thus traded to Kathmandu, Malekhu, Narayanghat and other major towns of the country. The noticeable change in the cropping pattern before and after the construction of MDR is commercial cultivation of vegetables. The area is also becoming quite popular these days for silk cocoon and bee-keeping farming, particularly in Baharbote, Bairenitar, and Dhunganagaon. Different types of herbs are also produced in the area of MDR. Modern agricultural inputs like high yielding varieties of seeds, pesticides, insecticides, and chemical fertilizers are available in the influence area of MDR and agronomic practices change rapidly with the replacement of out-dated techniques of cultivation by modern techniques.

Several agriculture extension programs have been implemented by District Agriculture Development Office (DADO), which include:

- Seed improvement program,
- Silk cocoon production in Baharbote and Bairenitar,
- Bee keeping and honey production in Dhunganagaon,
- Demonstration trial of improved cereal and vegetable cultivation,
- Establishment of nursery and distribution of fruit saplings,
- Pesticides and sprayers distribution, and
- Provision of improved agricultural tools.

### 3.2.1 Cereal Crops

Paddy and wheat are grown in the river terraces while maize and millet are grown in the upland hill slopes. Potato and vegetables are grown in suitable locations of both areas. The notable change in cropping pattern has been observed in Parewatar, Dhobhantar, Phisphisetar, Taktake, Nibuwaswara and Patle, particularly, commercializing vegetables. The change is pronounced in the fact that of the total crops production of 724.98 metric tones, cash crop production stands at 63.14% and cereal crop production stands at 36.86 %. This is a significant change in the sense that the total production of cash crops by the sample households alone is just short of the total production of the District in 1994/95 which has been quoted by ITECO in its feasibility study. Comparatively, significant changes took place in vegetables cultivation. The potentiality of commercial cultivation of vegetables in most of the land along the roadside is very high, as the road has created accessibility to the market for the product.

Major cropping pattern in the area of MDR can be highlighted as:

#### **High Land**

- Maize
- Mustard/Wheat/ Potato/Millet/Lentil
- Potato/Maize
- Vegetables-Vegetables
- Maize-Millet-Potato

#### **Low Land**

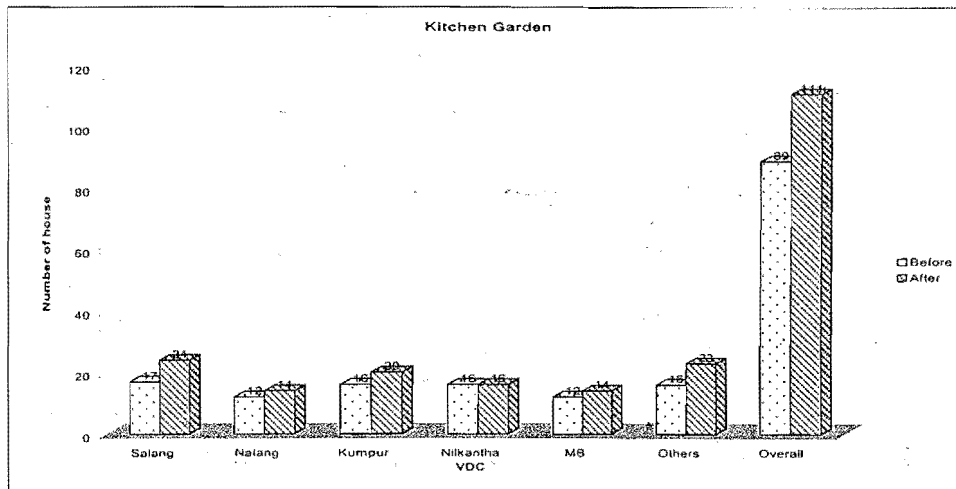
- Paddy-Wheat/Potato/Lentil-paddy.
- Paddy-Vegetables/Wheat/Maize
- Paddy-Mustard/Lentils/Wheat-Maize
- Paddy-Paddy

Many households resorted to changed agricultural pattern after the construction of the road. The commercial cultivation of vegetables in most of the plain land along the roadside is very high, as the road has created accessibility to the market for the product. Cropping pattern has increased by 33.65 percent after the road was constructed.

### 3.2.2 Kitchen Garden

Households cultivate green vegetables, mainly, beans, peas, cucumber, potato, pumpkin, tomato, radish, and bitter gourd. After the construction of the MDR, changes have also taken place in the practice of kitchen garden. The number of households having kitchen garden has increased by 13 percent which was around 52.7 percent before the road was constructed.

Figure No. 4

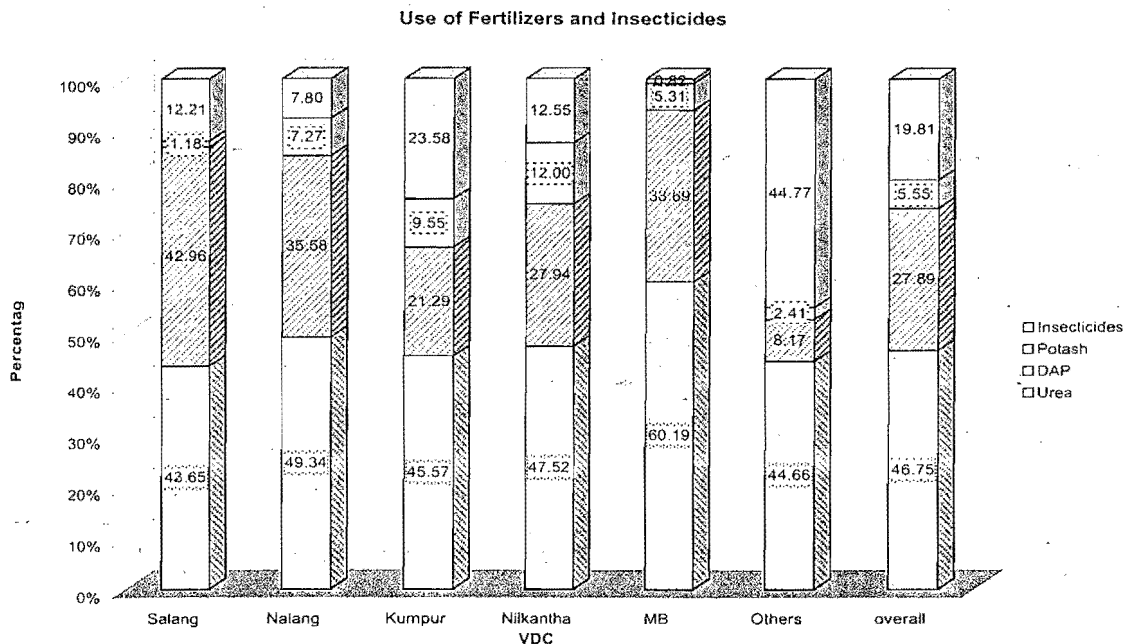


Source: Household Survey, 2003.

### 3.2.3 Use of Modern Inputs in Agriculture

After the construction of the MDR changes have been noticed in the use of high yielding varieties of seeds, pesticides, insecticides, and chemical fertilizers. Of the total expenditures on agricultural inputs, the distribution of the expenditure among different categories of fertilizers varies from VDC to VDC. Majority of the expenditures in fertilizers goes to the use of Urea. Murali Bhanjyang spends three-fifths of the total expenditure in Urea followed by Nalang (49.34 %) and Nilkantha (47.52%). Similarly, DAP occupies the highest share in Salang (42.96%) followed by Nalang (35.58%). The use of insecticides is highest in Kumpur VDC followed by Nilkantha. Figure No. 5 gives the details of the use of fertilizers and insecticides.

Figure No. 5

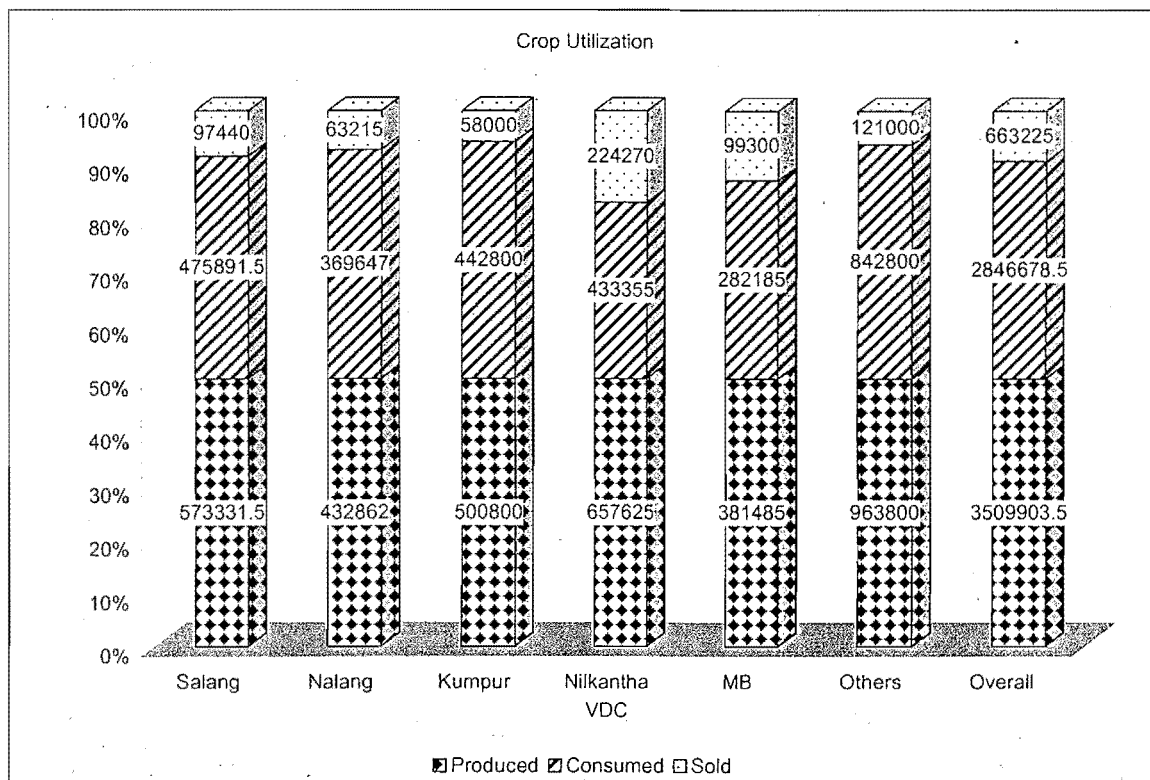


Source: Household Survey, 2003.

### 3.2.4 Crop Utilization

Some change in crop utilization has also been observed after the construction of the MDR. Looking back at the records of production, consumption and sales, it is found that last year the total production, consumption and sales of crop amounted to NRs 3,509,903, NRs 2,846,679 and NRs 663,225 respectively. Nilkantha VDC has the record of selling cereal crops equal to NRs 224,270 and Kumpur sold the smallest amount of it for a value of NRs 58,000.

Figure No. 6



Source: Household Survey, 2003.

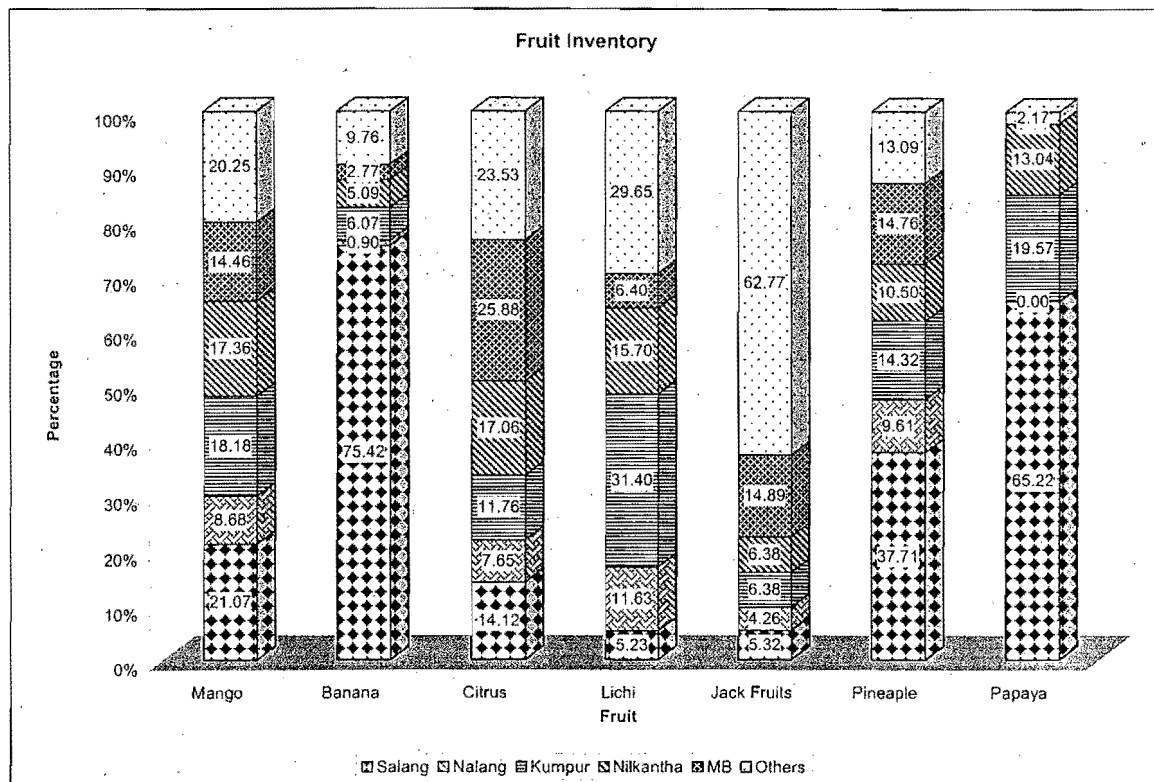
### 3.2.5 Fruit Cultivation

The information provided by the key informants and the FGDs has shown that the prospects of fruit cultivation in the area of MDR is very high. People's interest in fruit cultivation is also increasing in the study area. The construction of MDR has increased the commercial cultivation and transportation of these fruits in the Kathmandu Valley, Malekhubazar, Narayanghat and markets in the Terai region.

Since the climatic condition and type of land of this area is very suitable for banana, pineapple and citrus. Salang and Murali Bhanjyang are leaping forward in fruit cultivation. The cultivation of fruits has increased significantly. Figure 7 shows that Salang produces three-fourths of total banana production of the study area and about two-thirds of total papaya production. Similarly, about two-thirds of total jackfruit production

is obtained from other areas (VDCs other than Nalang, Salang, Nilkantha, Murali Bhanjyang and Kumpur). Likewise, Lichi is the Major production of Kumpur.

Figure No. 7

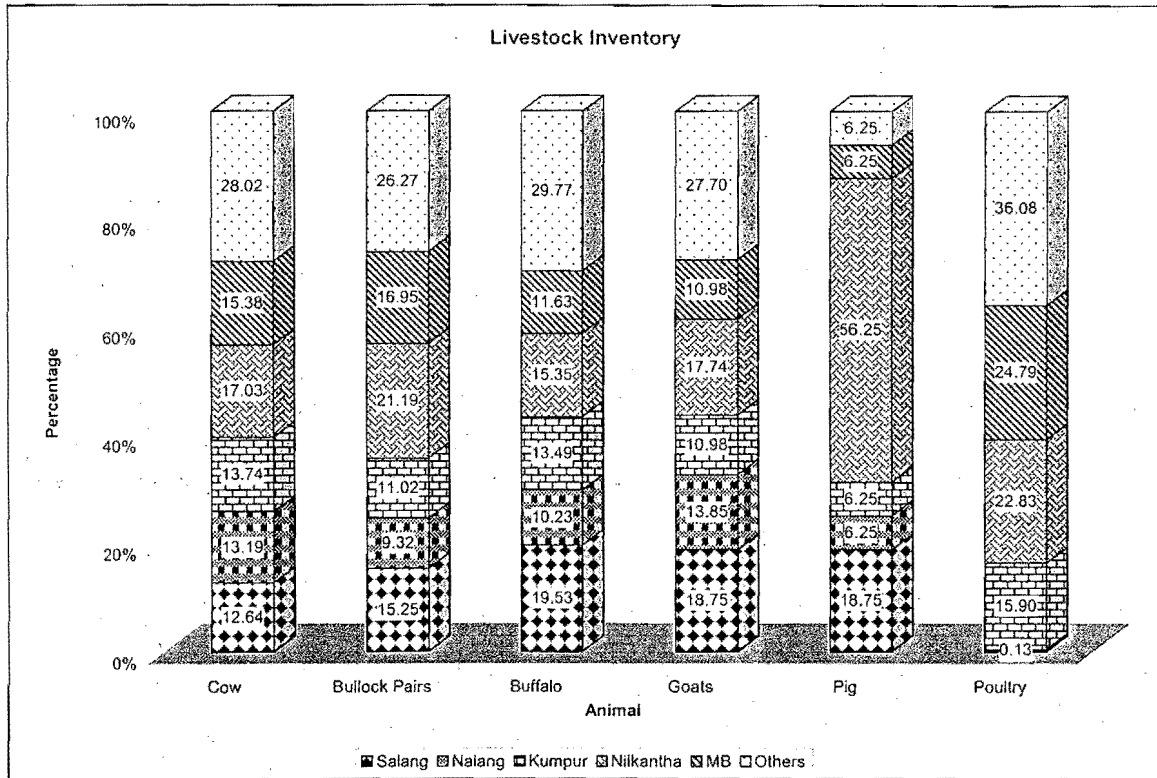


Source: Household Survey, 2003

### 3.2.6 Livestock

Farmers usually rear cattle, bullock pairs, buffaloes, goats, pigs, poultry and other domestic animals to meet their requirement of meat, milk, egg and manure. From the discussions with the Focus Group participants and the information obtained from the household survey, it has been found that most of the cattle and buffaloes reared in the area are of local varieties. So productivity of livestock has been low. But farmers are aware of potential economic opportunities from the livestock. So the progressive farmers of the area should be motivated for commercial livestock farming by replacing the traditional varieties of livestock by improved varieties. Especially the experience of Ilam district should be capitalized in this area for the livestock development. In Ilam the cultivation of vegetables and cash crops led to the development of fodder trees and that led to the promotion of livestock development. Details of the distribution of livestock can be obtained from Figure 8.

Figure No. 8



Source: Household Survey, 2003.

### 3.3 Industry

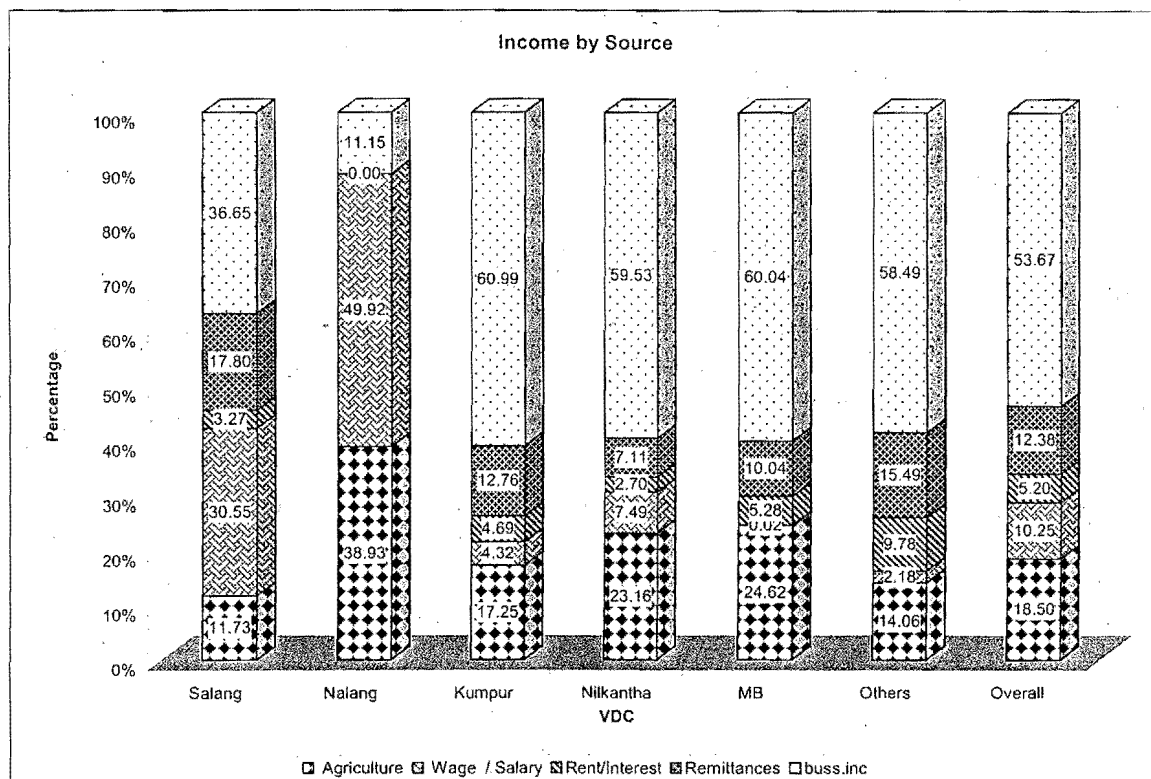
The zone of influence has abundant prospects for slate and quartzite mining industries. A slate industry is operating at Kalidaha. The construction of the MDR has facilitated the use of vehicles at competitive cost. This has helped to develop vehicles repair centers at Dhadingbesi. Less than 1 % of the households have their own micro enterprises such as water mill and bamboo products. However, most of the entrepreneurs lack technical knowledge to increase their productivity and marketing knowledge to promote their products. The market expansion for the slates produced by Kumpur Slate Industry due to low transportation costs and easy transportation has led to increased output of the industry. The direct employment generated to the local people fluctuates in the range of 30-50 laborers depending upon the demand for slates which shows seasonal fluctuation.

### 3.4 Income Pattern

Though agricultural sector has been playing a significant role in the total household income of the study area, but after the construction of MDR, the dominance of agricultural sector has been replaced by business sector. In recent years employment within the country and abroad has been attracting significant number of working youth of the area. Remittance stands at a significant level. Industrial activities are almost non-

existent in the area of MDR. Economic activities which generate income include agriculture wage, rent, interest, remittances and business.

Figure No. 9



Source: Household Survey, 2003.

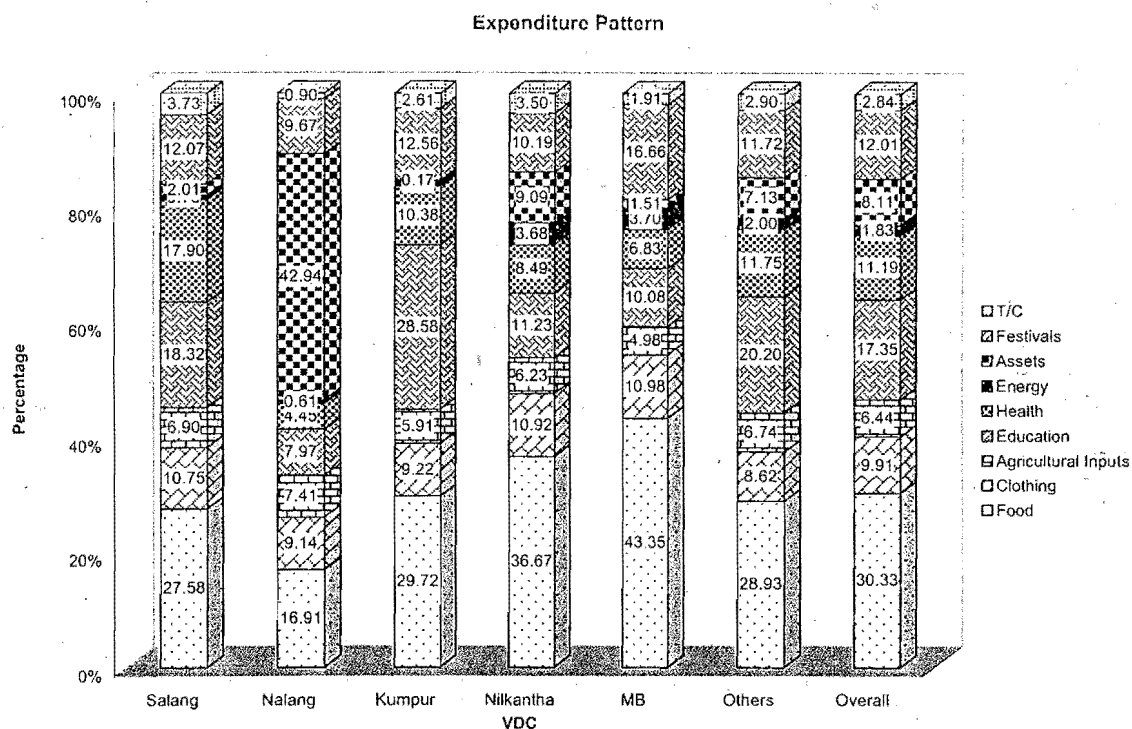
On the whole, about 54 per cent of the total income of the study area comes from business. Businesses include those related to the supply of consumer goods as well as local traders of vegetables who purchase the locally produced vegetables for very cheap price. Businesses are followed by agriculture (18.5%). This general trend applies to all areas except for Nalang where about 50% of the household income comes from wages.

### 3.5. Expenditure Pattern

Noticeable changes have occurred in the expenditure pattern of the households of the study area, especially in food, education, health and festivals. The size of household expenditure is found to be highest in Salang followed by Nilkantha. Different items comprising the expenditure of the households in the zone of influence are food, clothing, purchase of agricultural inputs, education, health, purchase of energy, purchase of assets, festivals and transportation and communication.

Data on expenditure pattern exhibit that about one-third of the total expenditure is spent on food followed by purchase of agricultural inputs (17.35%) and festivals (12.01%). Similarly, education, health services and clothing also occupy a significant share in household expenditures.

Figure No. 10



Source : Field Survey, 2003.

### 3.6 Amenities Purchased

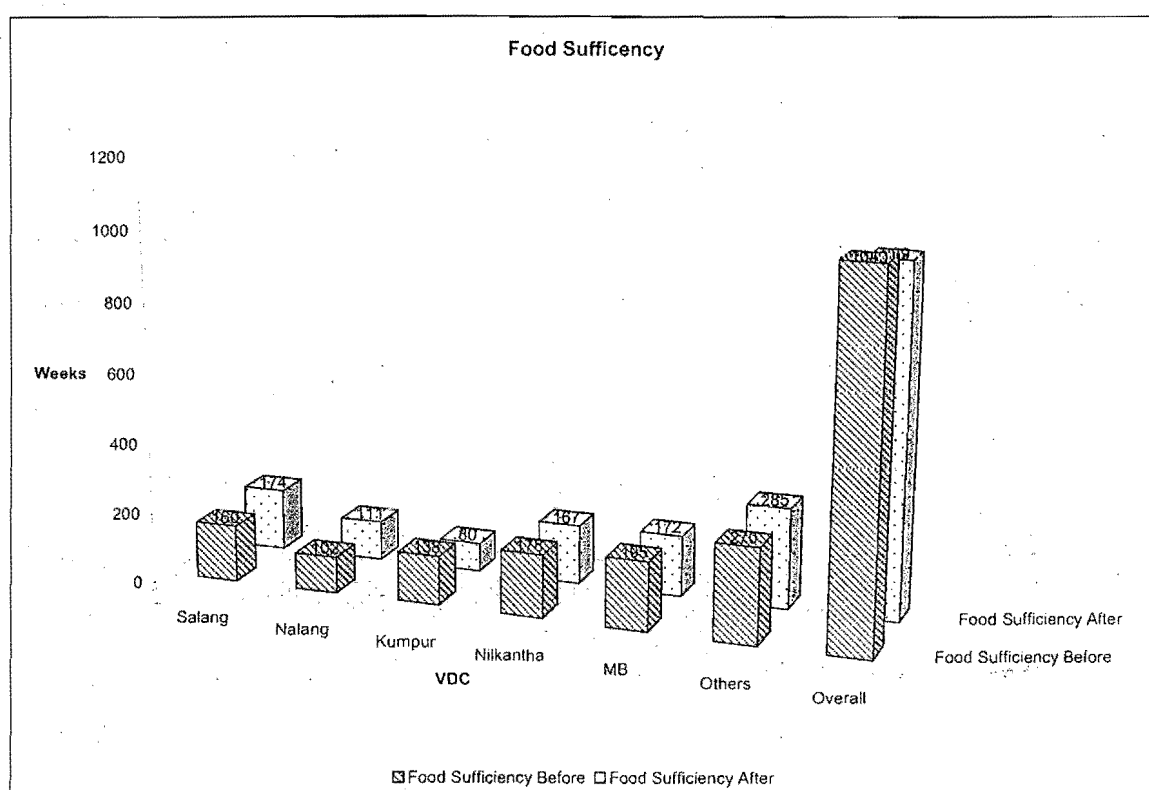
The construction of MDR followed by increased economic activities in the zone of influence has given opportunities to the households to increase their income from sources other than the traditional ones. The provision of electricity to the households in the settlements adjoining to MDR has changed the consumption pattern as well. The observation of the Study Team reveals that almost 120 households in the settlement adjoining the Road are using electricity for meeting their energy requirements other than cooking fuel. Increased income coupled with changing pattern of consumption has brought about remarkable changes in the purchase and use of physical facilities vehicles, domestic appliances like TV, VCD/VCR, radio, rice cooker, washing machine, refrigerator, fan, heater, etc.

### 3.7 Food Sufficiency

The direct impact of MDR can be seen in food sufficiency. The percentage of households with food sufficiency from own agricultural produce has declined after the construction of MDR. This could be due to shifting of households from farm economy to market economy system as the construction of road has opened up the door for new opportunities which provide higher benefits than the traditional agricultural sector. There might be increasing tendency of discarding traditional cereal producing agricultural practices and adopting the practice of producing cash yielding crops like vegetables, most of which enters the market. Another plausible reason behind increased food deficiency is

that literate young generation is inclined to seek jobs other than their engagement in agriculture. The information provided by the household survey on the sources to manage food insufficiency also reveals that business along with remittances has become the major source to combat food insufficiency after the construction of MDR. The share of pensions and remittances from employment along with the benefits of currently employed service holders has also been significant in this respect. Figure 11 reveals that before the construction of MDR, there was food balance for over six months but after the construction of the road, the amount of food production declined to meet the requirements of just over five months only. The average period of food sufficiency was less than before. Even though the change is of less than one percentage points, the decline in food sufficiency in the last couple of years is indicative of increasing shortage of locally produced food in future when more land used for production of cereal crops is used for producing vegetables.

Figure No. 11



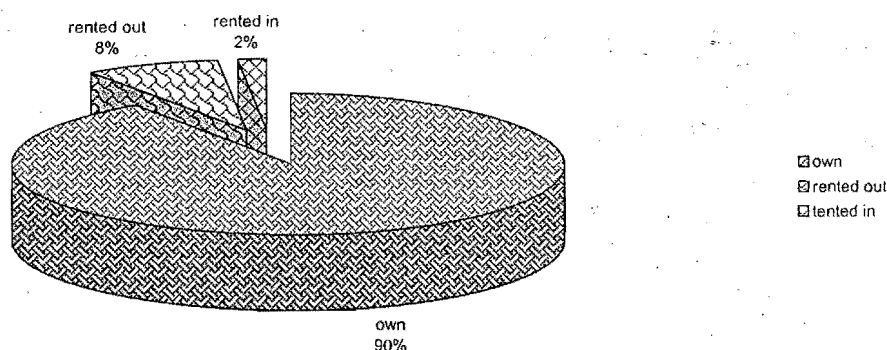
Source : Field Survey, 2003.

### 3.8 Land Ownership

Information obtained from the household survey gives very small size of land holding. Private ownership is the dominant form of land tenure where nine-tenths of land is owner-cultivated. The following figure demonstrates land holding by type.

Figure No. 12

Land holding by Type



Source: Field Survey, 2003.

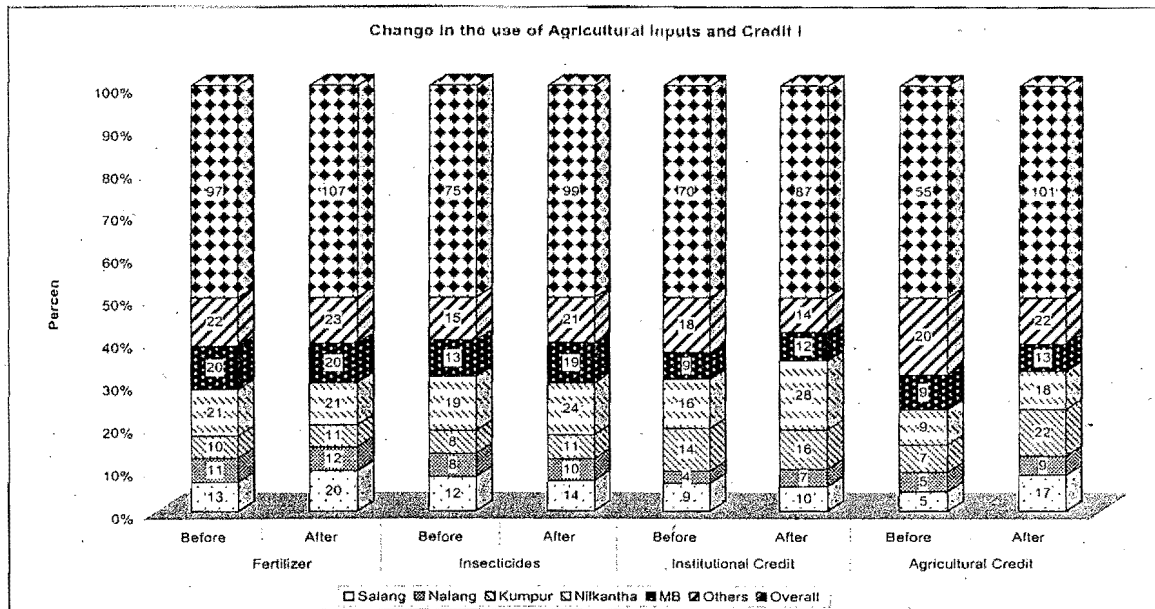
The per capita land holding, as is found during the household survey, is 2.23 ropanies in own land category, 0.19 ropanies in rented out category and 0.04 ropanies in rented in category.

### 3.9 Credit

Before the construction of MDR, there was dominance of traditional sources of agricultural credit like landlords, village moneylenders cum traders and retailers, who charged exorbitant rate of interest. But after the Road construction, some change in this respect has taken place. Institutional sources of agricultural credit have replaced the traditional sources to some extent, particularly in most of the settlements along the Road side. This is mainly because of reduced travel time to reach the banks and other financial institutions.

Before the construction of MDR, 70 households had their accession to agricultural credit. The completion of the Road has enabled 17 additional households to find their accession to agricultural credit through organized sector which is an increment of 24.29 % in the number of agricultural credit users.

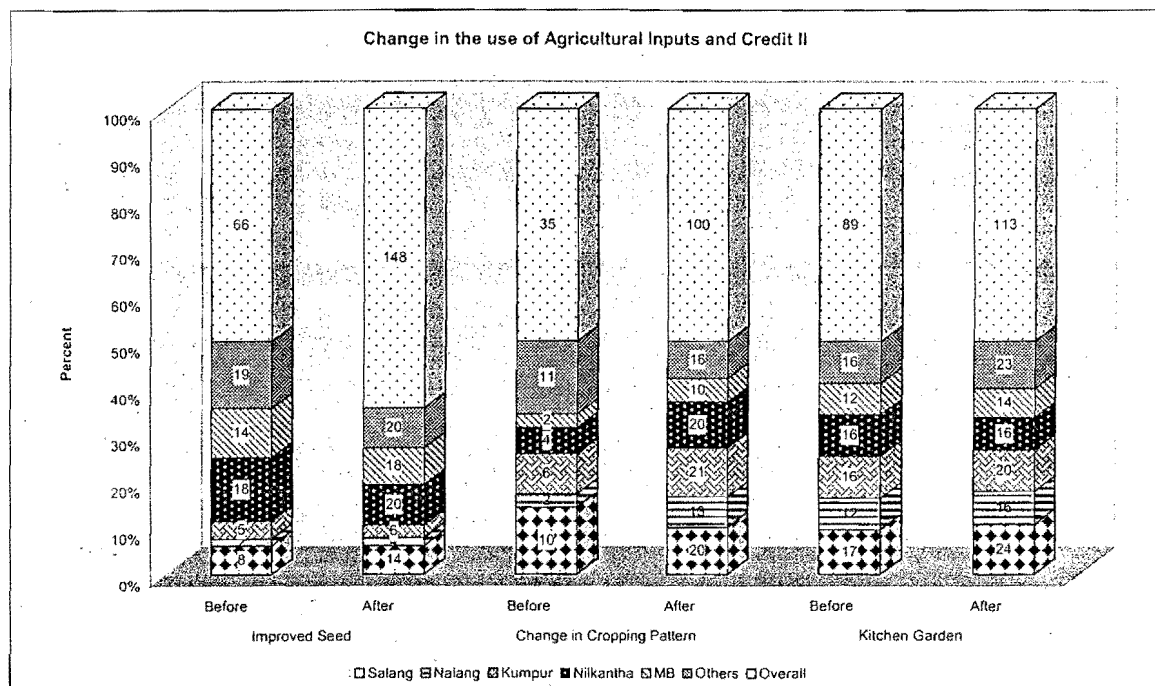
Figure No. 13



Source: Household Survey, 2003.

Institutional credit includes in the area, particularly banks-NBL, RBB, ADB/N, co-operatives etc. There is notable change in credit pattern which have replaced to a large extent traditional source of credit like landlord, village money lender, trader, and retailer. Before the construction of MDR, 55 households used institutional credit for purposes other than in agriculture. After the completion, 101 households are found to be using such credits. This shows a rise in the proportion of institutional credit users by remarkable 83.63%.

Figure No. 14



Source: Household Survey, 2003.

### 3.10 Trade and Commerce

The construction of the Road has made Dhadingbesi the major market centre for the people of northern and western parts of the district along with the majority of the population in the adjacent VDCs of Gorkha district due to reduced prices of commodities. Current exports from the district include vegetables, butter, goat and sheep skins, honey, and medicinal herbs. Transportation of necessary items required for existence and construction materials into the study area have also been easier and cheaper by the construction of the Road.

### 3.11 Transportation

The upgradation of the MDRP has resulted into a significant reduction in the transportation cost. As per the information obtained from the FGDs, Key Informant Survey and household surveys, it was found out that the one-way bus fare was Rs. 35 from Malekhu to Dhadingbesi (and vice versa) before the upgradation of the road while it came down to Rs. 20 after the completion of blacktopping. However, with the increase in the price of petroleum products four months ago, the fare has hiked to Rs. 25.

Likewise, transportation cost of goods from Narayanghat to Dhadingbesi is 60 paisa per kg, which is now a 25 percent reduction in the cost that existed before the road was blacktopped. Similarly, the entrepreneurs in transportation sector revealed a 20% reduction in the maintenance and operation costs of the vehicles.

### 3.12 The Hinterland

The household survey also covered the hinterland of the MDRP. The hinterlands of MDRP have shown dual responses. Especially in those areas connected to MDR through fair-season motorable roads, the agriculture has shown encouraging responses due to easy and economic transportation of vegetables, fruits, fertilizers and other commodities. In the areas without local feeders, the response is negligible.

The upgradation of the Road and construction and rehabilitation of the bridges has begun to show some positive impacts in the pattern of travelers. The people of adjoining VDCs of Gorkha and Nuwakot along with the tourists destined to Ganesh Himal have begun to use this road for traveling and transportation purposes. This has increased the magnitude of local business operation in the hinterland beyond Dhadingbesi.

### 3.13 Maintenance and Cost Recovery of the Road

Six workers are employed to carry out the routine maintenance of the Road. But they are not getting their salary for the last three months due to the lack of financial resources. The project cost including the construction and maintenance of the bridges over Thopal Khola and Trishuli River is very high. The actual cost of this 17.5 Km road is Rs. 608 million including the construction bridges over Trishuli and Thopal Khola as of the information obtained from ITECO final report. Since the Road extends along a poverty stricken settlement, the idea of cost recovery is not justifiable. However, *Pay Roll /Toll Taxes* should be imposed to cover routine maintenance of the Road under *User's Pay Principle*.

### **3.14 Land Encroachment and Compensation**

The Road runs along the Besi on the banks of Thopal Khola. The majority (almost 80%) of the land on which the Road is constructed was under the private ownership in early sixties and was used for farming. The land is still under private ownership. The individuals are not compensated for the land encroached for the road construction, but they are still paying land taxes to the government. This has produced a negative impact on the well being of the locality. In addition, the people whose land was encroached do not have a positive opinion on the project. During the FGDs, the study team found some people who were compelled to give up more than 50 per cent of their total land holding in the year 1970.

### **3.15 MDR and Poverty Alleviation**

MDR is the major infrastructural construction between Malekhu and Dhading. The construction of the Road has not only increased the incentives for a change in agricultural pattern from market considerations, it has expedited social mobility and interaction leading to higher awareness. The changed agricultural pattern, seeking jobs out of the locality due to social interaction and mobility, expansion of business opportunities etc have led to increased income, which, coupled with higher awareness of the society, has contributed a lot in reduction of poverty of rural masses. The adverse consequence of the construction of the Road is the incidence of labor substitution (of porters) which has increased the incidence of poverty among the landless households and the households who were working as porters seasonally. FGDs revealed that around 300 porters were totally displaced and were compelled to seek jobs outside Dhading and abroad in some instances. Thus, despite a significant contribution of MDR in the expansion of economic activities, the improvement in the scenario of poverty is yet to improve.

### **3.16 Employment Generation During Construction**

The construction of the Road was carried out from 1968/69 through the year 2002. In the early phase of the construction, people participated in the construction works voluntarily. When the upgradation began in late nineties, however, some forty to fifty people were given opportunity to work for the MDRP at different capacities, the majority of them being low-paid construction workers. Since the employment opportunity was available for just a couple of years, the remuneration/wage of the workers was spent on maintaining household activities. In lack of opportunities in spending on locally produced goods and services, the retention ratio of such money was small and this has brought about a negligible change in the quality of life in the catchments of MDRP.

### **3.17 Summary of the Discussions with Focus Group**

The FGDs were conducted with a view to achieving correct information about the effectiveness of investment on Malekhu-Dhading road in general and the impact of the road on socio-economic activities in particular. In this connection, total four focus group discussion were organized and conducted. The FGDs conducted, represents local people, leaders of political parties, teachers, social workers, businessmen and local elite.

The study team members discussed with the officials of the government offices and District Development Committee, members of the Chamber of Commerce, and the

NGOs and CBOs of Dhading districts on the selection of the settlement for FGDs and household survey. They all ratified that selection of settlements for the survey by the consultant is appropriate for generating the information sought.

At Phisphisetar, the FGD was conducted with the participation of the political leader, businessmen teachers, students, and farmers living in Kumpur and in adjoining settlements. The meeting was organized with the help of social workers. The location was selected due to the entry point of the MDR, 1,300 meters away from the Prithvi Highway.

At Murlibhanjyang too the FGD was conducted with the participation of the teachers, farmers, servicemen, and the housewives. The meeting was organized with the help of local people. The location was selected due to the adjoining point of Dhadingbesi 3 KM behind from the market center.

At entry point of Dhading market center, the FGD was conducted with the active participation of the social workers involved in the Integrated Community Development Center, Combat against Human Trafficking and Federation of NGO's-District branch. The location was selected due to the concentration of NGOs offices in one particular center.

At central market place of Dhading the FGD was conducted with the participation of the businessmen, teachers, advocates and servicemen who have had long experience of business before and after the construction of Malekhu-Dhading Road. The location was selected because of central market center.

MDR directly and indirectly affects people living in these selected locations. Furthermore most of the centers act as the market nodes to serve a wide hinterland. In all FGDs, the consultant was assisted and supervised by the officer from the Central Monitoring and Evaluation Division (CMED) of National Planning Commission Secretariat. The names of the participants of the FGDs are given in Annex 2.

### **3.17.1 Summary of Key Informants Survey**

The study team members also interacted with a number of key informants to assess the advantages and disadvantages of the investment in MDRP. The interaction also provided a lot of insights into the commercially attractive activities that can be carried in the area to utilize effectively the road. The tremendous benefit could be derived from agriculture and industries in different locations such as development of the carpet and garment industries, development of agro-based industries in Parewatar, quartzite mining in Nalang and Salang VDC, slate mining in Kumpur VDC. The key informants represent officials from Government Organizations (GOs), Non-Government Organizations (NGOs) and Community Based Organisations (CBOs).

The list of key informants with whom interviews and interactions were conducted is given in Annex 3.

### **3.18 Conclusion**

It has hardly been two years since the MDR has been blacktopped. Everyday thirty two buses ply to and fro on road. Each bus does two trips per day. Thus the construction of the road has facilitated transportation of 2304 passengers. Hundred metric tonnes of goods is transported to different parts of the district and almost same amount is transported out of Dhading everyday. The passenger transportation cost had been reduced

by 42.85 percent right after the upgradation of the road. But with the recent hike in the price of petroleum products, the bus fare has again increased by Rs. 5, which has resulted into a net reduction in bus fare by 28.57 percent. The saving of the passengers in the poverty stricken area is used in financing their other necessities. Almost 90,000 people of Dhading including the residents of adjacent VDCs of Gorkha District are benefited directly.

Reduced transportation cost of the goods has laid to a competitiveness of locally produced goods in the market of Kathmandu, Pokhara and Narayanghat. This has, no doubt, given the farmers using traditional tools and techniques sufficient incentives to use modern agriculture inputs such as high yielding seeds, chemical fertilizers, insecticides and agriculture equipments and go for a change in the pattern of agriculture. But it is noticeable that agriculture sector is being transformed slowly and is being dominated by market oriented practices. Along with this change in agriculture, the business sector has begun to outstrip the share of agriculture in the livelihood of local people which is reflected in the share of business income in the total income of the study area.

## CHAPTER IV

### SOCIAL IMPACTS

#### 4.1 Demographic Situation

According to the population census of 2001, the projected population living in the immediate influence area of the MDR numbers to about 35,591. Among that population 17460 are males while the remaining 20,730 are females.

The number of households in the immediate influence area of the MDR has been identified to be 1570 and 169 households were taken as sample size after consideration of total benefited population. Table 2 shows the demographic structure of the sampled households according to their respective Village Development Committees (VDCs).

The household survey indicates that 59.2 percent of the people are in 15-59 age group. Only 8.2 percent people are above 60 years of age and around 8.9 percent are under 5 years. Around 26.7 percent of the population is school going children aged between 6-14.

Table 2: Demographic Structure  
(Percentage)

VDC		Sex				Age -Group	
		0-5	6-14	15-59	60+	Total	
Salang	M	7.69	38.46	42.50	3.84	100	
	F	3.70	40.74	44.44	3.70	100	
	T	5.76	40.38	48.07	5.76	100	
Nalang	M	4.16	4.16	79.16	12.49	100	
	F	10.00	15.00	70.00	5.00	100	
	T	6.81	9.09	75.00	9.09	100	
Kumpur	M	15.78	31.57	42.10	10.52	100	
	F	11.11	27.77	55.55	5.55	100	
	T	13.51	29.72	48.64	8.10	100	
Murali Bhanjyang	M	17.85	21.42	53.57	7.14	100	
	F	15.00	15.00	65.00	5.00	100	
	T	16.66	18.75	58.33	6.26	100	
Nilkantha	M	5.79	31.88	53.62	8.69	100	
	F	2.89	2.43	60.97	9.75	100	
	T	5.94	32.00	61.37	0.99	100	
Total	M	9.10	16.20	56.00	0.70	100	
	F	8.60	27.50	63.79	7.75	100	
	T	8.90	26.70	59.20	8.20	100	

Source: Household Survey, 2003

## 4.2 In-migration Pattern after the Construction of the Road

The in-migration pattern has been calculated taking into account only the areas adjoining the road. The settlements have increased along the roadside because of better economic opportunities provided by the road. However, it was not so, in the case with areas lying up and away from the road.

Table 3: In-migration After Road Construction

Area	Number	Percentage Migrated
Parewatar	4	36.36
Phisphisetar	3	33.33
Samaitar	8	61.53
Bunchung	11	64.70
Kalidaha	7	38.88
Shashatar	5	45.45

Source: Household Survey, 2003.

The main reason for in-migration along the road was reported to be better economic conditions which were followed by better schooling opportunities for children and reduced time and cost in traveling and doing business. However, despite the opportunities provided by the road, migration along the road was seen to have taken place by the people who had land adjoining the road. This point was more pertinent to respondents of Samaitar and Bunchung.

Table 4: Reasons for Migration  
(Percentage)

Reasons/Area	Parewatar	Phisphisetar	Samaitar	Bunchung	Kalidaha	Shasatar
Better opportunity for schooling children	57.3	63.5	47.2	63.1	37.7	52.2
Better accessibility to health service	69.4	52.7	51.8	48.9	31.2	27.6
Better economic activities	92.8	84.3	63.1	88.9	93.7	43.6
Time and cost saving in traveling business	63.4	57.2	32.8	59.3	52.7	28.1
Others	1.2	3.5	17.1	12.3	9.7	6.5

Source : Household Survey, 2003.

(Note: Figures do not add up to hundred percent due to multiple choices).

## 4.3 Educational Status of the Sampled Households

The literacy rate of the sampled households is 76.64 percent, which indicate high rate of literacy in comparison to the overall literacy rate for the district. The literacy rate for Dhading district has been put to 48 percent.<sup>1</sup> Likewise, girls schooling has increased by 6.47 percent after the road was constructed. Nonetheless, 16.47 percent of the girls who are of school going age still do not go to the schools.

<sup>1</sup> Nepal District Profile, Census 2002, CBS.

Table 5: Educational Status of the Zone of Influence

Total literacy rate of the sampled household (in %)	Total illiteracy rate of the sampled household (in %)	Girls Schooling		Girls not attending school (in %)
		Before (in %)	After (increase in %)	
76.64	23.35	77.50	6.47	16.47

Source: Household Survey, 2003.

Table 6: Ratio of M/F Educated

Sex	Literate			
	School	Campus	University	Others
Male	57.0	78.0	75.0	48.4
Female	43.0	22.0	25.0	52.6
Total	100	100	100	100

Source: Household Survey, 2003.

According to Table 6, the ratio of males attending school is about 57.0% while the same for the females is 43%. Likewise, with regards to campus and university education males show a higher rate of ratio than the females. However, with respect to other categories other than formal education, females have a higher ratio than the males. This can be attributed to the fact that several NGOs in the past had run adult female literacy classes.

#### 4.4 Health and Sanitation

After the construction of the MDR, it can be inferred that health awareness has increased. Though the awareness cannot be solely due to the road, the road has definitely played a part by making the health centers in Gajuri and Dhadingbesi more accessible. From the FGD and key informants survey, it has been found more people have been using the health facilities after the construction of the road. The rate of increase in literacy rates has something to do with different non-governmental organizations working in community forestry and drinking water schemes as well. It has been found out those households using dehydration powder during diarrhea has increased by 14.11 percent but only a small change has occurred in the use of safe drinking water. Likewise, changes have also occurred in the number of households using toilet facilities. The toilet facilities have increased by 15.38 percent after the construction of the road, which was around 52.25 percent before the road was constructed (Table 7). Number of households using health facilities have increased by 13.36 percent (Table 7), the increase has been brought about by the construction of the road and the transport facilities. However, significant number of households away from the road and lying up in the hill still make use of the traditional faith healers.

Table 7: Improvement in Health and Sanitation

Details	Before (%)	After (% increased)	Never (%)
Use of dehydration powder	70.58	14.11	15.29
Use of safe drinking water	74.70	5.88	19.41
Existence of toilets	52.25	15.38	31.36
Access to health facilities	50.89	13.36	34.75

Source: Household Survey, 2003

(Figures do not add to 100 percent due to multiple choices)

#### 4.5 Existing Gender Relations in the Zone of Influence

With regards to gender relations in term of household activities, the areas under the zone of influence do not show any significant changes. This can be attributed to the fact that women all over Nepal share a maximum percentage of work when it comes to household activities. From Table 8 it can be inferred that women bear most of the burden of the household work than their male counterparts.

In household activities like cooking food, it was seen that women share most of the burden in all the areas under the ZoI. Likewise, women dominate the percentage of work done in fetching water, fuel collection, caring of dependents than their male counterparts. As such there have been no significant changes in gender relations when it comes to household activities.

Table 8: Household Activities (in %)

VDC	Fetching Water		Fuel/fodder Collection		Food Cooking		Caring Dependent		Purchase of Goods	
	M	F	M	F	M	F	M	F	M	F
Salang	37	63	35	65	27	73	49	51	51	49
Nalang	32	68	26	74	10	90	33	67	53	46
Kumpur	42	58	52	48	22	78	34	66	53	47
Murali Bhanjyang	8	92	19	81	4	96	8	92	50	50
Nilkantha	27	73	63	68	13	87	36	64	49	51

Source: Household Survey, 2003.

Agricultural activities also do not show any significant changes in gender roles. Women of this area, as elsewhere in Nepal, carry out the minute works like threshing, weeding and processing. In comparison to the men in terms of agricultural activities women's share of work is much more than the men as seen from Table 9.

Table 9: Agricultural Activities  
(Percentage)

VDC	Land Preparation		Manuring		Weeding		Irrigation		Harvesting		Threshing		Transporting		Storage		Processing	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Salang	45	55	33	63	41	59	43	57	41	59	53	47	69	31	31	69	37	63
Nalang	56	44	51	48	50	50	72	28	50	50	63	34	73	27	54	46	32	68
Kumpur	57	43	48	52	41	59	74	26	56	44	62	38	78	22	42	58	24	76
Murali Bhanjyang	44	36	21	79	20	80	56	24	47	53	49	71	77	33	37	63	20	80
Nilkantha	50	50	32	68	41	59	47	53	47	53	56	44	60	40	47	53	33	67

Source: Household Survey, 2003.

##### 4.5.1 Ownership over Property

As seen from the table below, it clearly indicates that apart from access<sup>2</sup> to property, women do not have any control<sup>3</sup> over the property. The ownership of the

<sup>2</sup> Access means to have the opportunity to use resources without having the authority to decide about the produce/output and the exploitation methods.

<sup>3</sup> Control means to have full authority to decide about the use and the output of resources and impose that definition on others.

property falls entirely on the domain of the males. Apart from some domestic animals like goats and poultry, women of the sample areas do not have any control over livestock. The only visible sign of control over property by women rests on the ornaments they have, which have been conferred to them by their house during marriage as "pewa". The control over the property such as house, land, cash and bank deposits falls entirely on the domain of the males or household heads, who are predominately males.

Table 10: Ownership Over Property  
(Percentage)

VDC	Land		House		Cash		Livestock		Bank Deposit		Ornaments		Total	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Salang	100	0	100	0	87	13	73	27	91	9	20	80	78.5	21.5
Nalang	100	0	100	0	92	8	60	40	100	0	26	74	79.7	20.3
Kumpur	100	0	100	0	95	5	62	38	85	15	25	75	77.8	22.2
Murali Bhanjyang	100	0	100	0	80	20	53	47	97	3	14	86	74	26
Nilkantha	100	0	100	0	76	24	40	60	95	5	9	91	70	30

Source: Household Survey, 2003.

#### 4.5.2 Decision Making Process

As seen from Table 11, women do not have any significant capacity when it comes to making decision regarding the sale of land and agricultural products, borrowing of credits etc. The decision making capacity is solely vested on the males or the male household heads. These observations show that even after the construction of the road there have been no such changes in the area of generating awareness with regard to family health for the fact that even in matters regarding family planning; the male members of the family have the upper hand. Though women contribute significantly in the agricultural activities, they do not possess the capacity to take decisions regarding the sale of agricultural products and selection of seeds. Thus in the decision making process as well it is heavily tilted in the favor of the males.

Table 11: Decision Making Process  
(Percentage)

VDC/Activities	Sex	Salang	Nalang	Kumpur	Murali Bhanjyang	Nilkantha	Total
Selection of seeds	M	70	80	90	60	55	71
	F	30	20	10	40	45	29
Sale of produce	M	85	80	90	80	60	79
	F	15	20	10	20	40	21
Sale of livestock	M	80	90	100	70	70	82
	F	20	10	0	30	30	18
Borrowing credit	M	95	100	100	90	80	95
	F	5	0	0	10	20	5
Sale of land and house	M	100	100	100	100	100	100
	F	0	0	0	0	0	0
Child education	M	65	90	85	80	50	74
	F	35	10	15	20	50	26
Family planning	M	55	60	90	95	55	71
	F	45	40	10	5	45	29

Source: Household Survey, 2003.

## **4.6 Community Participation**

The people living in this area are not new when it comes to participation. The entire road which is now blacktopped was first built using local labors where each household contributed voluntarily. There are several community based organizations active around the zone of influence. The most notable community based organization is the Forest User Groups (FUGs), which have contributed significantly to the conservation of forests. According to FGDs with the local populace, the community participated in the agricultural extension programs launched by the DADO and areas in which they were implemented showed that they are highly motivated to participate in such programs beneficial to the people. However, with the exception of the extension programs launched by DADO, there were no additional programs launched by the line agencies of the government.

As indicted by the discussions with the key informants and focus group participants, it was found that there was a dire need for programs of income generation, irrigation, tapped-water supply, cottage industries and electricity. The discussions also indicated that if such programs were to be introduced in the area, community participation would be very high.

### **4.6.1 Changes in Service Delivery and Access to Services**

Discussions with the government officials, key informants and focus group discussions indicated that service delivery by various organizations and access to services have been enhanced after the construction of the road due to the increase in the number of transportation vehicles plying on the road.

Major government institutions and private organizations all lie in Dhadingbesi, the district headquarters and NGOs are also providing services in the district, notably, the Danida funded Community Forestry Project.

Even though most of the government offices lie in the district headquarters, the flow of traffic on the road has made it very accessible. Discussions with the government officials have indicated that they have been able to render services effectively and efficiently. Moreover, according to personnel at the District Agricultural Development Office, several extension programs done in the past like bee keeping, silk cocoon production, distribution of food samplings and insecticides were done effectively due to the road. Private sector business has also expanded in the settlements adjoining the road.

The consultants also found a medical shop in Kalidaha, which lies at 9.8 Km from Trishuli bridge. This has cut down the travel time of the people in around areas like Bunchung, Samaitar, Bairenitar and other outlying areas like Baharbote, Archalalan, and Islan. Before the construction of the road, people generally bought from either Gajuri or Dhadingbesi and the outlying areas did not bother to buy medicines unless it was serious. Some people in Dhadingbesi have invested in transport business, which has facilitated the transportation of goods and passengers. Likewise, people in most of the settlements adjoining the road have invested in hotel and restaurants to provide services to the visitors and passengers coming all the way from some of the VDCs lying in Gorkha district. Though the number of NGOs operating in the ZoI is negligible, discussions with social mobilizers showed that due to regular transportation services on the road have made their task easy and cut the travel time to reach their target group.

FGDs with the local populace at different areas under the ZoI indicated that essential services like health, education and agricultural extension programs have become easily accessible in the study area after the construction of the road (Table 4). Discussions with the participants indicated that child mortality rates and maternal mortality rates have also decreased. Though this cannot be only attributed to the road, changing level of awareness has a role to play as well. However, the access provided by the road has come about as the main factor providing easy accesses to these services. Interviews with the people living in the hinterland like Phakphuk, Patlè, Thati Bhanjyang and other areas, where there is a rise in vegetable farming, have indicated that due to the construction of all-weather road, they have been able to sell their agricultural produce all season. This can be attributed to the fact that transport vehicles can now come easily to the pick-up points. The local populace sees the road as something that will introduce more development activities into the area, which will ultimately have a positive impact on their life. Thus from the FGDs and key informant interviews, it has clearly indicated that the local populace have benefited from the construction of an all-weather road in one way or the other.

#### **4.7 Conclusion**

As with most other infrastructure developments, roads create a potential for social change and development. The road access has significantly contributed in the health sector. This has been possible due to the transportation facilities, which have been opened up due to the construction of the road. According to information from the FGDs and key informants, it has been found that child mortality rates and maternal mortality rates have come down considerably. Though this aspect can be attributed to the growing awareness in the community due to the intervention of different sectors like NGOs, CBOs, but the road transportation has also provided the people with access to hospital services. Likewise, the use of toilet facilities have also increased considerably thus contributing to better sanitation facilities.

In terms of education, there has been an increase in the number of girls attending schools. Though this alone cannot be taken as an impact brought about by the road, however, the access provided by the construction of the road have played a role. Moreover, many students from the area are now going to Kathmandu for higher studies. Though migration has been somewhat restricted only to people having land adjoining the road, benefits in term of economic opportunities, access to better health and schooling opportunities will definitely lure more people from the hill to come down. Even now the people who have migrated down, near the road have been benefiting from it. The road has provided them with better economic opportunities, which will have a profound impact on their income level changes thus contributing to their standard of living.

Though there is an increase in number of women participating in community program, most notably the Community Forestry Program, there seem to be no significant changes in the gender relations. Women of the area bear the major percentage of task when it comes to household activities. And also in agriculture activities, women's workload burden is much more than the men. The gender relations is heavily tilted in favor of the male members of the society with women having almost no say in the decision making process and ownership of property. But changes are taking place slowly in the area as in the case of health and education and now with the construction of the road effective program can be introduced for social development.

## CHAPTER V

# ENVIRONMENTAL IMPACT OF MALEKHU- DHADING ROAD PROJECT

### 5.1 Introduction

The construction of the Malekhu-Dhading Road began in the mid-sixties under the auspices of Dhading District authorities. The most important feature of the process of construction is that it is one of the successful major road projects completed through people's participation. The sectors of the Road falling within each Village Panchayat were constructed through the voluntary participation of the residents of the people therein.

As is true with all construction works, the Malekhu-Dhading Road Project also has impact on the environment and its components. The study segregates the environmental impact into three chronologically ordered phases- pre-construction phase, construction phase and post-construction phase in line with the guidelines set up by the Geo-Environmental Unit, Department of Roads of His Majesty's Government of Nepal.

While going for the assessment of environmental impacts of the Road, we must restate again that the major investment in the Project was made in late nineties during the upgradation process of MDRP which constitutes the works related to converting the earth/gravel road into an all-weather bitumen road along with the construction of bridges over Trishuli and Thopal Khola and the culverts and cause-ways over other tributaries.

The environment-related findings of the study are discussed in the sections that follow.

### 5.2 Pre-construction Phase (1966 – 1997)

The pre-construction phase is recognized as the period extending from mid-sixties through the beginning of the upgradation works in late nineties. Since voluntary labour of local residents and traditional tools and equipments were used for tracing the Road, the environmental degradation due to workforce related activities, borrowing and earthworks etc were minimal. For this reason, local people have experienced no significant damage to the environment during this phase save the felling of the trees standing along the road under construction.

Toward the end of this phase, Dhading District witnessed an extensive practice of community forests followed by highly successful implementation that has more than offset the deforestation during the pre-construction phase of Malekhu-Dhading Road Project.

### 5.3 Construction Phase (1998 –2002)

This phase extends roughly for four years –the beginning of upgradation works in 1998 to the year of 2002, the year the contractor handed over the project to the Gajuri Site Office of Divisional Road Office, Bharatpur, Chitawan; a subordinate office of the DoR of HMG.

The German donor agency KfW had shown its interests in the upgradation of the Road by taking it as a Green Road Project. For this reason, the environmentally unfriendly activities like blasting dynamites which are likely to hamper the ecology of flora and, especially, fauna were exempted during the upgradation phase. However, the Project realized that it could not come to the completion without producing any environmental hazards. Therefore, the measures for the mitigation of the upgradation related hazards were taken as an integrated element of the Project and its cost. The major environmental impacts, mitigation measures and the relative effectiveness of the measures are discussed below.

### **5.3.1 Workforce Related Environmental Impacts**

**Hazard:** The workforce employed to carryout the upgradation-related activities was likely to generate income, diversity and nuisance to the local community. Some environment related serious damages were also anticipated – use of firewood as cooking fuel and fulfilling other energy requirements, transmission of diseases due to temporary settlements etc. The workforce, in addition, was likely to pollute water being used by local people for various purposes that increase the probability of spreading water bound diseases.

**Mitigation Measures:** In order to mitigate the likely hazards, the employment of local people was prioritized over the employment of immigrant workers. Since local people alone could not supply enough labor with required efficiency and technical know-how, the measures like supply of drinking water to labor camps were included in the contract paper.

**Implementation:** Even though supply of drinking water at workers camp and sanitation therein was included in the contract paper as the strict requirements, the implementation of this was weak. During the upgradation phase, the use of firewood for cooking purpose was higher than usual that exerted pressure on local forests due to the lack of provision of alternative cooking fuel.

### **5.3.2 Public Nuisance and Hazards Related Impacts**

**Hazard:** A house was to be demolished completely. Besides, the upgradation process produced the dust pollution in addition to that off the existing road. Several houses were cracked and increased construction related flow of traffic produced some fear. Even though it was unanticipated, widening of the road, in some instances, resulted into the encroachment of agricultural land.

**Mitigation Measure:** The affected people were to be compensated for the loss they incur, provided their lost land did not fall in the right of the road. Since most of the land encroached by MDRP fell within the right of the Road, majority of the affected households were not supposed to get any compensation. In order to dampen the nuisance due to dust pollution owing to increased flow of traffic in earthy road, water was sprayed over the Road regularly.

**Implementation:** The compensation to the damage occurred to residential houses as well as encroached agricultural land was not made properly. The people with their influence in local, district or national level politics received high albeit more than justifiable compensation where as the deprived people was devoid of receiving even a meager amount.

### 5.3.3 Borrowing and Earthwork Related Impacts

**Hazard:** The material borrowed from different paces and excess cut material deposited in areas along the road were likely to give rise to slit run off as well as soil erosion.

**Mitigation Measures:** Proper supervision and monitoring in the affected areas along with the compaction works were carried out. In order to reduce the hazards of soil erosion and slit run off, re-vegetation of the areas was carried out.

**Effectiveness:** During the construction, the initiatives and measures taken to eliminate the hazards were successful. Due to high gradient of the uphill, erosion and landslides have damaged the bioengineering itself. In addition, some potential areas for bioengineering to mitigate the hazards of soil erosion and slit runoff have been ignored.

### 5.3.4 Other Hazards

Beyond above mentioned major hazards, some minor ones were recognized by the Project. They, along with mitigation measures, are given below.

- a. **Blocking of Minor Irrigation Canals:** The realignment was provided during the detailed road design.
- b. **Deforestation:** Use of firewood for the heating of bitumen was discouraged.
- c. **Hazards During Bridge Construction:** Temporary diversion for waterway, reducing the extent of excavation were planned and executed for the construction of bridge over Thopal Khola. Proper supervision was made to minimize the hazards of these short-term phenomena.

The following table summarizes the possible impacts, magnitude of impact, their environmental effects, mitigation measures and levels of achievements in implementation of the measures.

Table: 12 Environmental Impact, Mitigation Measures and Levels of Achievements

Possible Impacts	Magnitude of Impact	Environmental Effects	Mitigation Measures	Levels of Achievement
Encroachment into Precious Ecology	none			1
Encroachment on Religious values	none			1
Loss of Land	small	a. Economic loss b. hardship to affected people	cash compensation	3
Loss of houses	small	Economic loss	cash compensation	2
Road erosion	medium	a. impairment of water quality b. reduced land values	a. proper water management during construction b. provision of proper drainage system	3
soil erosion, silt run off at borrowing and cutting	medium	"	a. control during borrowing b. water management on road and at deposit area c. vegetation of bare soil	2
noise/dust/fumes	small	nuisance and health hazards	common prevention, precaution and control measures	2
Presence of immigrant labor force	medium	a. community nuisance b. damage in forest ecology	use of local labor, regulation and enforcement	2
workers' safety	small	human safety/accidents	control measures at work	1
sanitation at workers' camp	medium	a. public health hazards b. pollution of stream and river	enforcement of sanitation and waste management	2
firewood for heating bitumen and cooking food	medium	a. loss of trees b. erosion	use of alternative fuels	2

Source: Field Survey, 2003.

Note: The achievement ratings 1, 2, 3 and 4 representing gradually regressed level of achievements beginning with excellent and ending at bad.

The table shows that the environmental management aspects of the Malekhu-Dhading Road Project were at the satisfactory level during the construction phase.

#### **5.4 Post Construction Phase**

The over all environmental management aspects of MDRP are at satisfactory level except for its failure to provide preventive measures against the risks of soil erosion and landslide management. This aspect of the Project is discussed at length in Chapter 2.

Beyond this, the change in the agricultural pattern – a transformation of traditional farming pattern into market-oriented cash generating crops like vegetables has expedited the use of insecticides and chemical fertilizers. If proper counseling is not provided to the farmers, the later results into soil quality degradation. The use of insecticides in an aberrant and unsafe manner in some areas like Patle imposes immediate threat over human health and several ecologically indispensable insects like bees and butterflies, threatening thereby, the ecological balance of the region as a whole.

#### **5.5 Conclusions**

The MDRP was constructed with a new concept of *Green Road*. Therefore, its detailed design, construction work, monitoring and supervision related works were framed accordingly. This naturally results in to a relatively high construction cost. Of the total upgradation cost corrected for the construction of the Bridges, the per kilometer upgradation cost of MDRP is surprisingly high when compared to NEW constructions. Despite being such a huge cost Project, it has shown a moderately satisfactory performance in the management of the environment.

The Road faces some serious shortcomings both from environmental and engineering perspectives, in that, the gradient of the up-hill of the road is very high particularly at CH 0+100 and 12+200. In some places where bio-engineering could have been practiced, there are constructions of concrete masonry walls. These could have been avoided to make the road environmentally friendly.

In some areas red soil excavation by local people could be observed. This is likely to cause, caving in, soil erosion and landslide in the future.

## CHAPTER VI

### MAJOR FINDINGS ON EFFECTIVENESS OF INVESTMENT

The major findings of investment have been analyzed taking into account the existing impact of the road and future development possibilities for new economic activities in the zone of influence of the road.

#### 6.1 Major Development Impact Due to Road

The impact has been analyzed by taking into consideration the impact of the road on the different sectors of the economy. The present analysis has tried to identify the benefits accrued to the people of the zone of influence. Following are the major changes that took place after the construction of the road in the area.

- With the construction of the road there have been changes in agriculture. Before the construction of the road, most of the farmers were involved in traditional farming but now with the construction of the road, farmers of the area are using new variety of seeds, pesticides, insecticides, chemical fertilizers and modern agricultural equipments, which have changed traditional method of production. The number of households having kitchen garden has increased significantly.
- The production of vegetables and fruits have increased significantly in areas like Phale, Patle, Thati Bhanjyang, Parewatar, Dhobhantar, Phisphisetar and Taktake. This has been possible only due to the construction of the MDR that has provided the area with access to improved markets for high value cash crops in Kathmandu, Malekhu Bazaar and Narayanghat. As such, farmers of this area are showing a keen interest in vegetable and fruits farming thus replacing cereal crop farming. The notable vegetables cultivated in this area are tomatoes, green vegetables, radishes, peas, cabbage, cauliflower, cucumber, capsicum and bitter guards. Likewise in fruits, most of the farmers are planting bananas, citrus and pineapples.
- Direct impact has been seen in food sufficiency after the construction of the road. The percentage of households with food sufficiency from own agriculture produce has declined due to shifting from farm family economy to market economy.
- Though the agriculture sector has been playing a vital role in the field of livelihood, employment, industry, and trade but in recent years, agriculture sector is slowly being replaced by business sectors in areas where vegetable farming is not commercially attractive. As such, there has been a shift from farm family economy to market economy.
- The construction of MDR has increased exports, reduced market imperfections to some extent, and transport cost for agricultural and basic industry inputs. It has also led to less damage of agriculture produce.

- Apart from the road benefiting the people of Dhading, it has also benefited people from 25 VDCs of Gorkha district. Thus the total number of population benefiting directly from the road is estimated at around 90,000
- Since employment within the country and abroad has been attracting significant number of working youths of the area, remittance is noticeable.
- The construction of road has encouraged people to invest in various transportation vehicles. This has led to increase in transport related works.
- The construction of road has led to the development of new markets in the area. The transportation cost of the commodities has also come down. Hence, availability of all basic commodities in the area has become possible. It has also provided opportunities to households along the settlements in roadside for additional income. There is an increase in shops and hotels. A substantial number of people have been using modern amenities like television, fan, heater, rice cooker, gas oven etc.
- Due to the construction of the road, people from these areas have easy access to financial and credit institutions, notably, Nepal Bank Limited, Rastriya Banijya Bank, Agriculture Development Bank, and cooperatives in Dhadingbesi. This has played a significant role in the replacement of traditional sources of rural credit such as landlords, village money lender cum traders, and retailers.
- With the construction of the road, awareness in terms of health, sanitation, and education has increased. There has been an increase in the number of people visiting hospitals and health posts and the habit of using toilet facilities in homes have increased. The tendency to send girl child to schools has also increased.
- The overall environmental management is satisfactory.

## **6.2 Future Development Potential**

It has only been around two years since the road has been completed. Before the permanent structure of the road and the bridges were completed, the road had provided few services to people. The cost of transportation was very high and during the monsoon the road would be closed. Now with the construction of the bridges and the improvement in the road, transportation facilities have been commencing without any disturbances that would have occurred during the monsoon. Some of the future development potentials recognized by the people in these areas are as follows.

### **6.2.1 Opportunities for Horticulture**

Some pockets of the area are used for horticulture and it has proved to be very profitable. As such, the government and the District Agriculture Office should provide training, technical know-how, distribute fruit saplings and financial help in many areas where horticulture farming are done in small scale. This would immensely help the people in the areas in term of their economic well being, which will ultimately have an impact in all areas of their life.

## **6.2.2 Opportunities for Cottage Industry**

The people have identified prospects for small cottage industry like hand-made paper, banana fibre production. Likewise, bee keeping and silk cocoon production in Dhunganagaon and Baharbote has been found to be very profitable. These activities could well be expanded in other areas with the help of the concerned agency so that the people of the area do not have to rely on agriculture alone for survival.

## **6.2.3 Development of Poultry Farming**

At the moment poultry farming is done only in some areas, this activity can be expanded since it has a ready market in Kathmandu.

## **6.3 Lessons Learnt**

The construction of MDR has given various lessons to the planners, policy makers and the implementers of the road upgradation program. The lessons learnt are as follows.

### **6.3.1 Accompanying Development Programs for the Effective Utilization of MDR**

In order to make the construction of the MDR more effective, accompanying development programs addressing both the economic and social dimensions have to be implemented during the final stages of the construction of the road. This would have been very important to take full advantage of the opportunities created by the upgradation of the road. Due to the lack of coordinated efforts for the concerned government agencies, new economic activities could not be exploited after the completion of the road. It has been realized that substantive increase in human development depends not only in improved access to existing facilities but also on accompanying development programs. Hence, if programs to increase the agricultural production along with identification and implementation of small scale cottage industries using the local resources in the areas are not carried out, the benefits that could be reaped from the road cannot be utilized effectively. Likewise, implementing accompanying development programs in the non-road sector (increase in number of health facilities and schools, identification of local resources for income generation etc.) would have been really helpful to the local populace not directly under the ZoI. Thus, the upgradation of the road provides a valuable lesson for the concerned line agencies to coordinate their efforts in providing comprehensive development programs when the road is upgraded.

### **6.3.2 Involve the Local Community in Managing the Road**

Given the amount of investment on the road, the question of sustainability of such infrastructure is paramount. It would not be economically viable for the government to oversee the management and maintenance of the road. So, for the sustainability of the road, the local community should be involved for the management and maintenance of the road. Tolls can be collected along the major points of the road from the road users, mainly, buses, trucks and other vehicles. Thus the fund generated from the tolls could be used for the maintenance of the road, enhancing its sustainability. This not only ensures the sustainability of the road but also provides employment to the local people of the area.

(Note: Before the upgradation of the road, each passenger bus plying the Malekhu-Dhadingbesi Road had to pay Rs. 50 per trip, which, according to the drivers and local people used to be collected by District Chambers of Commerce, Dhading. But tolls have not been collected after the upgradation of the road)

### **6.3.3 Confidence in Investment after the Upgradation of the Road**

The interview with key informants and FGD clearly indicated that the upgradation of the road has led people to build houses for business purposes along the road. New economic opportunities have been created and market centers have sprung up along the roadside. The all-weather road has come about as a pull-factor for in-migration from the hill areas to the *Tar*-areas. Consequently, permanent settlements and market centers have arisen at around five locations on the road.

## CHAPTER VII

# CONCLUSIONS AND RECOMMENDATIONS

### 7.1 Conclusions

Connecting mountainous rural setups to the national strategic road network is one of the main priorities of any country, and it is no exception with Nepal. Since the majority of the settlements in such areas are basically dependent upon agriculture, which is subsistence in nature, the societies therein constitute the endogenous sector of the economy where the incidence of poverty is high.

Realizing this, the HMG of Nepal has considered the provision of transportation and communication facilities to the deprived people in such areas as indispensable vehicles to achieve its goal of poverty alleviation. Malekhu-Dhading Road is one of the roads in the government's priority. The process of full-fledged construction of the Road came into an end only after the completion of the upgradation of the earth/gravel road in 2002.

However, the construction of the road is not only enough for sustainable economic development in this area. It may rather bring a lot of negative activities in the society. As such, it is necessary to bring a comprehensive package for enhancing economic activities along with the construction of the road. The activities of concerned agencies providing services in this area must be coordinated for the effective utilisation of the available resources.

The major findings of the study are summarized categorically below.

#### **Economic Impacts**

The Road has facilitated the transportation of goods from other parts of the nation. Reduced transportation costs of the goods have led to a competitiveness of locally produced goods in neighbouring markets of Kathmandu and Pokhara. These have given the farmers using traditional tools and techniques sufficient incentives to use modern agriculture tools fertilizers, seeds and insecticides and opt for a change in the pattern of agriculture. This has led to increased productivity and higher income leading to improved quality of life.

#### **Social Impacts**

The interaction of the people in the area have increased with people from other parts of the nation owing to their higher mobility due to transportation facility. Consequently social attitudes, value and practices have begun their gradual transformation. The social indicators have shown the signs of upward revision.

#### **Environmental Impacts**

The management of likely environmental hazards of MDRP is satisfactory in all phases of the construction. In the pre-upgradation phase, there was little environmental impact. The hazards during upgradation due to cuts and borrowing were also managed

well. However, in the post-upgradation phase, there are some indications of the sides of the roads caving in and soil erosion and landslides have appeared which call for the management of the problem in near future so as to constrain the problems from being exacerbated.

## **7.2. Recommendations**

Roads are a major infrastructural development and thus the MDR has also opened up new avenues of economic opportunities in the area. But the effective utilization of the road through the exploitation of opportunities have fallen short of expectation. Likewise, road being a costly infrastructure, the sustainability of the road, is also important. Thus, to effectively utilize the opportunities created by the road and for the sustainability of the road as well, following recommendations have been put forth on the basis of the study.

### **7.2.1 Recommendation for Immediate Action**

- Establishment of Agriculture Service Centers in areas having higher prospects for cash crop farming.
- Distribution of pesticides, insecticides and sprayers to the farmers along with the demonstration trial of improved cereals.
- Increasing the accessibility of agricultural credit to the farmers so that the farmers can introduce modern technology.
- The concerned agency should make preparations to provide skill training which will be beneficial to the youths for foreign employment, since there seems to be youths who wants to leave their area for foreign employment.
- The road consists of potholes in several areas, which have to be maintained to prevent its further deterioration.
- For the effective management and maintenance of the road, the concerned authority has to look into resource generation through the imposition of toll tax and pay roll taxes.
- The corrections that have to be done along the MDR lies at 12 km where there is a sharp bend (Plate 1,2, & 3) There is a dire need to employ tributary (Chyado Khola) training instead of gabion walls.
- There are two landslides at 4.9 km and 13.1 km, which may stop regular flow of traffic particularly in the monsoon. The landslide can be controlled, by removing the unstable masses, since they have occurred due to plane failure.
- In some places where stone masonry drainage has been constructed, there is also a need to pave the spot where the water falls to prevent gully erosion.
- Cattle grazing on grass cover on the roadsides should be stopped to avoid the sides of the road from caving in. The local populace living near the road should refrain from throwing wastage inside the drainage because the drain ultimately joins with the stream and rivers, thus polluting the river and hampering the ecosystem.
- In some areas of the road particularly between Phisphisetar and Samaitar, the people have been extracting red-soil from the slopes which may instigate soil erosion.

- Due to improper bio-engineering in some points along the road, the unstable soil mass have been falling down on the drainage, which is blocking the cross drains. To prevent this, proper bioengineering should be implemented and drainage system should be cleaned regularly.

### **7.2.2 Recommendation for Mid-term Action**

- Improving the status of livestock through replacement of local breeds by improved high productivity breeds.
- Establishment of Cold Store.
- Development of secondary market through local resource mobilization.
- Improve the position of vulnerable groups like women and low- income households through the creation and stimulation of income generating activities. Some of the income generating schemes that can be employed in the area are as follows:
  - Identifying and sale of non-timer forest products can be one means of income generating program since community forestry program has done very well in that area.
  - Bamboo are in abundance in those areas and the concerned agency can give the local population the vocational skill required to make bamboo products, i.e. decorative items, bamboo wall coverings, baskets etc, which can serve as an income generating program.
  - Livestock raising and poultry farming, which can be a profitable trade now due to the construction of the all-weather road can be started out with the help of the concerned line agency.
- Increase awareness through different formal and non-formal education and provide improved access to education particularly to girl child.
- Using bioengineering extensively to mitigate the problem of soil erosion and landslide.
- At CH 12+00, tributary training must be employed instead of gabion walls for the sustainability of the road.

### **7.2.3 Recommendation for Long-term Action**

- Providing Irrigation facility in the Tar areas.
- Encouraging the investment in mining industries.
- Introduction of crop diversification program.
- Providing long term loan for the development of local industries.
- For the heavy transportation vehicles to ply on the road, the following have to be rectified. The road is not appropriate due to the switchbacks at 0.1 km, 12.2 km along with curvatures particularly at 12 km and 14 km and at 3.5 km to 5 km, where the uphill slope will come as an obstacle for trucks carrying goods. For the heavy transportation vehicles to ply on the road, the following have to be rectified.



## Annex- 2

### Participants of FGDs

Serial Number	Name	Address	Profession
1.	Kumar Ghale	Kamrang	Farmer
2.	Mitha Bdr, Ghale	Kamrang	Farmer
3.	Prem Ghale	Kamrang	Farmer
4.	Sabitri Ghale	Kamrang	Farmer
5.	Tilak Bdr. Ghale	Kamrang	Farmer
6.	Shanti Ghale	Kamrang	Farmer

Serial Number	Name	Address	Profession
1.	Manju Khadka	Shashatar -2	Farming
2.	Indu Maya Bhattarai	Shashatar -2	Farming
3.	Dinesh Koirala	Shashatar -2	Cottage Industry
4.	Modnath Koirala	Shashatar -2	student
5.	Damodar Koirala	Shashatar -2	Farming
6.	Madhab Prasad Aryal	Shashatar -2	Farming
7.	Nanda Kishor Koirala	Shashatar -2	Farming
8.	Chabi Lal Shrestha	Shashatar -2	Farming

\*Indu Maya Bhattarai- member of the Jyamire Forest User Group

Serial Number	Name	Address	Profession
1.	Moti Silwal	Kalidaha	Trade/Industry
2.	Mana Kumari Silwal	Kalidaha	Housewife
3.	Shree B. Silwal	Kalidaha	Farming
4.	Nava Silwal	Kalidaha	Farming
5.	Ranjita Silwal	Kalidaha	Trade

Serial Number	Name	Address	Profession
1.	T.P. Lohani	Parewatar	Teacher
2.	Ramesh Lohani	Parewatar	Student
3.	Mrs. Srijana Lohani	Parewatar	Business Woman
4.	Krishna Shrestha	Parewatar	Teacher
5.	Maya Shrestha	Parewatar	House Wife

Serial Number	Name	Address	Profession
1.	Asmita Thapaliya	Bunchung-8	Social Mobilizer
2.	Tanka Prasad Silwal	Bunchung-8	Trade/Farming
3.	Sabitra Thapaliya	Bunchung-8	Student
4.	Raj Kumar Poudel	Bunchung-8	Trade/Farming
5.	Tara Nath Silwal	Bunchung-8	Trade/Farming
6.	Kamali Thapaliya	Bunchung-8	Trade/Farming
7.	Anju Thapaliya	Bunchung-8	Trade/Farming
8.	Tilak Ghale	Bunchung-8	Trade/Farming
9.	Ganesh Poudel	Bunchung-8	Trade/Farming

Serial Number	Name	Address	Profession
1.	Karna Bdr. Ghale	Samaitar	Farming
2.	Baburam Ghale	Samaitar	Farming
3.	Buddha Ghale	Samaitar	Driver
4.	Sabitri Giri	Samaitar	Farming
5.	Shanta Ghale	Samaitar	Farming/Shop
6.	Prem Bdr. Ghale	Samaitar	Farming
7.	Shanta Ghale	Samaitar	Farming

**Karna Bdr. Ghale- Chairman of Devisthan FUG**

Serial Number	Name	Address	Profession
1.	Ranga P.Thapaliya	Phiphisetar	Shopowner
2.	Nil Bdr. Magar	Phiphisetar	Farming
3.	Yan Bdr. Magar	Phiphisetar	Student
4.	Dhawa Raj Shrestha	Phiphisetar	Farming
5.	Chandr Bdr. Magar	Phiphisetar	Farming
6.	Gajendra Thapaliya	Phiphisetar	Student
7.	Kajiman Sharestha	Phiphisetar	Trader
8.	Santosh Magar	Phiphisetar	Farming

**Ranga Prasad Thapaliya- Former VDC chairman**

Serial Number	Name	Address	Profession
1.	Chetnath Koirala	Murali Bhanjyang	Service
2.	Durga Koirala	Murali Bhanjyang	Service
3.	Sita Ram Koirala	Murali Bhanjyang	Teaching
4.	Lila Devi Koirala	Murali Bhanjyang	Farming
5.	Kopila Koirala	Murali Bhanjyang	Farming
6.	Sita Ram Shrestha	Murali Bhanjyang	Farming
7.	Badri Koirala	Murali Bhanjyang	Teaching

Serial Number	Name	Address	Profession
1.	Indra Bdr. Shrestha	Nilkantha	Service
2.	Bharat Shrestha	Nilkantha	Trade
3.	Padam P. Pokhrel	Nilkantha	Lawyer
4.	Krishnamaya Shrestha	Nilkantha	Housewife
5.	Baburam Dawadi	Nilkantha	Trade
6.	Rita Shrestha	Nilkantha	Trade
7.	Dilip Adhikari	Nilkantha	Teaching
8.	Ganga Kumar Shrestha	Nilkantha	Trade

Serial Number	Name	Profession	These people belong to the various social and environmental organizations based in Dhadingbesi
1.	Bala Ram Lamsal	Social Worker	
2.	Ram Krishna Adhikari	Social Worker	
3.	Gokarna Rijal	Self-employed	
4.	Pramila Shrestha	Self-employed	
5.	Madhab Acharya	Self-employed	

**The above mentioned participants are associated with the following organizations:**

- Integrated Community Development Center
- Association against Human Trafficking
- NGO Federation, Dhading District Branch

## ANNEX- 3

### KEY INFORMANTS

1.	Ranga Prasad Thapaliya	Ex-VDC chairman (Kumpur)
2.	T.P. Lohani	Teacher (Gajuri High School)
3.	Karna Ghale	Chariman (Devasthan FUG)
4.	Shambu Karki	Engineer (District Technical Office)
5.	Shambu Singh	Ranger (District Forest Office)
6.	Asmita Thapaliya	Social Mobilizer (Community Forestry Project)
7.	Hira Regmi	Social Mobilizer (Community Forestry Project)
8.	Moti Silwal	Propreite (Kalidaha Slate Factory)
9.	Indra Bdr. Shrestha	Secretary, Nilkantha VDC
10.	Babu Ram Lamsal	Social Worker
11.	Jiban P. Shrestha	Acting CDO
12.	Bed P. Kharel	Adm. Officer, District Administrators office
13.	Narayan Gyawal	LDO

## Annex 4

### QUESTIONNAIRE

FOR

#### A Study on the Effectiveness of Investment in MDRP

Name of Household Head:

**1. Demographic Information:**

S.N.	Relation With household head	Code No	Sex	Age	Education	Occupation	
						Main	Secondary
1		1					
2		2					
3		3					
4		4					
5		5					
6		6					
7		7					
8		8					
9		9					
10		10					

Sex. Code :

Education Code :

Occupation Code:

Male - 1

Illiterate - 1

Agriculture - 1

Female - 2

Literate - 2

Service - 2

School - 3

Business - 3

Campus - 4

Agri labour - 4

University - 5

Non agri labour - 5

Student - 6

Cottage industry - 7

**2. Migration**

Are you a native of this area?

Yes  No

If no, when did you migrate to this area?

Year : .....

Migrated from?

.....

What is the main reason for migration to the present locality?

- 1) Easy accessibility to schooling children
- 2) Better accessibility to health service
- 3) Better economic benefits/activities
- 4) Time and cost saving in travelling and business
- 5) Other, please specify .....
- 6) All of above

3. Did any member of your family migrate? Yes  No

If yes, when they migrated from this area Year: .....

Migrated place? ..... Purpose .....

**4. Land ownership**

4.1 Landholding

Cultivated Land	Code	No. of parcel	Area
Irrigated	1		
Un-irrigated	2		
Upland	3		
Other	4		
Total	5		

Do you have rented in other land? Yes  No

If yes, How much .....

Do you have rent-out your land to others? Yes  No

If yes, How much .....

**5. Agricultural Credit**

4.1 Did you borrow loan? Yes  No

If Yes, from where

Source	Code	Amount	Purpose	Interest Rate	Outstanding
Bank	1				
Co-operatives	2				
Landlord	3				

**6. Chemical Fertilizer and insecticide**

Quantity of chemical fertilizer and insecticide used during last year

Urea (kg) .....

DAP (kg) .....

Potash (kg) .....

Insecticide (Rs) .....

**7. Fruit Trees Inventory**

Fruit Plants	No. of Plants		
	Code	Before	After
Mango	1		
Banana	2		
Pineapple	3		
Guava	4		
Citrus	5		
Lichi	6		
Jack fruits	7		
Papaya	8		
Other (.....)	9		

**8. Livestock inventory**

Livestock and Birds	No. of animals		
	Code	Before	After
Cow	1		
Bullock pair	2		
Buffalo	3		
Goat	4		
Sheep	5		
Mule	6		
Horse	7		
Pig	8		
Other Poultry	9		
Other (please specify)	10		

## 9. Household income and Expenditures

9.1 How much did you spend last year on :

1	Sources	Code No.	Total value (Rs.)
1	Food, food-grains	1	
2	Oil, salt, spices, tea, sugar	2	
3	Milk, Ghee, Meat, Fish, Egg	3	
4	Fruit and vegetable	4	
5	Clothing's	5	
6	Wage	6	
7	Fertilizer and pesticide	7	
8	Hiring of Animal	8	
9	Education	9	
10	Medicine/Treatment	10	
11	Energy (Kerosene fuel wood)	11	
12	Transport & communication	12	
13	Taxes	13	
14	Purchase of Property	14	
15	Social Activities	15	
16	Remittance	16	
17	Interest	17	
18	Machinery/Equipment rent	18	
19	Festivals	19	
20	Agriculture tools	20	
21	Others	21	
	Total		

9.2 How much income did you earn last year?

S.N.	Earning sources	Code No.	Amount (Rs.)
1	Crop	1	
2	Livestock	2	
3	Fruits	3	
4	Vegetable	4	
5	Fish	5	
6	Wage	6	
7	Salary	7	

8	Pension	8	
9	Interest	9	
10	Rent (House)	10	
11	Rent (Equipment)	11	
12	Animal Rented	12	
13	Business profit (Trade)	13	
14	Cottage industry	14	
15	Remittance	15	
	Total		

**10. What domestic amenities you have added after the road construction?**

Assets	Code No.	Number	Approximate cost (Rs)
Radio	1		
TV	2		
VCR	3		
Electricity	4		
Private Tap	5		
Watches	6		
Furniture	7		
Sewing machines	8		
Motor cycle	9		
Cycles	10		
Bullock cart	11		
Lands	12		
Houses	13		
Iron	14		
Fan	15		
Pressure cooker	16		
Rice Cooker	17		
Refrigerator	18		
Other (.....)	19		

**11. Do you have Toilet?**

1) In the past                      Yes                       No

2) At present                        Yes                       No

**12. Where children go for defecation?**

Details	Code	Past	Present
1. Open space			
2. Toilet			
3. Pit latrine			
4. Others (.....)			

**13. Use of:**

Details	Code	Past		No	
		Yes	No	Yes	No
1. Use of dehydration powder during diarrhoea					
2. Use of safe drinking water					
3. Improved seed for agriculture					
4. Fertilizer					
5. Insecticides					
6. Sending school to daughters					
7. Institutional credit					
8. Others (.....)					

**14. Crop utilization (last year)**

Crops	Code No	Area	Production	Consumption	Sale	Purchase
Paddy	1					
Maize	2					
Pulse	3					
Summer vegetable	4					
Wheat	5					
Oil crops	6					
Potato	7					
Winter pulses	8					
Vegetable	9					
Millet						
Fruits						
Others( if any)						

**15. Have you changed the cropping pattern after the road construction?**

Yes  No

If Yes,

1. From local variety to improved one

- 2. Cereal crop to cash crop
- 3. Cereal crop to vegetable farming
- 4. Introduce new variety (specify)

16. Do you have kitchen garden?

- 1. Before Yes  No
- 2. After Yes  No

17. Do you sell:

Details	Code	Before		After	
		Yes	No	Yes	No
1. Milk	1				
2. Buffalo	2				
3. Goat	3				
4. Chicken	4				
5. Eggs	5				
6. Pig	6				
7. Paddy	7				
8. Wheat	8				
9. Maize	9				
10. Millet	10				
11. Potato	11				
12. Lentil	12				
13. Soybean	13				
14. Pulses	14				
15. Oilseed	15				
16. Summer vegetables	16				
17. Winter vegetables	17				
18. Others (please specify)	18				

**18. If you have food insufficiency, how do you manage?**

Details	Code	Before		After	
		Yes	No	Yes	No
1. Taking loan	1				
2. Selling land	2				
3. Selling asset	3				
4. Pottering	4				
5. Seasonal Migration	5				
6. Agriculture wage	6				
7. Non-agriculture wage	7				
8. Business income	8				
9. Salary	9				
10. Remittances	10				
11. Others	11				

**19. What is the food sufficiency duration of your family?**

Duration	Code	Before	After
1. More than 12 months	1		
2. Upto 12 months	2		
3. Upto 9 months	3		
4. Upto 6 months	4		
5. Upto 3 months	5		

**20. Where do you go for treatment?**

Places	Before	After
1. Hospital		
2. Health post		
3. Sub-health post		
4. Private clinic		
5. Nursing home		
6. Traditional faith healer		

□

22. Do you like to participate in community works? Yes  No

If yes,

Construction of canal

Construction of road/trail

Construction of school building

Construction of other public works

Tree plantation

Temple/monument construction

Preserve drinking water source

Political Parties

If no, what do you think the reason behind it?

.....

Why don't you participate in politics? Yes  No

why?

.....

23. Do you or any of your family members are the member of the social organization? Yes  No

If yes,

Farmer's organization

Co-operative

Forest user's group

Mother's group

Women's organization

Water user's organization

Politics

24. What benefits you have received from the road?

a) Increase cropping intensity

b) Crop diversification

c) Increased crop yield

d) Increased economic opportunities

- e) Labour employment
- f) Family employment in own farm
- g) Food sufficiency in the village
- h) Access to agricultural inputs
- i) Business opportunities
- j) Access to higher education
- k) Access to health
- l) Appreciation of land

**25. What is the source of drinking water?**

- a) Piped water
- b) Stream water/spout water
- c) Well
- d) Community tube well
- e) Others .....

**26. What are the fuel sources for cooking?**

- |             |                          |                               |                          |
|-------------|--------------------------|-------------------------------|--------------------------|
| Firewood    | <input type="checkbox"/> | Forest bi-products            | <input type="checkbox"/> |
| Bio-gas/gas | <input type="checkbox"/> | Kerosene                      | <input type="checkbox"/> |
| Dung cake   | <input type="checkbox"/> | LPG                           | <input type="checkbox"/> |
| Electricity | <input type="checkbox"/> | Straw/maize stalk/wheat straw | <input type="checkbox"/> |

**27. Do you have access to?**

- |           |                              |                             |
|-----------|------------------------------|-----------------------------|
| Newspaper | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| Telephone | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| House     | Yes <input type="checkbox"/> | No <input type="checkbox"/> |

If no, state what you are residing in and the amount you pay annually.

.....

**28. What type of house you have?**

- Pucca  Katchcha (Thatched)

**29. Do you have toilet facility in your house? Yes  No**

**30. Do you have separate cattle shed? Yes  No**

**31. Common diseases occurred in your family**

Diseases	No. of person affected during last year
Diarrhoea	
Dysentery	
Flu/cold	
Jaundice	
Cholera	
Ski diseases	
Typhoid	
Others	

**32. Division of labour between male and female**

Activities	Share of work in percentage		
	Code	Male	Female
A. Household			
1. Water fetching	1		
2. Fuel wood & fodder collection	2		
3. Food cooking	3		
4. Care taking of children and old people	4		
5. Care taking of animal	5		
6. Purchasing of goods	6		
B. Agriculture related			
1. Land preparation	7		
2. Manuring	8		
3. Weeding	9		
4. Irrigation	10		
5. Harvesting	11		
6. Threshing	12		
7. Transporting	13		
8. Storage	14		
9. Processing	15		

**33. Ownership over property**

Type	Percentage		
	Code	Male	Female
Land	1		
House	2		
Cash	3		
Livestock	4		
Bank Deposit	5		
Ornaments	6		
Others	7		

**34. Decision making process**

Activities	Decision making role in percentage		
	Code	Male	Female
Selection of seed and crops	1		
Use of labour	2		
Sale of agriculture products	3		
Sale of livestock	4		
Sale of land/house	5		
Borrowing of credit	6		
Education of children	7		
Ritual ceremonies			
Family planning			
Participation in community works			
Others			

**35. Decision making role and participation of male and female in agricultural and social activities.**

S.N.	Activities	Code No.	Decision making		Participation	
			Male	Female	Male	Female
<b>Agricultural Activities</b>						
1	Land preparation	1				
2	Planting/seeding	2				
3	Weeding	3				
4	Fertilizing	4				
5	Application of agrochemical	5				
6	Irrigation	6				
7	Harvesting	7				
8	Threshing	8				
9	Transportation of product	9				
10	Animal care	10				
11	Sale of production	11				
12	Food grain purchase/sale	12				
13	Household expenditure	13				
<b>Social Activities</b>						
14	WUA	14				
15	Repair & maintenance of school, VDC building etc	15				
16	Resolution of conflicts	16				
17	Membership of social organization	17				

**36. What is the means of transport?**

- a) Means of transport : .....
- b) Cost of transport (NRs/quintal) : .....

**38. From where do you transport farm inputs ?**

- a) Place (name) .....
- b) Distance ..... km
- c) Cost of transport/Q. Rs. ....
- d) Means of transport .....

**39. What you added after road construction**

Details	Changes		Approximate value
	From	To	
A. Physical facilities			
1. House	1. Straw roof		
	2. Slate roof		
	3. Clay house		
	4. Brick house		
2. Shop in premises	1. Own shop		
	2. Shop in rent		
	3. No shop		
3. Land purchase			
4. Vehicle (no)	1. Cycle		
	2. Tractor		
	3. Motor cycle, Scooter		
	4. Motor/Jeep		
	5. Truck/Bus		
5. Industry			

**40. How do you meet your family expenses (Share in percentage)**

- 1. Agriculture
- 2. Business
- 3. Services
- 4. Remittances
- 5. Others

**41. What are the major problems of the area at present? Please state them in priority wise**

.....

.....

.....

.....

.....

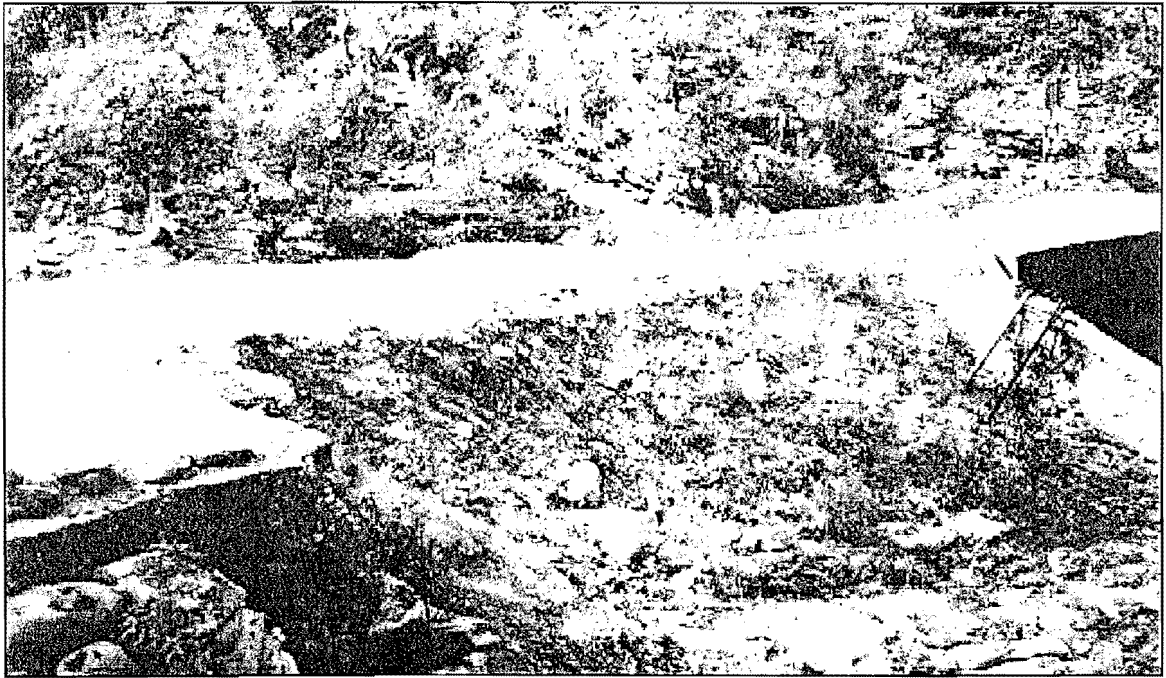
**42. In your opinion, what economic and development activities could be more beneficial to flourish in your area? What is the reason for suggesting them?**

.....

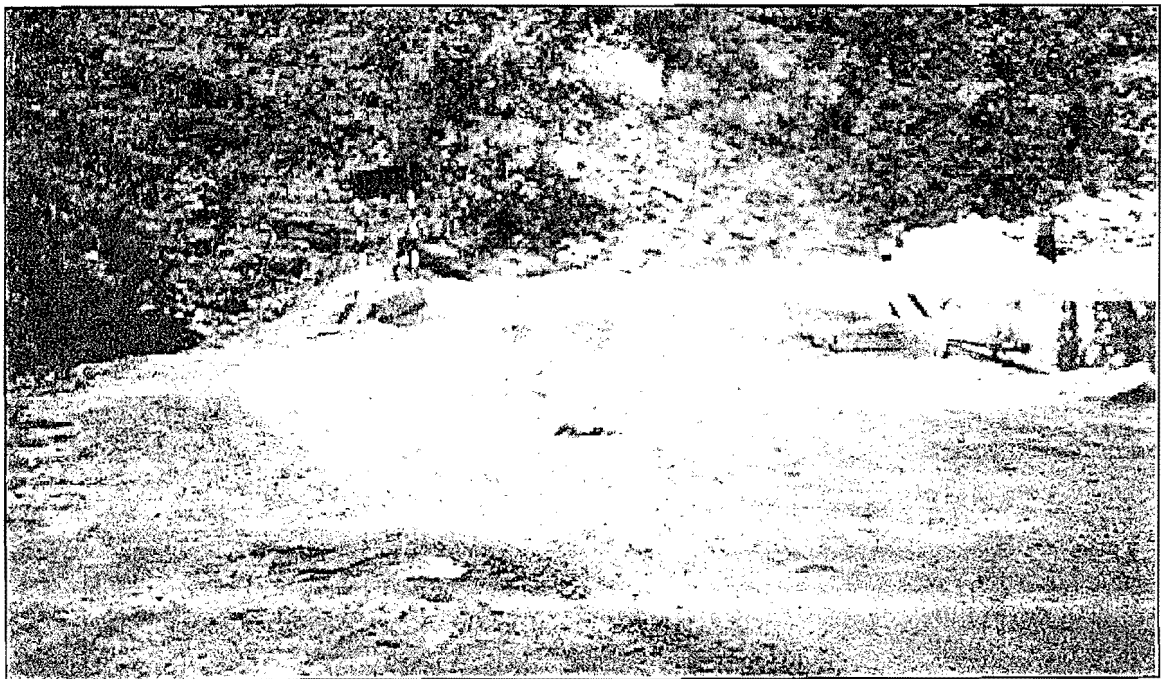
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**43. What will be the extent of community participation in the area?**

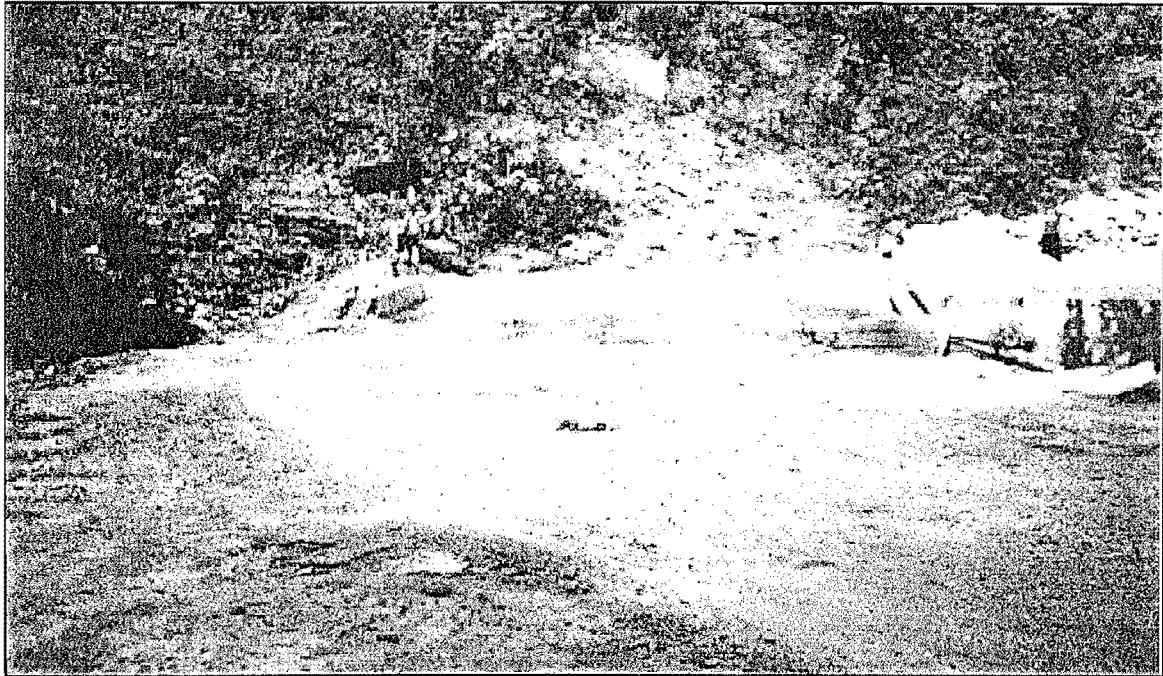
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**Plate 1: Sharp bends at CH 12+000**



**Plate 2: Sharp bends at CH 12+000**



**Plate 3: Sharp bends at CH 12+000**



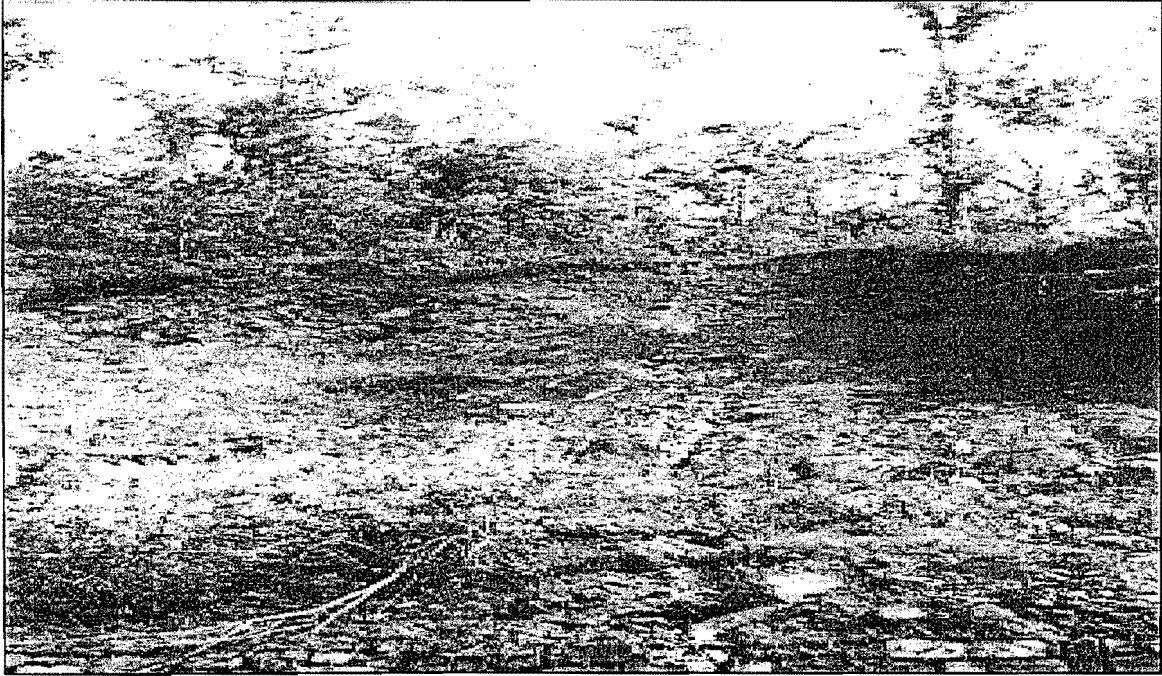
**Plate 4: zLandslide at CH 13+100**



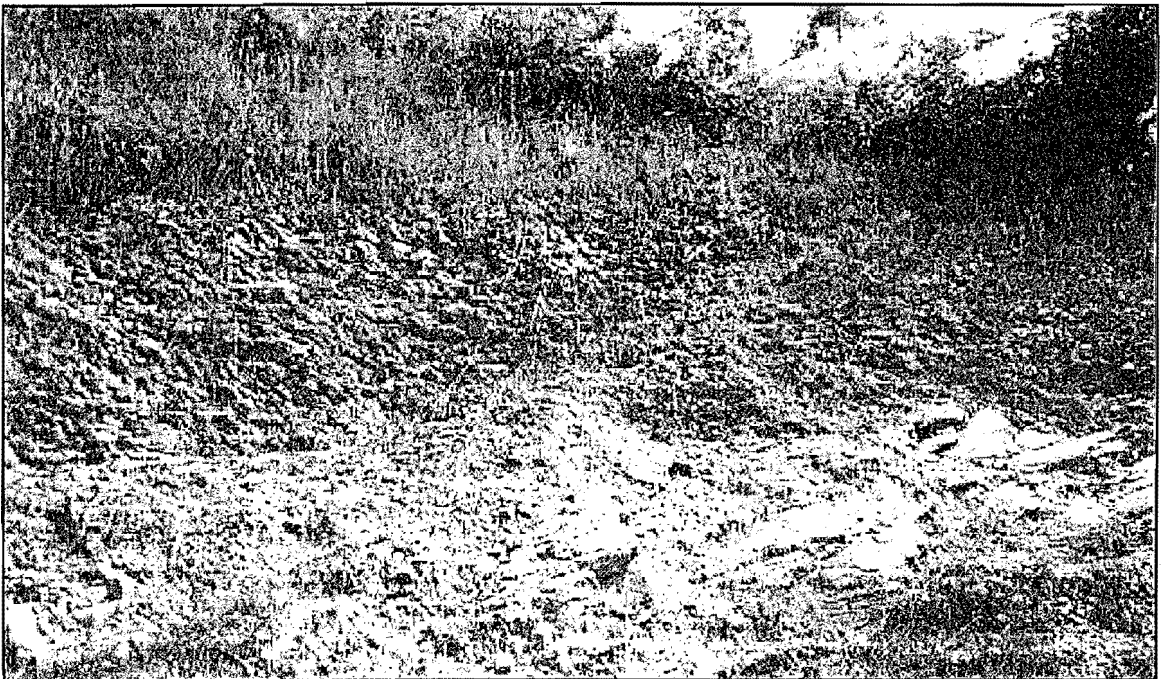
**Plate 5: Ineffective Bio-engineering**



**Plate 6: Ineffective Bio-engineering**



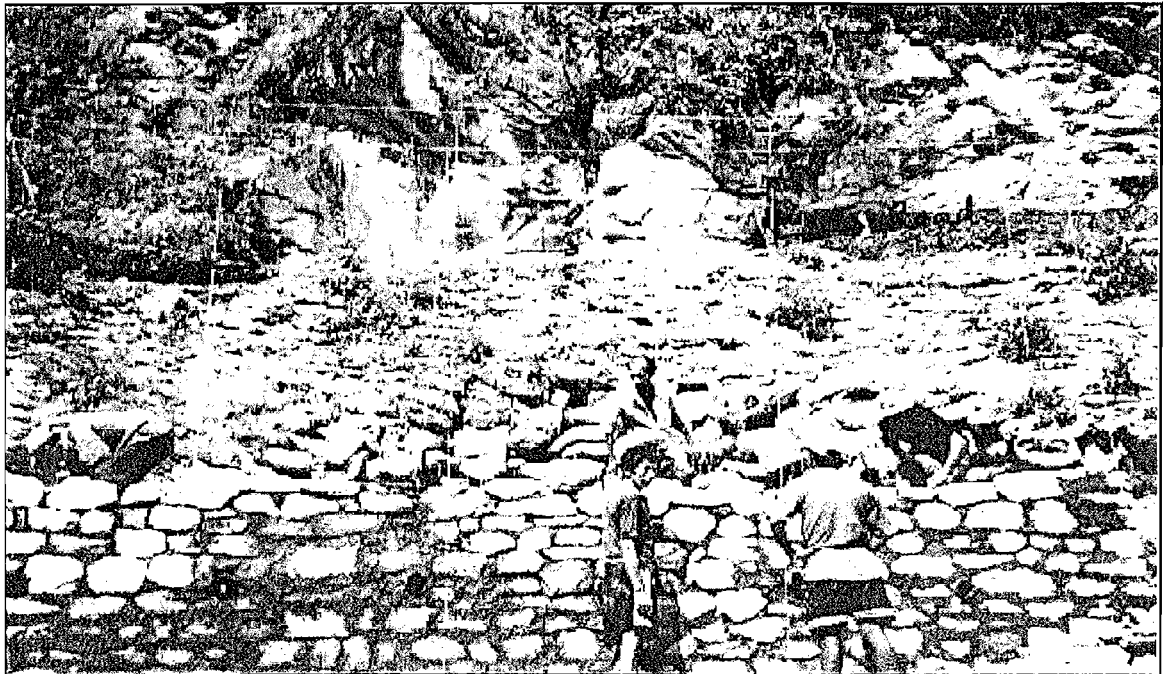
**Plate 7: Ineffective Bio-engineering**



**Plate 8: Ineffective Bio-engineering**



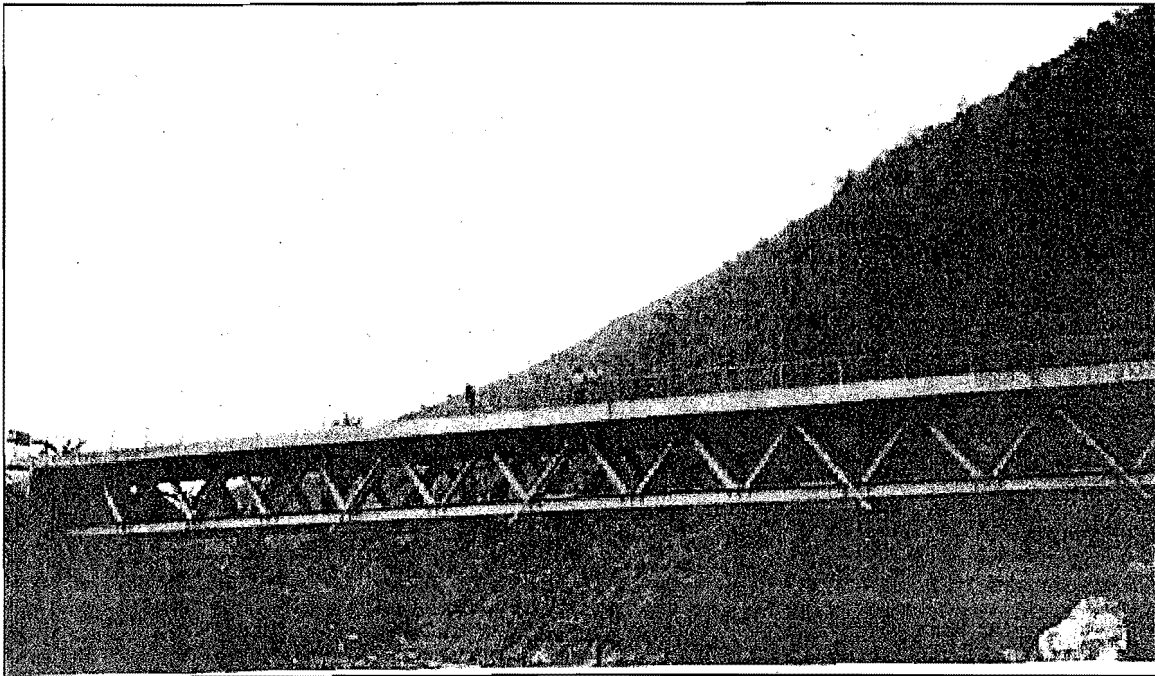
**Plate 9: Concrete masonry wall would have been appropriate here**



**Plate 10: Necessity of proper tributary training at CH 12+000**



**Plate 11: Necessity of proper tributary training at CH 12+000**



**Plate 12: Bunchung Bridge over the Thopal Khola**



**Plate 15: FGD at Murali Bhanjyang**



**Plate 16: FGD at Dhadingbesi**

