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ASSESSMENT OF THE IMPACT OF LABOUR OUT MIGRATION ON HOUSEHOLD AGRICULTURAL PRODUCTION AND INCOME DISTRIBUTION

A case study of Mardi Watershed in Western hills of Nepal

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DECLARATION

I, **Jennifer Kasanda Sesabo**, declare that this is a product of my own research work, and all other sources of materials are duly acknowledged. This work has not been submitted to any university for award of any academic degree.

Signature: ----------

Place and date: 13th August 2001 Ås ----------

DEDICATION

TO:

My parents Benjamin and Lutgarda, who brought me up and gave me the value of education,

I will always love you and remain grateful to you.

May almighty God bless you.

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ABSTRACT.

The migration of labour out of agriculture can have a profound effect on agricultural production, consumption and income distribution in rural areas of third world countries. This study examines the effect of labour-out- migration in Mardi watershed area in Nepal.

The study was based on the data collected through a formal questionnaire administered to 200 households selected randomly from three Village Development Committees (Lwang-ghalel, Lahachowk and Rivan). Informal interview was also used to collect relevant data and information from key informants, which included village elders and local officials.

The study revealed that out of 200 surveyed households, 96(48%) were found to have at least one migrant. Of these households, 53 households receive remittances from their migrant members. Most of migrants went to find jobs in Middle East countries.

Econometrics models were used to investigate the characteristics of migrants' households and the effect of migration on rice production, total expenditure, and income. The decomposition of the coefficient of variation and Gini coefficient were used to assess the effect of migrant's income (remittances) on income distribution.

A probit model was used to examine the factors influencing the decision to migrate. The probit results indicated that both number of adults and mean education within the household are significant variables for increasing the probability of migration. This implies that the households with more adults and educated members have high probability of migrating. The greater the amount of credit obtained, the higher was the probability of migration. The increased per capita off-farm incomes lead to the lower probability of migration, which was against the hypothesis that the larger the per capita off-farm income the greater is the ability to cover migration costs. However, this was in line with the economic theory that migration income and off farm income obtained locally considered to be substitute goods.

In evaluating the impact of migration and remittances on rice production, three stage least square (3SLS) method were used. The results indicated that the number of migrants per households has positive impact on the production of rice where by the households with migrants tend to hire labour and hence increase rice production Furthermore, households with migrants usually had more members, and so the movement of one member does not affect the supply of labour for rice production. Nevertheless, availability of remittances for the households with migrants makes them less dependent on agricultural income, and usually they use remittances to finance their personal expenditure or invest in other profitable activities.

In consumption analysis migration was found to have a positive effect on per capital expenditure, in that, 63.3% of households receiving remittances use the money for personal consumption, 30.5% to pay back loan and remaining percentage used in starting businesses or buy land.

While migration increases the per capita income, remittances have negative effect on income distribution among the households. Most of households who received remittances were from the upper income group.

ABBREVIATIONS

ACAP	Annapurna Conservation Area Project,
GDP	Gross Domestic Product- a measurement for the volume of production within a country's border
ESCAP	Economic and Social Commission for Asia and the Pacific
ILO	International Labour organization
VDC	Village Development Committees
MU	Marginal utility
OLS	Ordinary Least Squares
RSS	Residual Sum of the Squares
SFDP	Small Farmer's development Program
NELM	New Economics of Labour Migration

UNITS, MEASUREMENTS AND EQUIVALENT

Hal = 0.05 Ropani

Ropani = 0.05 hectare

Muri (Rice) = 48.8 kilograms

Muri (Maize) = 63.2 kilograms

Muri (Millet) = 72.64 kilograms

Muri (Wheat) = 62.2 kilograms

Muri (Mustard) = 59.8 kilograms

Muri (barley) = 45.36 kilograms

Exchange rate

(May to July 2000)

1 US $ = 70 Nepalese Rupees

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Chapter One: Introduction

1.1 The problem formulation

Migration out of the agricultural sector in Nepal has been a very important source of income since the18th century. For more than two centuries household members, especially the young males (and to lesser extent women) have left the rural areas to go and work else where in Nepal and abroad (Seddon, D. et al. 1999). Among the caste groups of Nepal, Gurung has been the major caste group engaged in the labour migration activities, though recently the migration has grown very rapidly among other caste groups. Remittance from migrants has become an important source of income for many households in Nepal. Economic study conducted in the two villages situated in the Phokara valley found that 60 to 75 percent of surveyed households had temporary and permanent migrants (Gurung, 1995).

The majority of the Nepalese (more than 80 percent) live in rural areas and their main occupation is farming. Migration of labour may affect agricultural production. The increase in labour out migration from the agricultural sector may relax the liquidity constraint through the remittances and thereby increase investments in agriculture. On the other hand, farmers might experience a shortage of labour to allocate in various production activities, hence realize a decrease in agricultural production.

However few studies have been conducted to specifically determine the extent to which the agricultural sector has been affected by labour out migration. This study is, therefore, aimed at increasing the understanding of the effect labour out migration on agricultural production and income distribution in some selected village development Committees along the Mardi watershed area.

1.2 Study Objectives

Labour out migration from the study area had possible important contributions to the change in agricultural production and welfare of the people. The overall objective of the study is to provide an understanding of the interface between migration and agricultural production and

its impact on the distribution of income among households in the Mardi watershed area. The specific objectives are:

(a) To identify possible factors influencing migration out of agricultural sector in the area.

(b) To examine the impact of migration and remittance on the production of rice in the area.

(c) To examine the impact of migration on the consumption, and finally

(d) To examine the impact of migratory remittances on income and distribution of income among rural households

1.3 Hypotheses

The following hypothesis will be tested

Topic	Hypotheses
(a) Migration characteristics	***H_1: Higher education, larger number of adults members, access to credit, availability of assets and off-farm income increase the probability of migration.*** ▪ Migration is costly, people who have access to credit, have more credit and higher income have a higher probability of migration to migrate because they can finance migration activities.
(b) Migration impact on Production	***H_2: An increase of remittances income will lead to increase in agricultural output:*** If remittances from migrants will be used in agriculture activities like maintaining the terraces, hire more labour, and hire oxen this will lead to increased production. ***H_3: Out-migration will have a negative effect on the agricultural output.*** The movement of people who are able to work from the household to urban areas or outside the country will lead to a decrease in labour available at the farm ***H_4 An increase of remittances will have a negative impact on production.*** The increase of remittance from migrants will cause the households to reduce the reliance on agricultural income.
(c) Migration and household consumption	***H_5. An increase in migration will lead to increase in income and hence increase in consumption (food and non-food items).*** Because of the rise of income from remittance, the consumption of non-food and food items increases. Households with high income will increase their consumption more than those with low income.
(d) Income inequality	***H_6: Migration increases income inequality.*** The high initial cost of migration, and the higher cost and income the further away someone go, make the rich farmers more likely to migrate. Thus, they will increase their income more than others and this will again lead to increased inequality between the households.

1.4 Organization of the thesis

The study is organized in six chapters. Chapter one presented the introductory part of the study. Chapter two will give some background information about Nepal and the study area in

Mardi watershed. Theoretical framework and literature review are presented in chapter three. The chapter sets the background for the analysis and conclusion. Chapter four provides the methodology used for the analysis of the impact of labour out migration at household level. The results and discussion will be presented in chapter five. Finally, in chapter six, the conclusion on how the labour out migration affects the household production and income distribution will be presented.

Chapter Two: Background

This chapter presents an overview of migration trends in Asia and Nepal and a short presentation of the Nepalese Economy. The chapter also gives background information about Nepal and the study area.

2.1 Migration

Migration may be defined as a movement of people from one place to another, resulting in a change of residence for a substantive period. It may be classified on the basis of its duration, volume, geographical range or direction, and inherent characteristics (Gyasi, 1992). So far different authors have tried to make a distinction between the phenomena of migration at large based on whether it is a necessary move or a move caused by needs. It all depends on the conditions in which the move took place. Necessary moves are related to push factors, such as forced or semi-forced moves from an area of origin due to political, religious or other push factors. In contrast moves caused by needs are a result of both push and pull factors, usually due to economic forces pushing people from areas of origin accompanied by economic pull factors at the destination (Peterson, 1958). In area terms, it may be short or long distance; it may involve the crossing of boundaries between countries or within a country. It involves individuals, households or groups. The motivating factors underlying migration are complex, based on social organization of the migrants, their families, their clan and role of individuals. Migration may be voluntary or involuntary.

Other authors have tried to make a distinction based on the spatial dimension, that is whether it was internal or external. Internal migration is defined as a movement to another part of the migrant's own country and external migration means leaving the country of residence (Palmer, 1985). Palmer elaborates further that in general, internal migration brings less return, but it is easier and involves less initial capital costs. The majority of cases allow for more frequent home visits. The frequency of home visits, however, varies enormously by region and by distance to the migratory employment. Thus the internal or external migration distinction is not meaningful when assessing the impact. Other distinctions of migration can be based on temporary dimensions, which are whether the movement is permanent or seasonal.

In spite of the big differences between societies and environment within less developed areas, it is possible to say that patterned regularities in the growth of migration through space-time during recent history are highly associated with the modernization process.

2.1.1 Migration in Asia

The movement of people within and between Asian countries, like most other countries in the world has a long historical tradition. There have been, however, significant differences in the volume and direction of the population movements in the past and further fluctuations are expected in the future (Skeldon, 1999). Castle et al (1993) in Skeldon (1999) argued that recent time is an " age of migration" while others have argued that the actual proportion of the population which is moving neither appear to have increased markedly over the recent past nor seem unduly large when compared with previous "ages of migration" (Zlotnik, 1998).

The majority of the migrants are engaged in the movement within countries. Skeldon (1999) showed that the level of internal migration in ESCAP[1] countries is increasing, dominated by movement from rural to urban areas. Large share migrants are temporary. In Thailand, temporary moves, which include both seasonal movement and other forms of short-term moves, have been estimated to account for one third of all migrations with a duration of one month or more (Chamratrithirong et al, 1995). These movements are also common in China — with temporary migrants, i.e. the "floating population", outnumbering registered migrants by approximately four to one. This is the case also in Indonesia and Viet Nam. They are particularly prevalent in the movement to large cities. All studies reviewed indicate that in Asia temporary migrants tend to be mostly older, male, with lower levels of education, married (but have left behind their families in the area of origin), live in poor conditions and remit more of their income compared with more permanent migrants. The main purpose of their migration is to earn cash in order to support their rural-based households (Guest, 1999).

Several studies have addressed the factors, which cause people to migrate from rural areas. Rural unemployment resulting from rapid population growth and the mechanization of agriculture has been identified as the leading causes of rural to urban migration, especially in Latin America (National Reports for Population and Developments 1995). In addition, a

[1] Economic and Social Commission for Asia and the Pacific

growing shortage of fertile land in the context of high population growth, land holding inequality, environmental degradation, rural poverty, and lack of infrastructure and social services in the rural areas cause rural-urban migration. Ogden (1984) showed that the adverse environment conditions, unfavourable macro economic policies and declining markets for certain types of produce are also important factors for male out migration in Africa. Skeldon (1997) showed that in Southeast and East Asia the most likely factors causing young adult members to migrate is the population pressure. He argued that the pressure seem to imply that there is an imbalance between the population in an area and the capability of the area to support the population.

The migration of labour out of the agricultural sector is a typical feature during the process of economic development and modernization, both historically in developed countries and currently in developing countries (Rozelle et al 1999). The movement of labour from rural areas has profound effects on agricultural productivity and on distribution of income in less developed countries. This is mainly due to the fact that the majority of the labour force still lives in the rural areas. The large difference between expected rural and urban or foreign income; coupled with the risk reducing function of migration, cause workers to migrate either to urban centres or abroad. Stark et al (1982) suggested that migration in less developed countries both increases expected income and control risk through the diversification of sources of income.

2.1.2 Migration trends in Nepal

Migration at a significant scale in Nepal started between the18th and 19th centuries. From a historical perspective, both seasonal and permanent migration within and outside Nepal, was caused by economic hardship due to oppressive land and labour policies plus population pressure (Poffernburger, 1980). Various historical accounts point out that permanent emigration accelerated after 1850s particular across the boarder to Sikkim, Bengal, Assam Darjeeling, Bhutan and Burma (Carplan, 1970; Poffenburger, 1980). By 1900 about a quarter of a million people of declared Nepal origin were recorded in an Indian census. Also Carplan (1970) has noted that by 1891 about half the population of Darjeeling in India was of Nepalese origin. During 1950s people started to move from hills to Terai[2] with the introduction of anti-malaria programme. This migration led to depletion of forest resources on

[2] Terai is the plain area which is 300 metres below sea level and lies southern part of the country.

a massive scale as the settlers needed shelter as well as cultivable land in their new surroundings.

Migratory movement of labour (defined as inter district/ international out migration for work) is relatively large in scale and it has been further strengthened in the last three decades. Such movement can be divided into two categories, seasonal (or circular) movement and permanent movement. Low wage rates, lack of income from non-agricultural sources, higher level of human deprivations, and lack of social services (such as education and health centres) have significantly contributed to migration of people to Terai and cities and towns of Nepal and India in search for wage employment. These types of movements have been found to be very common in the mid-western and far western Mountains and Hills. It has been noted that more than one-half of all households were involved in such routine (McDonald, 1968). Studies have shown that migration income forms a high proportion of the total household income for the seasonal migrants' households. In addition, seasonal migration is no longer limited to people from the hills; the routine has picked up considerably among the people in Terai as well, who mostly migrated to urban areas in Nepal or areas of North India. Not only are more seasonal jobs available in both of these areas, but the wage rates are much higher as well. The census and some other data sets, however, do capture the scale of permanent migration. Data from different population census show that 0,44 million people during 1961-1971, 0,93 million during 1971-1981 and 1,23 million during 1981-1991 migrated permanently. Census data also show that during 1981-1991, 3.5% of the population in Mountains and 5,9% of the population in Hills moved away permanently, mostly to Terai (Adhikari,1996).

The migrants' income (remittances) becomes a major source of foreign exchange and source of income in many households and local communities throughout the country, particularly in the hilly areas. In Nepal as whole remittances accounted for 52.6% of total receipts of convertible foreign exchange in 1960-61. But their contribution declined to 7.3% in 1986/87 even though their value had increased significantly (figure 2.1). The main source of remittances was army service and such remittances began to flow in 1816 when the British government started recruiting people into military services. The decline of jobs in British military plus the existence of unrecorded remittances led to decline in proportionate contribution of remittances. However, this decrease in remittances from army workers does not lead to decreases in its contribution to household income due to increase of non-army jobs available to the Gulf states and South-East Asian countries. A recent study estimated that

remittances accounted on average for about a quarter of household income, although the share was higher in hills (30%) and in western region (33%). In rural areas, 25% of remittances came from urban areas, 33% from other rural areas, 40% from India and 3% from other countries (Seddon et al, 1999)

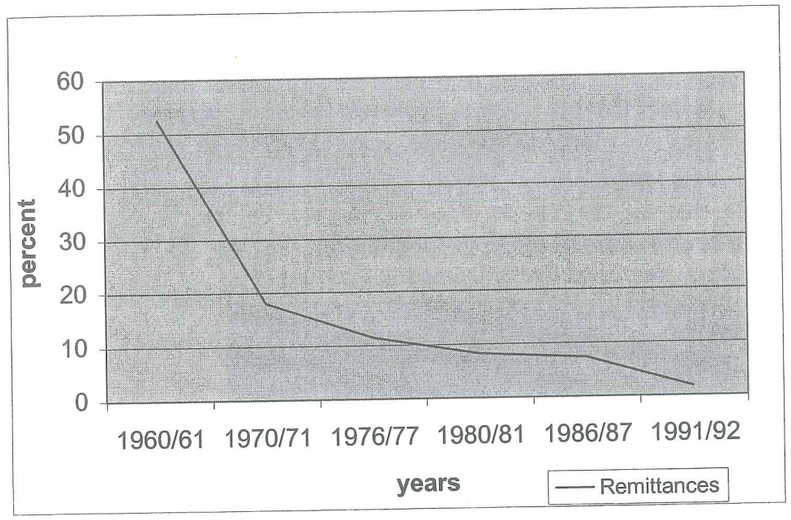


Figure 2.1 Remmitances contribution to total foreign exchange
Source: Adapted from Adhikari (1996)

The increased participation of rural households in labour migration, despite the decline in remunerative jobs in foreign armies, points to the fact that there is a continuous need for access to off-farm income. Despite the decline in military jobs, especially in British army, many of the households still obtain pension and other benefits. The importance of labour migration as a source of income and its effects on restructuring of household economy has become important even in the area where farm income was dominant.

Despite the significant role of migration activities through remittances, the income effect of migration is not well documented. The increasing importance for rural household economy from non-farm income and remittances from migrants has been largely ignored. Dixit et al. (1997) has pointed out that all the figures and calculations done by the National Planning commission does not take account of the contribution of remittances into the national accounting.

2.2 Structure of the Nepalese Economy

The Nepalese economy is largely dominated by the agricultural sector, which contributes more than one-half of the household income, and provides employment to more than 80% of the population. The remaining percent of the population are engaged in non-agriculture activities, including the service and industry sectors (Nepal Human Development Report, 1998). However, the agricultural productivity is very low which is evident from the fact that the population engaged in agricultural activities contribute only to 42% in total GDP (figure 2.2).

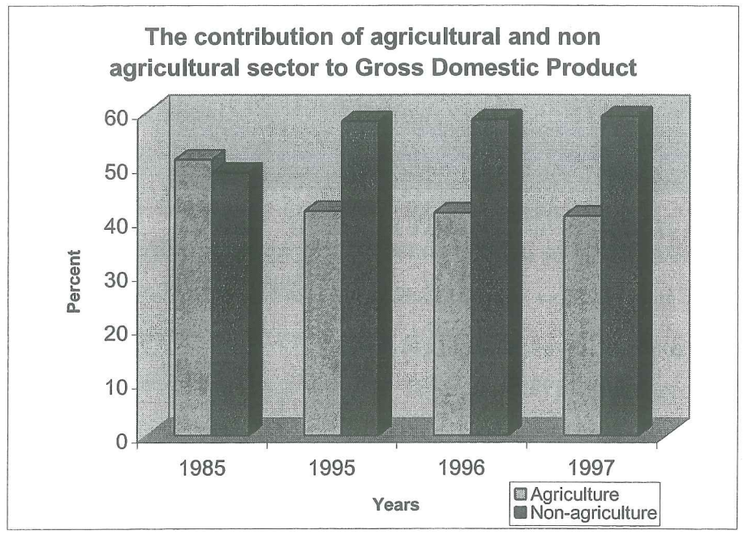


Figure 2.2 The contribution of agricultural and non-agricultural sector to Gross domestic Product
Source: Ministry of Finance, 1997

The agricultural sector has not had the necessary drive when compared with non-agricultural sector. The trend of the sector during the years 1985/86 to 1998/99 has shown big year-to-year fluctuation (Economic survey report, 2000). The average agricultural sector growth rate from 1985/86 to 1998/99 was 2.8% while the average growth rate of the non-agricultural sector for the same period was 6.4% (figure 2.3). As a result, the GDP growth rate were also fluctuating and the average growth rate was 4.7%. According to the Economic survey report (2000), the GDP growth rates in 1998 and 1999 were less than those planned under the Ninth Plan due to lower growth of the agricultural sector facing adverse weather conditions, and production of other dependent sectors also trailing behind.

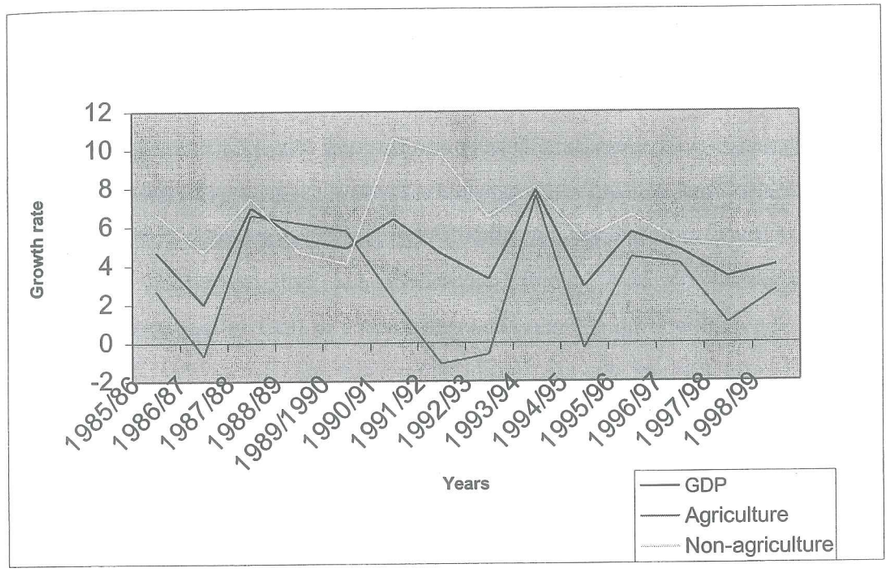


Figure 2.3 Growth rate of GDP, agriculture and non-agriculture sector
Source: Economic Survey Report, 2000

The low productivity is due to several constraints including land degradation, use of traditional technology and lack of support policies in the agricultural sector. The seasonal nature of agriculture and the problems associated with it lead to increasing of seasonal and permanent migration from rural areas to urban areas. As a result there is a decline in the agricultural workforce. Between 1981 an 1991 agricultural work force declined from 91% to 81% of the total workforce (ILO SAAT, 1997). Different micro studies indicate that in the hilly region of Nepal, income from off-farm employment contributes from 32.5% to as much as 57% of the total income (Khatry-Chhetry et al 1991). The contribution from off-farm employment is higher for the landless and small farmers simply because they have little land to cultivate, hence lower agricultural income

The seasonal and permanent migration from the agricultural sector affect the households through adjustments of the three productive resources; labour, capital and land.
The long-term male rural out migration may change the gender division of labour in the farm household. Men may not be available for doing the heavy tasks, which are energy intensive. For women this will give them more work to do in the agricultural activities and less time for

domestic tasks. With diminishing supply of male labour, women must either depend on hired labour or resort to limited agricultural production. Thus labour shortage my lead to a reduction in total agricultural output and underutilized or idle productive land.

Migration may be beneficial to agricultural production through migrants' remittances, which may be used to invest in land, invest in new production activities, to acquire more land or to hire labour. In this case remittances can relax the liquidity constraint. However, male migration does not necessarily lead to more income for the farm household. Research in Pakistan and India shows than migrant men send remittances to their fathers to pay debts or buy land rather than to their wives who are running the households (Roca, 1993). In Malaysia, most of the remittances are used to maintain rural families or repay social debt and only small portion of remittances are used directly as investment for rural development (Ahmad, 1988). All these impacts will affect the production and food security within the households.

2.3 Description of the study area

Nepal is known as the Himalayan Kingdom. The country situated between India and China. It is a landlocked country with a limited resource base. From the southern low lands, the country rises in successive hills and mountains, including towering Himalayas. It comprises a total of 147,181 square kilometres of land. Because of the dramatic change in altitude, Nepal is invariably divided in major three ecological zones The Terai, Hills and Mountains.

The Terai contain the largest portion of agricultural land, which comprises 17% of the total land, and is often regarded as the granary of Nepal (Shrestha et al, 1999). Mountains and hills cover 83% of the total area. The hills landscape is both natural and cultural mixture, shaped by geological and human forces. The mountain region is situated north of the hills, along the Tibet plateau of China. The region has harsh topographic and climatic conditions, which cause the region to be sparsely populated. The region has been supported less than 8% of the country's total population.

2.3.1 Location and physical environment

The study was carried out in Mardi watershed in the western hills of Nepal, which extends well above the Pokhara valley to the Annapurna range. The area is situated in Kaski district of

western Nepal covering an area of about 63 km^2. The attitude ranges from about 900 meters at the confluence of Mardi and Seti Rivers to as high as above 5000 meters above mean sea level. From Phokara, the headquarters of western development region of Nepal, the closest and farthest settlements in the watershed, namely Lahachok and Sidhing, are about 15 and 45 kilometers northwest. Mardi, the main river of the watershed, is the major drinking water source of Pokhara town. Mardi watershed area contains: Lahachok, Dhital. Rivan and Lwang-Ghalel Village Development Committees[3] (VDCs), and partial area (ward No. 6 to 9) of Dhampus VDC. The sample was drawn from three VDCs, which included Lwang-ghalel. Rivan and Lahchok.

The study area (Lwang-ghalel, Rivan and Lahchok) are within the ridge and plain landform and these features have distinctive impacts on climate and weather conditions (See figure 2.6). Accordingly, the ridges have a humid temperature with long, warm summer seasons and short cold winter seasons. Primarily due to elevation, there are significant spatial variations in temperature range as well as the amount of precipitation. During summer season (March to October), the average temperature ranges between 18 degrees centigrade in hilly region and approximately 23.5 degrees centigrade on the plains. In the hottest month of July and August, the temperature scales to 26 degrees centigrade (See figure 2.4) on the plains but on ridges it is limited to 20 centigrade (see figure 2.5). The average annual amount of rainfall on the ridge is about 4700 mm, compared with 4000 mm on plains. The peak rainfall season is between May and September. In the month of July and August, the average monthly rainfall is as high as about 1300 mm on the ridges and 1000 mm in the valleys.

The climatic conditions and topography structure generate environmental problems such as soil erosion and landslides. Loss of nutrients rich topsoils in uplands affect the down stream ecosystem and the farm lands. This problem, partly natural in character is further accelerated by human activities. This indicates that any problem in the upland will have cumulative effects on the people living in the plain areas.

[3] The smallest administrative units in rural Nepal.

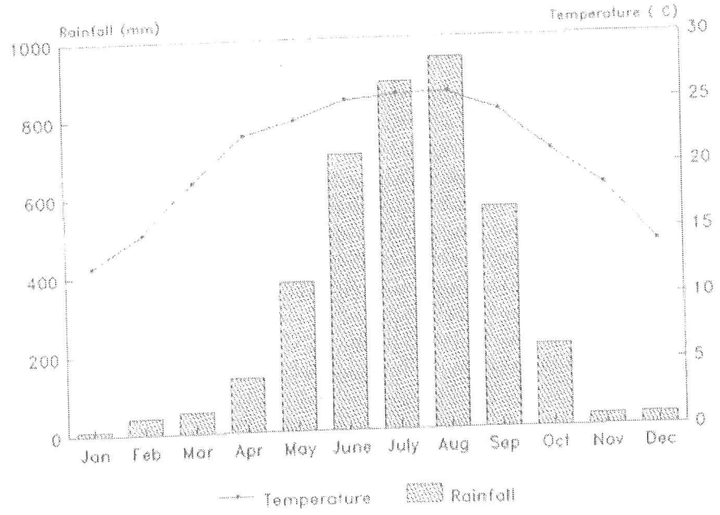


Figure 2.4 Temperature and rainfall from Pokhara Airport (2700')

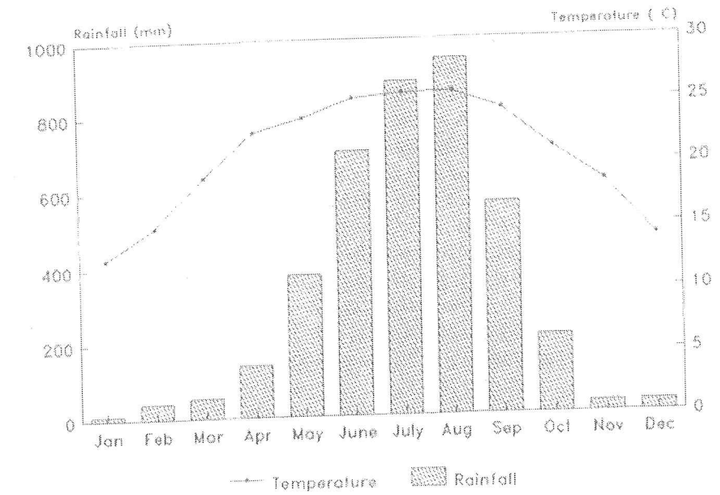


Figure 2.5 Temperature and rainfall, Lumle (5500')

Adapted from Thapa, (1995)

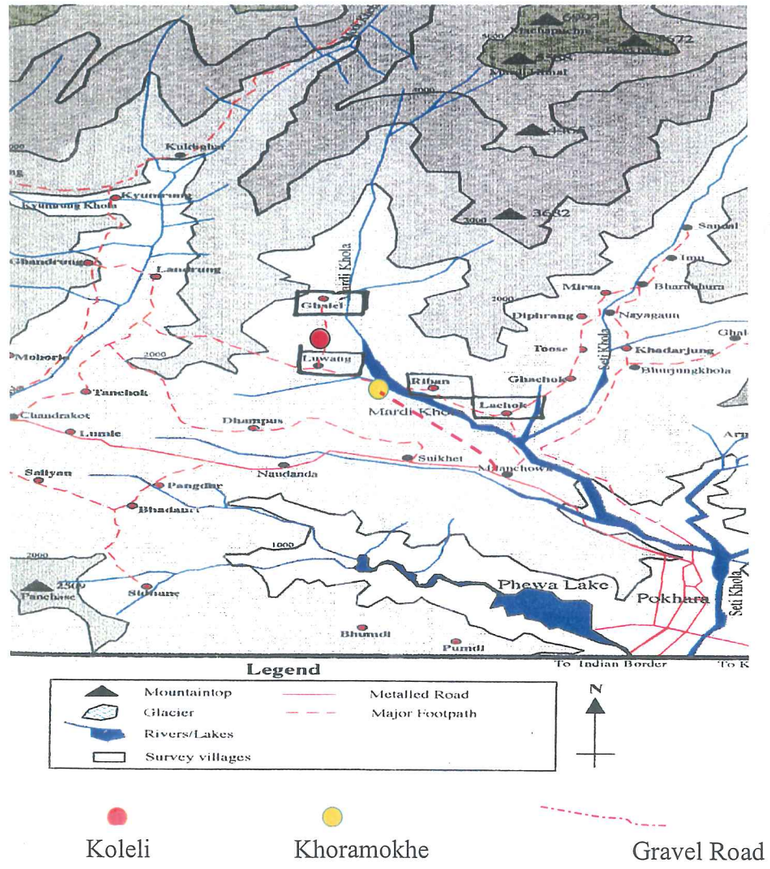


Figure 2.6 Map of the study area

2.3.2 Soil and vegetation

The agricultural land in the area can be broadly divided into valley and terraced land lands (Thapa et al, 1990). The valleys contain the alluvial plains with the slope gradients of less than 1^0. The predominant soil type in the valleys is Entisols, which are deep and fertile with loamy/boulder texture. Some parts of it consists of calcareous, course gravely soils. Terraced lands allocated on ridges and slopes between 1200m and 2200 m. Most of the lands are on slopes between 5^0 and 30^0. Soils are inceptisols, 50-100 cm deep and well drained, with loamy/ skeletal texture.The vegetation types ranges from *Schima-Castanopsis* mixed forest type to *Daphniphyllum*, *oak* and *Rhododendron* mixed types as the elevation goes up to tree line. Alder (*Alnus nepaleusis*) forms the major species in moist gullies with landslides in the past, as well as community plantation sites. Above the tree line exists the alpine grassland.)

2.3.3 Infrastructure

Transport systems and road networks are very poor in the study area and situation is worsening due to the problem of occasional landslides. The area is not accessible by road during the rainy season but jeeps can drive as far as Khoramokhe in the central plain area during the dry seasons. Many villages are situated on the hills and people have to walk long distances to Khoramokhe (2 to 6 hours) to access social services like school, health care and to sell their agricultural products. Agricultural products are transported to the market by family members or by using hired labour. The agricultural products are often sold in local market in the villages at lower prices.

2.3.4 Demography

Considered to the political and cultural centre of Nepal, the hill region, were the study area is located, historically contained the largest population. Despite the high rate of migration to Terai the southern lowland belt of Nepal, and to India – the region contains some 46% of the total population (Shrestha et al., 1999). The watershed area where the study area lies have 3265 households at present with a population of 16885 (ACAP Economic Field survey 1999). The population density per km^2 is 268. Present rate of population growth is 1,34%. The average household size is 5.66, which is consistent with the national average but slightly higher than the average of the Western Development Region (5.5) and considerably higher

than the average at Kaski district (4.9). The population of the study area (Lwang-Ghalel, Lahachowk and Rivan VDCs) is 10927 with 1989 households. The average household size is 5.42, which is slightly lower than the average household size of the whole watershed area. (Table: 4.1)

According to the sex distribution of the population in the study area, the percentage of females in the population is 49.45 and male is 50.55. From the total population of 10927 in the study area 10.98% fall in the category of 0-4 years, 28.21% in the category of 5-14 years, 61.22% in the category of 15-59 years and (8.08) in the category of 60 years and above. The percentage of people belonging to class 15-59 is considerably higher comparing to national population census (51.79%). Thus about 39% of the total population depends on the economically active population (15-59 years).

2.3.4.1 Sample Population

The sample population has at least equal representation of males and females in both VDCs (Table 2.1). The working force population between 15-55 years of age represents the largest part of the family (46 %). Children up to age 15 constitute 39% of the total population. The oldest population in the surveyed household accounted for the smallest share in the family composition (24%). The average household size in the sample is 5.33, which is close to that of the watershed area presented by the ACAP (1999), which was 5.66. The household size is higher than the average of Kaski District, which was 4.9. A total of 23.5% of all households interviewed were female headed and the remaining was male headed (76%). In this context the household head was defined as the person who is in charge of the economic budget, and has a last say on most of the major decisions taken regarding household activities. In most of the Brahmin and Lower caste society men make almost all decision, where as among Gurung society the male dominance is less prominent. In the later group it is often women who are in charge of taking the decisions about economic activities. In the study area 40.42% of all female-headed households were from the Gurung ethnic group. Out of the total population 56% were engaged in the agricultural activities.

Table 2.1 Population structure of surveyed households (in Percentage)

VDCs	Age category							Total households
		0-5	6-10	11-15	16-20	21-55	55++	
Lwang-ghalel	Male	13	13	15	11	32	16	319
	Female	14	11	13	11	37	15	346
Lahachowk	Male	16	15	11	11	30	115	79
	Female	9	11	17	14	39	12	103
Rivan	Male	16	15	13	11	36	11	103
	Female	16	12	12	12	41	9	116
All 3 VDCs	Total	14	12	13	11	35	14	1066

2.3.5 Education

Education is observed as the means of upgrading peoples' awareness. It is also an important factor in the socio economic uplifting of the people. Education helps people to understand the environment and the environment conservations programs, and in other hand, make them to be able to adopt different alternatives means of livelihood, if necessary (ACAP 1999). In the watershed area, 58% of the total population are estimated to be literate. The ACAP survey report indicated that male literacy rate in the area was as high as 67.8% while female literacy rate was 48% (for the total male 10978 and female 10466)

From the surveyed household there was variation in the education levels. The mean education for the whole population above 15 years was 3.7 years (exclude literate). Households who were registered as literate without attending school were considered as missing variables in the system. Most of the household members who are above 15 years old did not have any education (42.1%) , this is indicated in table 2.2. The average number of the years of schooling for the household heads in the sample was 5 years. Only 19.5% of the household heads registered to have more than 2 years of schooling. Additionally the 68 persons registered themselves as literate and 79 as illiterate. There were significant different between education of the high caste and the Lower caste people above 15 years. Mean years for the higher caste was 4.9 while it was 2.3 for lower caste. The t-test of equality means gave the p value of 0.000.

Table 2.2 Education level of households members above 15 years of age (% of the population recorded literate excluded)

Level of education in years of attend school	Percent
No education	42,1
1-5	21,9
6-10	33,7
11-14	2,4

2.3.6 Caste system and Religion

The caste system was abolished in 1963, but is still widely practised through out the country. In the caste system, which is divided in four levels, the Brahmin belong to the highest level and referred to as priest class The lower caste, belong to the lowest level and they originally regarded as the working class, equipped with various skills such as carpentry, leather and iron working, sewing and so on. Other castes groups also regard them as untouchable. Water and all cooked food from lower caste are regarded as impure and not accepted by other caste groups. The others castes are chettri and Gurung.

Households living in the study area have different ethnic groups and different castes. The most predominant group in the study area is Gurung ethnic group (33.6%), which have the East Asian/Mongol features, and they are predominantly Buddhists (See table 2.3). The other group belong to Hindus. Gurung households have their own language originated in the Tibetan language, but the common language in the area is Nepali. Table 3 also show that, in Lwang ghalel, and Rivan most of households are from Gurung ethnic group (more than 50% and 47,9% respectively). Brahmins are the dominant ethnic community in Lahachowk VDC (43,4%) , followed with Chettri ethnic groups (20,5%).

Table 2.3 Caste –wise classification of Population

Caste	Lwang ghalel	Lahachowk	Rivan	Total population	*Percent*
Brahmin	3,5	43,4	26,2	23,4	**23.4**
Chettri	16,9	20,5	14,7	17,9	**17.9**
Gurung	54,9	4,1	47,9	33,6	**33.6**
Lower caste	23,5	17,6	11,1	18,9	**18.9**
Others	1,2	14,4	0,0	6,2	**6.2**
Total population	4075,0	3801,0	1749,0	9625,0	***100,0***

Source ACAP 1999

From the sample households, out of 200 households 24.5 % belong to Brahmin, 10.5% Chettri, 30% lower caste, 29% Gurung and 5% others (Magar Tamang).

The dominant religions in the study area are Buddhism and Hinduism, but the degree of cultural integration and influence from one culture and society to another had led to a more mixed culture. Few households practices the lamaistic faith and there are some who work as lama or priest

2.3.7 Land holding and utilization

The limited amount of land suitable for agriculture, combined with the concentration of the major proportion of the national population in the mountains has given rise to an agricultural economy characterized by small holding (Regmi, 1977). Thus, historically as well as present, mountain farmers have been working on smallholdings, which are getting steadily smaller in size due to population growth. The size of farm holding in the study area was 8,27 ropani[4]. As shown in table 2.4, 53% of the surveyed household have less than six ropani, 40% hold between six and twenty ropani , and 7% hold more than twenty one ropani.

Table 2.4 Land holding among all households in percentage (N=200)

Size of Land in Ropani	Hectare	Cultivated land	Grazing Land	Unproductive land	Forest land
<5	< 0.25	53,5	96,5	97	98,5
5-20	0.3-1	40	3	3	1
>20	> 1	6,5	0,5		0,5
Total		**100**	**100**	**100**	**100**

The distribution of land holdings between the two groups of households indicated in (table 2.5). The percent of migrants' households with land less than 5 ropani was 47,9 while for the non-migrant households was 57.7. In both cases most of the household have less than 5 ropani.

[4] 1 ropani = 0.05 hactare

Table 2.5 Distribution of land holding between migrants and non -migrants households

Size of land holdings		Percent of migrants households (N= 96)	Percent of non-migrants households (N=104)
Ropani	Hectare		
< 5	<0.25	47,9	57,7
6-20	0.3-1	42,7	37,5
>20	>1	9,4	4,8
Total		**100**	**100**

There are two types of cultivated land which are commonly described in the mid hills: *pakho*[5] (upland) and *khet* (lowland). The usual way of classifying lands as *pakho* or *khet* is by crops grown. The land on which wet rice is grown (that is irrigated or rain fed rice fields) is called kheti and the rest is grouped under *pakho*. Sometimes, *pakho* has been converted into *khet* after developing irrigation facilities. Crops like maize, millet, and potatoes ad mustard are mainly grown on pakho. In khet, mainly rice is grown, but sometimes maize, millet,wheat and mustard are also grown on khet land.

The values attached to *pakho* and *khet* are different. *Pakho* is considered to be inferior, reflecting the lower yield of rice or wheat grown without irrigation. Having more *khet* land used to be a matter of prestige in the past (Adhikari, 1996). The general practice of attaching prestige to ownership of *khet* was most probably because rice is the staple crop and the irrigated or rain fed wet field produce higher yields and were more reliable than those of uplands. Since land has been the main form of wealth in this rural community, both social and economic power of individual households are reflected on land ownership.

Households of most of the Occupational Caste as a group had smaller land holding in comparison with other ethnic groups. Table 2.6 showed that out of the all households who owned land between 0-5 ropani, 42% were from Lower castes. Only two out of 54 (3,7%) Lower caste households were found to own between 16-20 ropani, and 4 (17,4%) households of Chettri caste, 15(20,3%) households of Gurung and 18 (36%) households of Brahmin caste.

[5] *Pakho* land is also called *Bari*, but there exists a slightly difference is the use of two terms. *Pakho* also include some of uncultivated upland, where as Bari exclusively refers to cultivated land used for growing upland crops. Since *Bari* is more indicative of well attended, well fences and well-manured fields, the *pakho* term seems to be more appropriate to use.

Table 2.6 Households land owner ship by Caste (in %)

Size of total land	Brahmin	Chettri	Gurung	Occupational Caste	Total
0-5	12,5	12,5	33	42	**100**
5-20	30,7	12,5	37,5	19,3	**100**
20<	50	4,1	45,9	0	**100**
Average	13,5	8,0	12,7	4,9	
Average of Cultivated Land	**11,2**	**6,8**	**9,1**	**4,5**	

Like the other areas of Nepal, agricultural forms the basis of livelihood in the study area. Owing to the small size of holding and scarce non-farm employment opportunities, virtually all farm households in all settlements had utilized their land for cereal crops production to safe guard their food supply. Confronted with the problem of increasing food demand and marginal land holding, both valley and ridge farmers have adopted a practise of mixed cropping and crop rotation system.

2.3.8 Production System

2.3.8.1 Cropping system

The subsistence agriculture was the cropping system which is common with the particular food grains dominating the agricultural activities, and account for the main part of agricultural production. The greater part of the cultivated land was rain fed, but some households make use of rivers water especially from the Mardi River in the fertile valley bottomlands. In the terraces, the main crops cultivated were maize, millet, wheat and paddy (rice). Cultivation pattern vary from indefinite fallow to continuous cultivation. Multiple cropping predominates with occasional pure stands of some crops maize and paddy in particular. Mixtures nearly always include at least one-legume crop. Although several cropping patterns can be discerned, the most important practices in the area were preferable to paddy-based activities on irrigated plot or maize activities on rain fed *bari*.

Major crops grown in the study area include paddy, maize, millet, and wheat for staple cereal crops, and these crops provide a regular food supply to the households. Potatoes and soybeans grown at the edge of paddy fields were the part of local diet. Soya beans were an important protein source, because meat was occasionally consumed. The legume plants also return potassium and phosphorus back to the soil. Usually the households had vegetables plot

(kitchen garden) adjoining their farm in which they grow a rich of diversity of vegetables (cabbages, carrots, legumes, tomatoes, chilli, ginger, cauliflower, cabbage, spinach, onions, radishes, different types of beans, garlic, sweet potatoes, Ghiraula[6] and corela[7]). Almost all of these were seasonal and annual, though potatoes and maize can be cultivated and harvested in late summer and early spring. Cash crops were hardly grown in this area. ACAP[8] is stimulating the development of cash crop growing like tea, but still practised on limited scale. The agricultural calendar for the study area is shown in figure 2.7.

2.3.8.2 Livestock

Livestock raising was a fundamental component of the hill farming system and the vital link between agriculture and forestry resources. The maintenance of soil fertility still depends largely upon the application of animals' manures and the import of nutrients from adjacent forestland. Crop residues also represented as important component of livestock feeding. Assorted species of livestock fulfilled farmers' requirements of manure and draught power for field crops cultivation and dairy products for consumption as well as for sale. Farm households had reared assorted species of livestock mostly cattle, buffalo, goat and poultry.

[6] Nepalese vegetable
[7] Nepalese vegetable
[8] Annapurna Conservation Area Project, managed by King Mahendra Trust for Nature Conservation.

ACTIVITIES	JAN.	FEB.	MAR	APR.	MAY	JUN.	JULY	AUG.	SEPT.	OCTO.	NOV	DEC.
Collecting fuelwood	→	→	→									
Planting Corn			→	→	→							
Planting Millet					→	→						
Planting Paddy						→	→					
Harvesting Corn							→	→				
Harvesting Millet and Paddy										→	→	
[9]Off-farm activities									→			→

Figure 2.7The agricultural calender of Mardi watershed

(Source: adapted from Bajracharya, 1993)

2.3.9 Migration in the study area

Migration had been practised in the study area for several decades in form of permanent and temporary migration. It started with the recruitment of local youth in the foreign army. Until seventies, out migration to join the military services in the England and India were common. Basically people from Gurung ethnic group where mainly involved in such activities. India was a principal destination for the non-army jobs seekers. People were migrating because other sources of non-farm income were very limited.

In the last two decades there has been an increase in the movement of people from the study area to Gulf States and South-East Asian countries to seek non-army jobs (Gurung 2000). The

[9] Also take place during other months and especially during the firewood-collecting month.

educated people in the area, and the increased tourism business in Pokhara were the main factors that attracted local youth to migrate to urban area and outside the country. Educated young people started to move out of the village to join public services within the country and others preferred to go to Pokhara and work as tourist's porters and guiders. The rate of temporary out migration from the study area has increased. In 1961, the rate of migration from Kaski district (within which the study area lies) was 3.2% of the total population (Gurung 1965 quoted by Thapa et al 1990). Adhikari 1992 reported that the rate of labour migration in the Rivan- Lahachock area to foreign countries to be 10% in 1992. A study conducted in 1997 in the seven VDCs adjacent to the watershed showed the rate of out migration to be 15.37% of the total population (ACAP 1999). From the surveyed sample it can be seen that, most of the migrants went to Middle East (48%), out of which 69% were from Lower Caste (table 2.7). Most of migrants opt to migrate to Middle East countries because the risk involved to go to these countries is lower compared to countries like Korea and Japan. Migration remittances influence the income level of the household by relaxes the cash constraints.

Table 2.7 the percentage of migrants destination by caste

	Nepal	India	Middle East	East Asia	Total
Higher Caste	7,2	45,8	38,6	8,4	100 (107)
Lower Caste	4,8	21,4	69	4,8	100 (42)
Total	6,4	37,6	48,8	7,2	100 (149)

Numbers in parentheses denote the number of migrants.

2.3.10 Income Pattern and sources

Like many communities in a developing country, the study area is allocated in a less favourable agricultural area. Limited infrastructure shapes non-farm opportunities. Transport to the study area is too poor to make the daily commuting to non-farm work in nearby town attractive.

A large share of population in study area is solely dependent on agriculture for their livelihood. However 53.5% of the surveyed households had less has less than 5 ropani. ACAP study showed that out of the 4062 households interviewed in the watershed area, 46,33% did not disclose any other source of income. (ACAP, 1999). The study also indicated that more than 50% have no other source of income, 45% have only a single source of income (non

agricultural). Households having multiple sources of income, that is more than three sources, account only 0,15%. Pension, mostly from India was the major source of income of non-agricultural income for the population. Pension Income accounted for 32.9%. Majority of earning households (60,14%) belong to the income class of Nepalese rupees 10,001 to 50000 per annum (ACAP, 1999).

The household survey showed that the each household in the study area was dependent on different sources of income. The sources of income in the study area were rent for hiring out labour and oxen, employment, remittances, farm income and other sources (such as small businesses). The main source was remittances, which contributed for about 26,8% in the total gross income, followed by farm income (25,8%). Other sources of income contributed about 23,4 % in the total gross income and the remaining part was from rent (17.7%) and employment (9.4%). Table (2.8) show the income share of different sources of income in three VDCs. In Lwang Ghalel the migration income (remittances) was the dominant income source, with 32,6% share of the total income followed by other sources of income (25.1), and farm income (23.7%). In Lahachowk, other source of income and farm income were the important sources of income, with the contribution to total income of about 24% and 30,3% respectively. Rent, remittances and farm income were the important sources of income in Rivan as indicated in table 2.8

Table 2.8 Income share in actual figures as well as (%) for the each VDC

Annual income for sample households in NRS	Lwang ghalel	Lahachowk	Rivan	Total
Rent	11,0	16,8	25,1	14,7
Employment	9,6	20,8	5,6	9,4
Remittances	32,6	8,1	23,7	26,8
Other Income	25,0	24,0	17,0	23,4
Farm Income	23,7	30,3	28,6	25,8
Total in Nepalese Rupees.	**7432750**	**1946900**	**2238484**	**11618134**

The percentages of income received by the different ethnic groups were presented in table (2.9). Lower caste had rent and remittance as the main sources of income, with 30,8% and 26,9% respectively. Remittance and other sources of income were the main sources of income for the households belonging to Gurung ethnic group. Brahmin and Chettri had farm income as the main source of income, with 35,5% contribution to their total income.

Table 2.9 Income per consumer unit in NRS and percent, by Caste in the study area

CASTE	Brahmin and Chettri	Gurung	Lower Caste	Others
Rent	16.4%	7.4%	30.8%	16%
Employment	11.1%	7.7%	6.5%	12.1%
Remittances	21.2%	24.5%	26.9%	31.9%
Other Income	15.9%	35%	17.9%	33.2%
Farm income	35.5%	25.4%	17.8%	6.6%
Total in Nepalese Rupees	**917105**	**137852**	**614897**	**99774**

2.3.11 Households expenditure

In the study area, income generated from different sources was used to meet consumption requirements. The household expenditure disaggregated into cash and non-cash component. The non-cash component includes the consumption of goods and services produced by the household, that is home-produced goods, mainly food. The cash component includes all consumption goods commodities, which were purchased by the households during the past year (may 1999 to May 2000).

From the surveyed household in the study area, lower caste generally had low subsistence level (non-cash component compared to the higher castes (Brahmin, chettri) due to lack of land available for cultivation. The Gurungs had the highest subsistence production as shown in table 2.10. Regarding the expenditure of non-cash components (value of subsistence production) and cash components (the expenditure of food and non food items), there was a variation in the expenditure among the households from different castes. Other castes and Lower caste households had the highest per capital expenditure when compared to Brahmin, Chettri and Gurung castes, where the food expenditure constituted 57.3% and 50% of the total expenditure respectively. This suggests that households from the two castes depend on a market economy. The Brahmin, Chettri and Gurung castes groups had higher expenditure on non-food items. The shares of the expenditure of the non-food expenditure in the total expenditure for these caste groups were 56.3%, 51.2% and 56.3% respectively.

Table 2.10 Average subsistence expenditure and household expenditure /consumer unit per household, by caste

Caste	Number of Households	VOSE Value of subsistence expenditure	Household Expenditure Pattern Non-food expenditure	Food expenditure	Total Expenditure
Brahmin	50	3262	56,2 %	43,7 %	**9665,7**
Chettri	19	3083	51,2 %	48,8 %	**13618,6**
Gurung	73	3520	56,3 %	43,7 %	**17968,5**
Lower caste	54	1623	42,7 %	57,3 %	**12389**
Others	4	1228	49,9 %	50,1 %	**12863,5**

Chapter Three: Theoretical framework

This chapter presents the theories related to migration and the farm household. The chapter will set the background for analysis and conclusion. In section 3.1 theories of migration will be presented, followed by the market imperfections in rural areas in section 3.2. Section 3.3 will present the agricultural household models with different labour assumptions and lastly a typical household model, which represents the household decision in the study area, will be presented

3.1. Theories of migration

3.1.1. Todaro Migration Model

Microeconomic model of individual choice assumed that individual rational actors decide to migrate if there is positive net return in their cost benefit calculations from the movement. International migration is conceptualised as a form of investment in human capital. Potential migrants estimate the cost and the benefit of moving to alternative locations and migrate to where the expected discounted net returns are greatest over come time horizon (Borjas, 1990). Neoclassical economics assumes that there is global rationality, perfect information, and no transaction costs.

The Todaro model is based on neoclassical assumptions. In this model the keys factors causing people to migrate are wage differentials, employment conditions and migration cost between rural and urban areas for rural-urban migration, and between countries for international migration. It generally conceives movement as an individual decision for income maximization. Under the neoclassical tradition, the macroeconomic models were developed to explain labour migration in the process of economic development (Lewis, 1954; Ranis and Fei, 1961; Harris and Todaro, 1970; Todaro, 1976). According to this theory and its extensions, international and internal migration is caused by geographical differences in the supply and demand of labour. Areas within the countries with large endowments of labour, particularly rural areas, have low equilibrium wages. Also the countries with large endowment of labour relative to capital have low equilibrium market wages. On the other hand, countries and areas with limited endowments of labour have high equilibrium market wages. The resulting differential in wages causes workers from low market wage areas or

countries to move to those with a higher market wage. As the result of this movement, supply of labour decreases and wage rises in areas with abundance of labour, especially rural areas and capital poor countries.

Ghatak, et al (1996) used the Todaro model to explain factors which increase migration. The following notations were adopted: w_r = rural wages (in real terms) and w_u = urban wage. Let L_u be the urban employment rate taking the value $L_u = \overline{L_u}$ prior to any migration. Let N_u be the total urban labour force and $M\overline{N_r}$ the number of migrants in equilibrium where the M is the migration rate, defined as the number of migrants as a proportion of the initial rural population, $\overline{N_r}$. Then the $N_u = \overline{L_u} + M\overline{N_r}$.

A simplified assumption in the Todaro model is that, W_u is fixed and institutionally determined. Urban employment L_u is therefore fixed and it can be written as $L_u = \overline{L_u}$. The rural real wage, W_r may be market clearing but is independent of migration rate M. In other words, they assumed that migration rate M is not very large as to have an effect on the rural labour market. From their assumption future expected income from migration is given by:

$$\int_0^{\infty}[\rho w_u + (1-\rho)w_b]e^{-rt}dt - C = \frac{1}{r}[\rho w_u + (1-\rho)w_b] - C \qquad (1)$$

Where r is the migrants' discount rate, ρ is the probability of employment and w_b is the real income received if unemployed or employed in informal sector. The migrants compare (1) with the future income from remaining in the rural sector

$$\int_0^{\infty} e^{-rt} w_r dt = \frac{1}{r} w_r \qquad (2)$$

The probability of obtaining employment is given by

$$\rho = \frac{\overline{L_u}}{N_u} = \frac{\overline{L_u}}{\overline{L_u} + M\overline{N_r}} \qquad (3)$$

Which assumes that migrants compete on equal terms with the incumbent urban employed population[10]. Thus as M rises, ρ falls and migration continues until the returns from (1) and (2) are exactly equal. Hence, the equilibrium migration rate M is given by:

[10] Todaro (1969) considers an alternative selection process in which urban employment is growing and entry into employment by the migrants is permanent

$$\rho w_u + (1-\rho)w_b - w_r = rC \qquad (4)$$

With ρ given by (3). Substituting (3) into (4) and solving for M gives the equilibrium migration rate.

$$M = \left[\frac{w_u - w_r - rc}{rc - w_b + w_r}\right]\frac{L_u^*}{N_r} \qquad (5)$$

From (5), the following familiar results are obtained:

$$\frac{\partial M}{\partial w_u} > 0; \frac{\partial M}{\partial w_r} < 0; \frac{\partial M}{\partial L_u^*} > 0; \frac{\partial M}{\partial c} < 0 \qquad (6)$$

The inequalities (6) state that any marginal increase in urban wage *(w_u)* or decrease in the rural wage *(w_r)* will increase migration. Any policy to increase employment in the urban sector will raise the migration rate and the urban unemployment. Also any decrease in cost of migration *(c)* will enhance the rate of migration.

3.1.2. Migration, uncertainty and risk aversion

In recent years, a "new economics of migration" has arisen to challenge the assumptions and conclusion of the neoclassical theory (Stark et al., 1985). A key aspect of this new approach is that migration decisions are not made by isolated individual actors, but by the larger units of related people – typically families or households in which people act collectively not only to maximize expected income, but also to minimize risks and to loosen constraints associated with the variety of market failures, apart from those of labour markets (Stark et al, 1982; Stark, 1984; Katz et al., 1986; Taylor, 1986; Stark, 1991).

Unlike individuals, households are in the position to control risk to their economic well being by diversifying the allocation of household resources such as family labour. While some family members can be assigned economic activities in the local economy, others may be sent to work in foreign labour markets where the wages and employment conditions are negatively correlated or weakly correlated with those in the local area. In the event that local economic conditions deteriorate and activities there fail to bring sufficient income, the household can rely on migrant income for support.

In developed countries, risks to household income are generally minimized through private insurance markets or governmental programs, but in developing countries these institutional

mechanisms for managing risks are imperfect, absent, or inaccessible to poor families, giving them incentives to minimize risks through diversified income sources and migration. In developed countries, moreover, credit markets are relatively well developed to enable families to finance new projects, such as adoption of new production technology. In contrast, most of developing countries, credit is usually not available or is procurable only at a high cost. The absence of accessible public or affordable private insurance and credit programs, creates a strong pressure for migration especially, international migration.

Studies by Stark and Rosenzweig (1989) and Lucas et al (1985) provide econometric evidence, using household data from rural India and Botswana, that families insure themselves against risk by placing members in labour markets distant from their village and where income is not positively correlated with local farm income. Sometimes remittances set a motion in development dynamic by loosening production and investment constraint faced by less developed countries' households..

3.1.3. Impacts of migration

Both positive and negative impacts of migration are shaped by the size, distribution, and influence of remittances on incomes in migrant's households. A number of studies have attempted to show the impact on production, consumption and income distribution.

A study conducted by Lucas (1987) on migration to the South African mines from five southern African (sending nations) found that, initially the production decreases due to lost labour in migrant sending. In the long run, however, agricultural productivity increased for two reasons: First, migrant remittances were invested in production at home, which loosen financial constraints on productivity-enhancing ventures and yields a higher output. Second, migration diversifies the source of income and encourages risk averse households to undertake risky, but potentially productive, investments. Adam (1991) found that households with migrants in rural Egypt had higher marginal propensity to invest than the non-migrant households. However, the policy biases the agricultural sector discouraged the investment in agriculture. A study conducted by Taylor (1992) indicated that the effect of migration on household farm production in rural Mexico initially was negative. In the presence of credit and insurance constraints, migration and remittance should have a positive effect on the rural household production because it plays the role of income insurance.

Remittance is assumed to have a positive effect on the economic development if the migrant's households spend a large share of their remittance income on productive investments. Most remittance use studies concluded that remittances are consumed rather than invested, but there is no clear distinction from the productive investment. For example, education is absent in the list of productive investments (Taylor 1999). This is because expenditures on educating family members usually do not create direct or immediate employment and income linkages within migrant households. By contrast, expenditure on farm machinery generally is regarded as a productive investment, although machinery is not produced within the village economy and may even displace labour in the village production and produce negative income linkages (ibid).

Several studies have showed the effect of migrants income on income inequality, either by comparing income distributions with and without remittance (Barham and Boucher, 1998), or by using income source decompositions of inequality measure (Adams, 1991; Stark et al 1986 Adam et al 1992). These studies show conflicting finding about the effect of remittances on income inequality: in some areas migrants' income appear to make the distribution of income more unequal while other areas migrants' income seem to reduce inequality.

3.2 Market imperfections and rural economies

The neoclassical household farm model (e.g Singh,Squire, and Strauss, 1986) assumes that rural markets are complete and well functioning. Under these assumptions, the households model is recursive, production decision are independent of household budget constraints and other sources of household income. Migrants income (remittances increases utility of the household which in turn leads to increased consumption of normal goods. Hired labour may be substitute for family labour to make room for increases in family leisure. However, the rural area markets (credit, labour, insurance etc.) are often missing completely, are rationed, interlocked or interlinked, seasonal or shallow/thin in nature (Sadoulet and de Janvry 1995).

The existence of market imperfections in these countries is due to several causes. High transaction costs due to distance to markets and poor infrastructure widen the price band, and this lead farmers to have non-identical buying and selling prices for production and consumption goods. Policy failures in form of government interventions that distorts market

outcomes (for example, price controls programs, taxation etc) and incomplete regulation of property rights may rise to market imperfections

Consequences of market imperfection are that the exogenous prices do not reflect the opportunity cost of commodity or factor. The households may face the price bands for goods or commodities, and those prices are determined internally as shadow prices. Production decisions may not be independent of consumption decisions, which means that separability may not hold. The household's production/income may have to be determined simultaneously with its consumption decisions.

3.2.1 Credit market imperfection

Credit is an important element in agricultural production and household consumption in rural areas. Unfortunately, rural credit markets are pretty far removed from perfect competition (Hoff and Stiglitz, 1990). The main reasons, causing the imperfection in rural credit markets are information problems or asymmetries related to difficulties in screening and monitoring borrowers. Land is considered as the main asset in rural areas, which is used as a collateral. However, most farmers in developing countries, and particularly poor ones have few assets that can be held as collateral.

The asymmetric information and adverse selection problems prevail in credit markets, giving rise to credit rationing as optimal behaviour (Stiglitz et al, 1981). Also government intervention in form of interest rate ceiling or subsidized interest rate is common in many countries agricultural sector, leading to rationing. When credit is rationed some borrowers cannot obtain the amount of credit they desire at the prevailing interest rate, nor can they secure more credit by offering to pay a higher interest rate.

In addition to that, there is unpredictable weather, which makes the income of farmers to fluctuate. The existence of income fluctuations makes lending to farmers more difficult than regular commercial lenders. The provision of credits to rural farmers in rural areas is very difficult due to increased transaction costs caused by servicing geographically dispersed clients, and the substantial unit costs in processing and administering small loans. The absence of credit limits their ability to produce more output and have surplus for selling in order to pay back the loan. Together with the absence of collateral, all the above-discussed

factors tend to discourage formal credit institutions to operate in rural areas. Where credit institutions are active in rural areas, they are likely to serve rich households in rural areas. In such circumstances, liquidity can become a binding constraint in many farmers' operation especially the poor ones. As a response to the lack of formal markets, informal credit markets are often operating in rural areas. Informal rural credit considered having relative quick disbursement of funds and low transaction costs. However, the informal credit markets have screening, incentive and enforcement problems (Hoff, et al 1990). The village moneylenders usually charged high interest rates and it is very unusual for friends and relatives to charge in zero or low interest rate.

The seasonality in agricultural operation implies that cash flows and cash needs of rural farmers are not synchronized. Farmers needed to allocate the available resources between current consumption and purchase of variable inputs at the beginning of production period. The rich families are likely to have access to credit and hence can separate consumption and production decision. Smaller farmers on the other hand are likely to be credit constrained and this makes their production, consumption and investment decision dependent upon the level of credit they receive.

3.3 Agricultural household models

3.3.1 The Chayanov farm household model

Chayanov agricultural household model focuses especially on the subjective decision made by households regarding the amount of family labour to be allocated in farm production in order to satisfy its consumption needs. The model assumes that the household maximizes utility, which is the function of income and leisure. Land is considered to be fixed. Also it assumes that there is no labour market, which means there is no substitution between family labour and hired labour. This implies that there is no separation between the consumption and production decisions of the households. In other words the decision are made simultaneously. In this model the household has two opposing objectives: an income objective, which requires work on the farm and a work avoidance objective, which conflicts with income generation.

3.3.1.1 Utility

The household's utility is a function of income and leisure:

$$U = U(Y, H) \tag{7}$$

The consumption is represented by the indifference curves in figure 3.1. They show different utility levels provided by the contribution of income and leisure. The consumption units and amount of labour in the households affect the indifference curve. The slope of indifference curves expresses the amount of leisure days the households would sacrifice for one unit increase in income. (-dH/dY), as illustrates by point B (where the Z line is tangent to indifference curve I_2) in figure 8. The slope (dH/dY) is called he household's subjective value of labour time Z, or the marginal rate of substitution (MRS) between leisure and consumption. Family size of the household and the number of workers in the household determine the minimum consumption need of the household and the maximum adult labour days available to the household. Demographic structure of the households is thus the key factor influencing the subjective wage rate of the household.

3.3.1.2 Production

The household production is the concave function of labour, f(L,). The production function multiplied with the price per unit output, Py, is illustrated in figure 1 as the TVP (Total Value of Production) curve:

$$TVP = P_Y f(L) \tag{8}$$

The TVP is a function of the market price of output and labour input. The TVP is called also the family income curve, which constitute income from production and exogenous income such as remittances. The slope of the TVP line is the marginal product of labour (MVP_L) multiplied by price.

3.3.1.3 Maximisation problem

The economic problem of the household is thus formulated below:

$$\max U = U(Y, H) \tag{9}$$

Subject to:

$$Y = P_Y f(L) + R \tag{10}$$

$$L \le L_{max} \tag{12}$$

$$T = L + H \tag{13}$$

Where Y, H; L, P_Y, R and T represent income, leisure, labour, output price, exogenous income and time, respectively. Thus the household maximizes utility subject to four constraints: The income (which depends on the production), the minimum acceptable income level, the maximum number of working days available, and the time constraint.

Assuming that the minimum acceptable income level and the maximum number of days available are not the binding constraints. The derivative with respect to leisure:

$$U_Y^{'} * (-P_Y f_L^1) + U_H^{'} = 0$$
$$\Downarrow \tag{14}$$
$$\frac{U_H^{'}}{U_Y^{'}} = -\frac{dY}{dH} = P_Y f_L^{'} = MVP_L = Z$$

Where $U_H^{'}$ is marginal utility of leisure time, $U_Y^{'}$ is the marginal utility of income and MVP_L is marginal value product of labour (as shown in figure 1). As indicated in figure (1), the range and relative level of this subjective wage is constrained in the one hand by the requirement that the farm household meets its minimum acceptable standard of living (given by $Y_{min)}$ and on the other hand, by the maximum number of full working days which it is physiologically feasible for worker members to the household to work (given by L_{max}).

The optimum allocation of family labour between farm production and leisure within the household will occur when the marginal rate of substitution of leisure for income (subjective wage) equals the marginal value product of labour. (Equation 14)

If the household produces one more unit than in the optimum, the extra unit's marginal value would be less than the subjective cost of labour required to produce that unit. On the other hand, if the household produces one unit less than in optimum, the unit's marginal value would be higher than the value of required family labour.

Sometimes $Y \ge Y_{min}$ and $L \le L_{max}$ may be binding constraints. In figure 1 Y_{min} measures the minimum income the household can accept with the respect to the assumption about minimum acceptable consumption level. L_{max} shows the maximum labour time feasible for the workers in the household. Both Y_{min} and L_{max} are determined by the size of household and

consumption curve (Y_{min}) or vertical if they hit the maximum labour curve (L_{max}). If this happen no amount of income could compensate for further fall in income or no amount of income could compensate for a further fall in leisure. The subjective value of family labour time (Z) , also called the household's shadow wage, gets very low when consumption approaches the minimum consumption level. Similarly, the shadow wage becomes very high when consumption approaches the maximum labour time feasible.

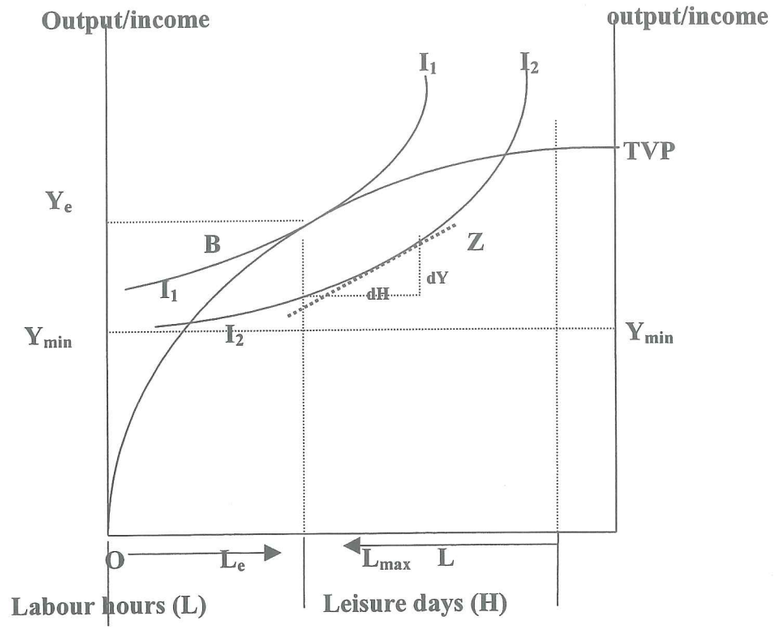


Figure 3.1 Chayanov model of farm household

Adapted from: Ellis (1993)

The main factor influencing this trade-off is the size of the household and its composition of working and non-working members; in other words, the demographic structure of the household. This factor is summarized by the ratio of consumer to worker in the household, called the *c/w* ratio. As the *c/w* ratio rises, the amount of time devoted to farm labour by each worker should increase. This can be due to a decrease in labour force within the household or an increase in dependants within the household. A lower c/w ratio leads to a higher average income per person in the household.

Chayanov model can be described graphically as in figure (3.1). The Vertical axis measures the output, which equals to gross income obtained when the farmers choose to sell the entire production. The horizontal axis measures the available time that can be spent on work and leisure. The total time available of labour can be determined by number of workers in the households. From the figure OL is total labour, OL_e is the amount of time used in farm production and L_eL is the amount of time used as leisure time. The time available for production is measured from left to right O-L and for leisure is from right to the left L-O.

3.3.1.4. The effect of increased remittances

Figure (3.2) shows the effect of a change in household remittance income (R). the increase of remittances will ffect the household income. This increase in income will cause the TVP curve to move upward to TVP'+Remittances curve and cause the amount of family labour used in production to decrease from Le to Le'. The decrease in family labour supply used in the farm production implies that the amount of leisure time increased. The overall impact of increased income is the reduction of family labour supply in the household production, which causes the production to fall.

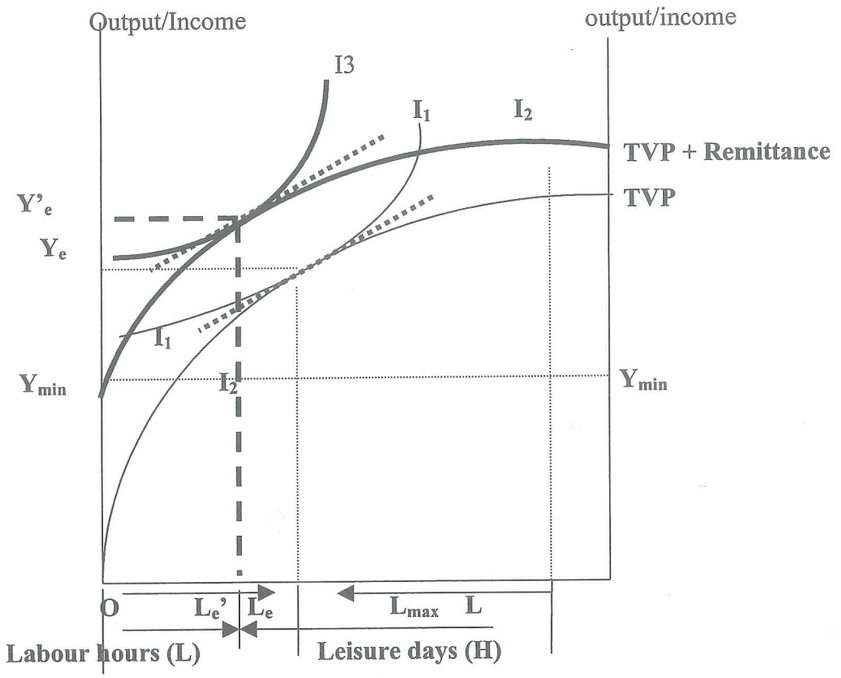


Figure 3.2 The effect of increased remittances in farm household

The increase of income through remittances makes the farm household to be better off and consequently reduces the equilibrium amount of family labour input. This will result to the decrease of Marginal utility of income (MU_Y) and hence increased the marginal value product of labour (MVP_L). This implies that the household workers will use less labour time in farm activities and more leisure time. The result is a decrease in household production.

3.3.1.5. The effect of increased migration

The increase in migration will affect the amount of family labour available for agricultural production and the household's consumption units. The total number of consumers will go down and at the same time total labour force within the household will decrease and hence decrease in production (see figure 3). The production decreases from point A to B. The decrease in labour force within the household will raise the consumer worker (*c/w*) ratio and this will lead to decrease in the Marginal utility of leisure (MU_H), hence decrease in marginal value product of labour. In this case worker in the household will work more and reduce their time of leisure. The farm household reduced the amount of time spent in leisure and increases the amount of time in the farm production.

In this model, the increase of household migrants will affect the farm household labour supply and this will lead to decrease in total labour within the household. The effect of the migration in production is uncertain when there is possibility of hiring in labour.

3.3.2. The farm household model with perfect markets

In the perfect labour market model, each member of the family can work as many hours as he/she wants at a given wage rate per hour and workers can be hired at a constant wage per hour. It can be assumed that hired labour is a perfect substitute (in production) for family labourers. Thus the wage rate is the same whether he is working on his own farm or outside.

Barnum-Squire farm model focuses on how a household allocates its family labour between leisure and farm production. The model assumes that there is a perfect labour market, which means that there is perfect substitution between family labour and hired labour. The allocation of labour to production is independent of family welfare function. Consumption and production decision are separable. When household is maximizing its utility, is also maximize farm profit.

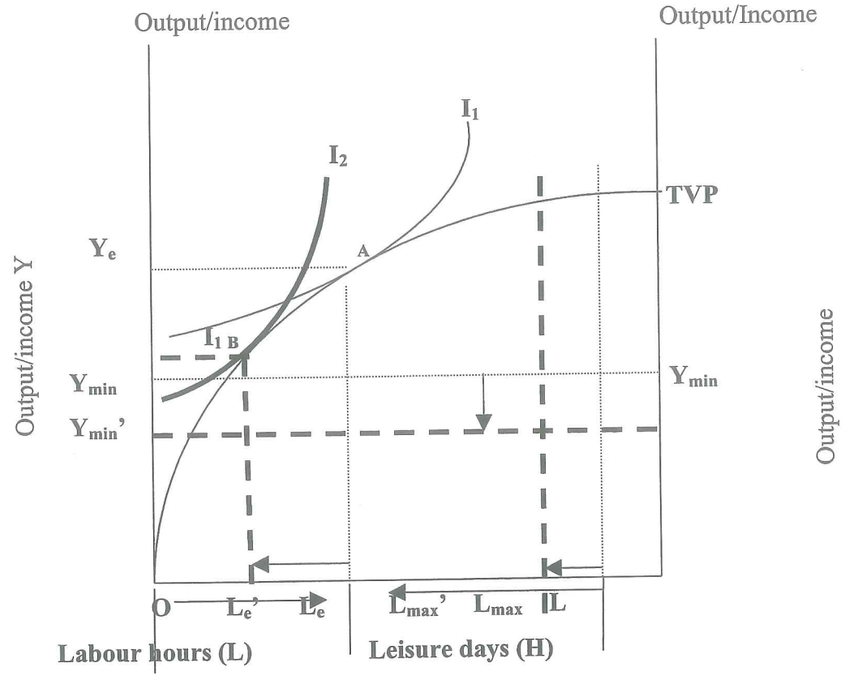


Figure 3.3 The effect of increased migration

Figure 3.4 illustrate what happen to the household farm model when there is existence of perfect labour market. Indifference curves I_1 and I_2 represent the household situation before and after migration. I_1 assume that the household sell out labour before migration and I_2 hire in labour. The existence of perfect labour markets make it possible to hire in or out labour at the existing market wage rate (w). A wage rate cost w'w' is introduced and represents the household opportunity cost of alternative uses of labour time that is farm work, migration and non-farm activities. Home time represents the time spent on doing activities at home, which includes cooking, taking care of children, water carrying, leisure and so on. In the same figure L_e' is the time household wants to spend to work more than the optimal time used in production. The household is willing to give up more time of home time, equals market wage. The optimum labour use in farm production is given by L_T, where the marginal product of labour equals to market wage. The difference between L_T and L_e' is the amount of time household members can spend on other non-farm activities, (Hire out labour). L_e is the time, which household want to work less than the optimal time use in farm production. L_T is higher than L_e. The difference is the amount of labour hired in by the household for farm work.

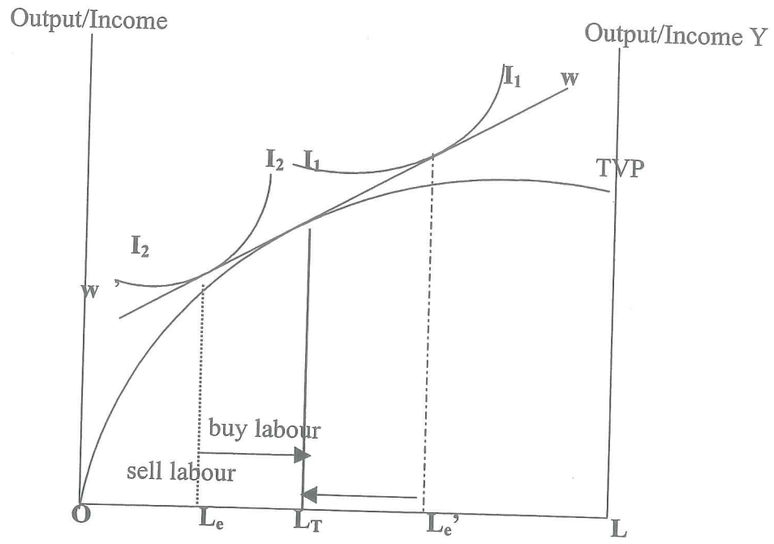


Figure 3.4 Household farm model with perfect labour market

Adapted from Ellis 1993

3.3.2.1 Maximizations Problem

In the model the cost of labour is no longer subjectively determined within the household but given by the market (w). In this case there will be a separation between labour allocation related to a trade off between home time and income (indifference curve), and labour allocation related to farm production (the production function). The problem is to maximise utility with respect to income (Y) and home time (H):

$$\text{Max } U_{L,H} = U(Y,H) \tag{15}$$

Subject to:

$$Y = P_y f(L) - wL + w(T-H) \tag{16}$$

That will give:

$$U = U(P_y f(L) + w(T-H-L), H) \tag{17}$$

Where (T-H-L) is the net sale of family labour as T is total time available, H is home time(leisure) and L is labour time spent on farm. the utility maximization can be solved recursively:

step 1 $$\frac{\partial U}{\partial L} = U_y^{'}\left[P_y f - w\right] = 0 \Rightarrow P_y f = w \tag{18}$$

The above equation shows the optimal use of labour in production with respect to production maximization and is illustrated as the tangency point between line ww' and TVP in figure 4

.

step 2 $$\frac{\partial U}{\partial H} = -U_y^{'} w + U_H^{'} = 0 \Rightarrow \frac{U_H^{'}}{U_y^{'}} = w \tag{19}$$

The above equation shows the optimal allocation of labour supply (either n the farm or off-farm) with the trade off between work and income. This point illustrated in the figure 4 as the tangency point between line ww' and I_1I_1. In this case the optimum labour use is where the market wage equals to the household's subjective value of labour time.

In the above maximization problem it has been assumed that all markets are perfect. The existence of the imperfect market in one market will make the decision of the household to be non-separable between production and consumption.

3.2.2.1. The impact of increase in exogenous income (remittances).

The increase of income may influence household decisions. It is assumed that income in household increase due to migrant's income. If the household's exogenous income increases there will be a shift in the Total value Product TVP1 to TVP2 (figure 3.5). The results of that shift cause the household to spend less time on farm production and increase the consumption of leisure time (as leisure increases from L_{e2} to L_{e2}'). The decrease in labour supply in this case will be compensated by the hired labour (Hired L) due to increase in household income. The household production remains the same because of the substitution, which occurred between the hired labour and migrants. In this case household use the money to hire in the worker to compensate the loss of labour in the household.

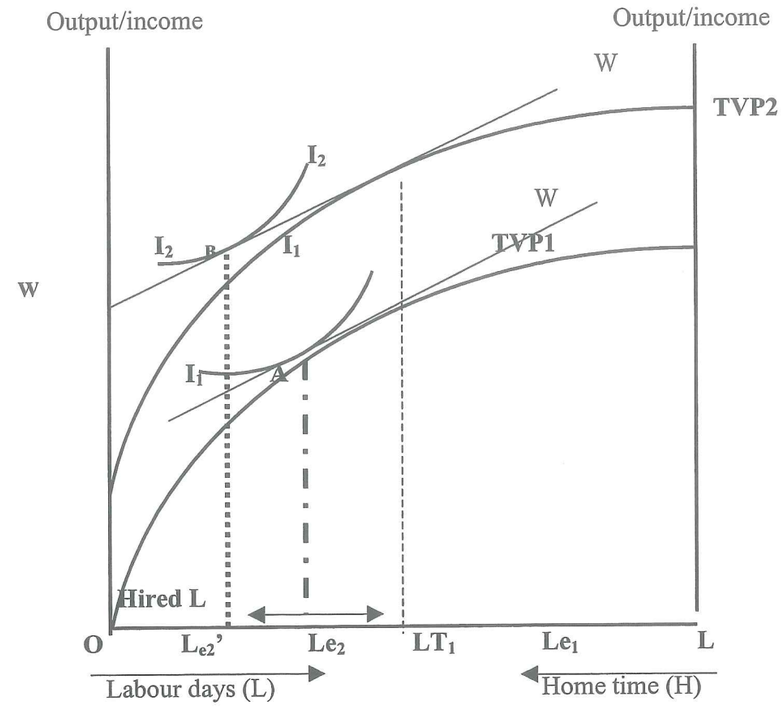


Figure 3.5 Impact of the remittances for farm household with migrants

3.2.2.2. Effect of migration.

Figure 3.4 can help to show what happen to the household with migrants. The household initial situation is representing by I_1, which indicate that household position before migration. In this point the household is hiring out labour. The presence of migration leads the shift of indifference curve I_1 to I_2, which makes the household to hire in labour. The increase in migration will lead to the reduction in labour supply within the household, and it can be compensated with hired labour. And the overall effect of migration can be zero.

3.3.3 The farm household model with imperfect credit and capital market

In this section it is assumed that production is a function of labour and capital inputs rather than a function of labour alone. The previous sections assumed that production is a function of labour and the household can decide to allocate labour between leisure time and farm activities. It also assumed that income from migrants could be contributed in the making of household capital. Capital can be used to purchase inputs, which are needed for production

activities such as fertilizers, seeds and insecticides. Also capital can be used to hire in more labour for conservation activities, which can be regarded as investment in soil conservation. In addition it is assumed that there is imperfect credit and capital market.

The case of imperfect credit market:

In this case the model is non separable because the credit is the binding constraint. The maximization problem is as follows:

$$Max U_{L,H} = U(C, M, H) \tag{20}$$

Subject to:

(1) Time constraint: $T = H + F$ (21)

(2) Production Constraint: $Q = Q(L, X_f)$ (22)

(3) Liquidity constraint: $w(L - F) + P_f X_f) \leq R$ (23)

The farmer faces a liquidity constraint at the beginning of the season.

(4) Budget constraint:

$$P_m M + P_f X_f = P_Q(Q - C) - w(L - F) + R \tag{24}$$

Combine equation 21, 22 and 24

$$P_m M + P_Q C + wH + P_f X_f = P_Q Q(L, X_f) - wL + R + Tw \tag{25}$$

The Lagrange function to this maximization problem is:

$$\ell = U(C, M, H) + \lambda(P_q Q(L, X_f) - wL + R + Tw - P_m M - P_f X_f - P_q C - wH) + \mu(R - wL - P_f X_f + wT + w \tag{26}$$

The first order conditions:

$$\frac{\partial \ell}{\partial L} : \lambda P_q \frac{\partial Q}{\partial L} - \lambda w - \mu w = 0 \Rightarrow P_q \frac{\partial Q}{\partial L} = \left[\frac{\lambda + \mu}{\lambda}\right] w \tag{27}$$

$$\frac{\partial \ell}{\partial X_f} : \lambda P_q \frac{\partial Q}{\partial X_f} - \lambda P_f - \mu P_f = 0 \Rightarrow P_q \frac{\partial Q}{\partial X_f} = \left[\frac{\lambda + \mu}{\lambda}\right] P_f \tag{28}$$

In the case above the labour and fertilizer price deviate from the market price w. When the $\mu > 0$ shows that the labour and fertilizer are more expensive and the household may use less labour and fertilizer because of the credit constraint. Here the amount of labour and fertilizer to be allocated in the household production depends on the amount of credit available and the

price of labour and fertilizer contains the shadow value, which the household uses to allocate the amount of labour.

Figure 3.6 shows how the incomes from other sources, which contribute to an increase in household income, have an effect on production, when the income used as investment in agricultural production. In this case it has been assumed that the household income has increased due to increase in remittances. Figure 6 will be of the help to explain the impact of increased income of the household in production.

If the households spend increased income in the purchase of more and better inputs, the production curve will shift from A to B (figure 3.6). in this case the household use more labour than before on the assumption that there is imperfect credit market which make the household to be capital constrained. The increase in the exogenous income will relax the cash constraints by allowing the household to have better working inputs for agricultural activities. Also the household will have the possibility of making the investments in land conservation because of the relaxation of the capital constraint. Household with perfect market may opt to invest in labour saving and may reduce the amount of labour to carry farming activities. In this case the production may increase due to increase in investments in labour saving technology and it can be argued that increased income due to remittances may affect production positively

However, there is a case where the farm production may decrease due to increase in household income from non-farm activities. The household may opt to invest in the activities, which give higher return rather than invest in agricultural activities. The production will decrease from point A to C. In this case it can be argued that increased in income may have negative effect on production activities

It can be concluded that effect of increased household income will be uncertain. It is hard to predict if the increased income will lead to higher agricultural output or lower agricultural output because of many factors (such as household constraint, preferences if household regarding type of work and so on), which shaped the household decision.

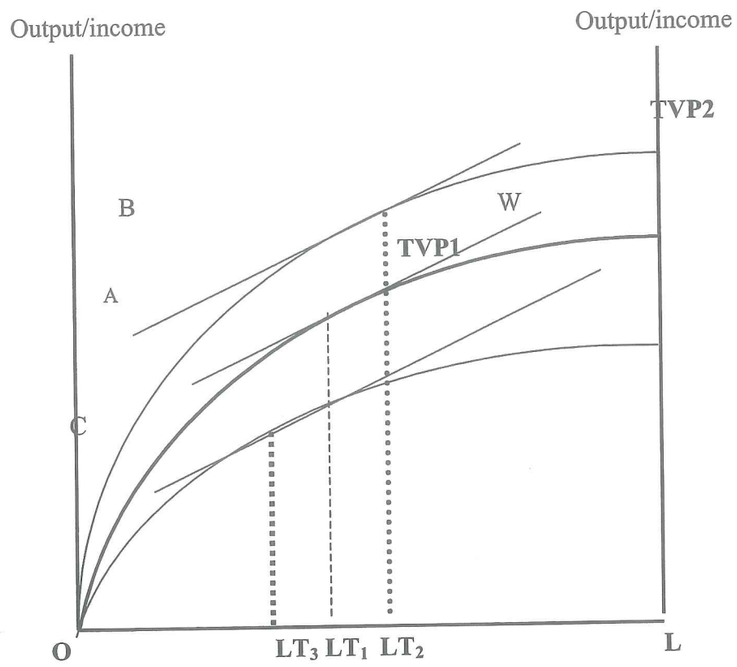


Figure 3.6. Effect of increased income on production

3.4 Summary

The models discussed above showed that the household would behave differently with and without perfect markets. According to the Chayanov model, production and consumption decisions are made simultaneously and thence there is no separability in the decision-making. In Perfect labour farm household model showed that there is separability between consumption decision and production decision. The farmers will make decision about the production and time allocation independently. In the imperfect market in credit and capital showed that the consumption and production decision are non separable. The households will make consumption and production decision simultaneous.

Table 3.1 Summary of migration and remittance effects on household's income and labour supply

Model	Agricultural production/Labour input	Total Household income
Chayanov Model		
Migration	Decrease	Decrease
Remittances	Decrease	Increase
Perfect market		
Migration	No impact	Decrease
Remittances	No impact	Increase
Imperfect credit and capital market		
Migration	Decrease	Decrease
Remittances	Ambiguous/uncertain	Increase

According to the models the migration may affect farm household production in the following ways

- Migration will cause labour shortage within the households. In the presence of labour market household will be able to hire labour and still increase leisure time. In this case the impact of the migration and remittance on labour supply will be zero (see table 3.1). In the absence of labour market household worker members remaining in the household will have to work more and reduce the leisure time.
- The migration will have negative impact on the total household income due to the decrease in labour supply within the household. While remittances will have positive impact on the household's total income. The availability of remittances leads to an increase in the household income.
- The migrant's income will have impact on the production activities. The increase of income will have negative or positive impact on household production. The impact on production will depend whether the household is using the income on agricultural activities or in other non-agricultural activities.

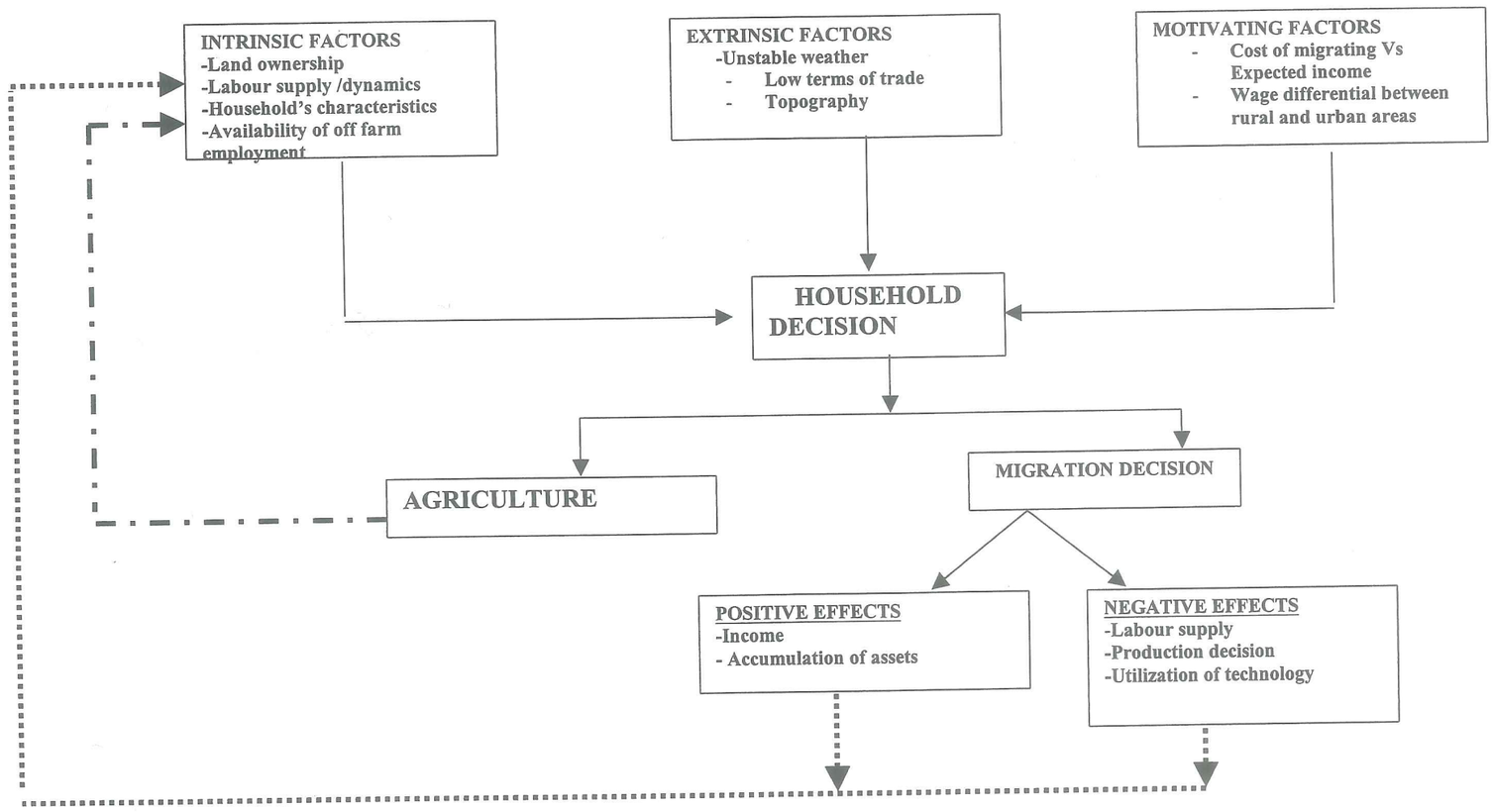
3.5.A simplified conceptual framework

The simplified theoretical framework (figure 3.7) can help to give the highlight in the data, which will be included in the data analysis. The diagram helps to show the interrelationship between migration, production and consumption. The migration within the household may be caused by the three factors, which are intrinsic, extrinsic and motivating factors. The intrinsic factors are all those factors, which are under control of the household while extrinsic factors

can have the impact on factors of production such as land endowment, labour supply, technology and skill necessary for production activities. This will indirectly affect the overall production activities undertaken by the household. Furthermore, income from migrants may have effects on production, consumption, income distribution and accumulation of assets.

Generally, migration decisions will have impact on other household decisions. The presence of income sources that influences overall household-farm income risk may influence production decision on risk averse household farms. Even in the expected-income model of household farm production, migrant's remittances may influence (non-migration) farm income if imperfections in local credit or labour markets exist. For example in the absence of perfect credit markets, liquidity constraints may limit the use of hired labour or output-enhancing modern input on the farm at planting time. So in this case migrants' income may loosen liquidity constraints. By the contrast, if leisure is a normal good and local labour markets can not provide perfect substitutes for family labour on the farm (especially for management expertise of household head), then the migrants income may be associated with decline in non-remittance farm incomes (as family demand for leisure increases).

Figure 3.7 Simplified conceptual framework for analysis of the determinants and impacts of out migration



Chapter Four Methodology

This chapter outlines the methods and procedures employed in sampling, data collection, and source of data, analysis of data and the descriptions of variables used in the models

4.1 Sampling techniques and data collection

The list of households in each ward[11] was obtained from ACAP office in Lwang. The simple random method was used to select the household sample from the list of households. A total of 200 households were selected by using the random sample table from different wards of the three VDCs. In Lwang Ghalel, households were selected from ward number 2, 3, 4, 5, and 6, in Rivan households from ward number 4 and 6, and finally, in Lahachowk households from ward number 2, 3, 5, 6, in Lahachowk VDCs. Topography conditions of area that is: plain, mid hills and high hills was taken into consideration in the selected of wards.

4.1.1 Data collection

The most commonly used method of data collection in sample survey are personal interviews. This procedure requires the interviewers to ask prepared questions and to record the respondent's answers (Scheaffer et al 1990). This can be done through the questionnaire. The primary advantage of interviews is that people will usually respond when they meet the interviewer face to face. In addition, the interviewer can note specific reactions and eliminate misunderstandings about the questions asked. The major limitations of the person interviews (aside from cost involved) concerns the interviewers themselves who might introduce a bias if they are not thoroughly trained (ibid)

The data used for this study was collected during two month fieldwork study (Late May- Mid July), which is the part of monsoon rain season. A household survey was carried out in the study area by use of semi structured and structured questionnaires. Participant observation, which involved observation f community and household activities, were also employed. This method provided the context in which all other methods were applied and it functioned as the initial medium for learning about social and physical environment interrelationships. The

[11] A small unit within the VDC

process of participation observation was used to tie together the more discrete elements of data collected by other methods and permitted these elements to be examined within the context of social system (Kajembe, 1994)

Enumerators who had completed university level of education and spoke the national language were used through out the fieldwork, since the researcher could not speak the local language. The enumerators were able to understand the language, culture and tradition of the study area, which helped to minimize the barrier of communication during the process of interview

4.1.1.1 Primary data

The primary data were gathered using questionnaire survey primarily design while in Norway, pre tested and modified in the study area (Appendix A1). Before starting the survey, there was discussion with field assistances about the setting and structure of the questionnaire, and the information in the survey intended to collect through these questions and how question should be asked. During the pre-testing, enumerators were trained on how to administer the questions to farmers.. Filled questionnaires were checked everyday on regular basis. Incomplete questionnaire were detected timely, and the households were revisited to improve the data. A daily feed back about the questions and households' responses has helped improve the research work. The purposes of pre- testing of the questionnaires were to make sure that it was suitable to collect needed information. That is to ensure the questions were clear and understandable by both the respondent and the researcher assistant, and to evaluate and suggest some ways of improving the performance of assistants.

In addition direct observation, informal interviews and group discussion were used to get clearer understanding of the study area. In most cases the head of the household was interviewed.

4.1.1.2 Secondary data

Information and data collected from publications and files from Tribhuvan University, ICMOD office, ACAP office in Lwang and in Pokhara were also important. Also the data from research journals, publications, research articles and studies conducted by national and

international organization such as World Bank, International Labour organization, etc proved to be important.

4.1.1.2 Data reliability and data validity

Data reliability and validity are the two methods, which measure the accuracy and consistency of the research.

Data *reliability* shows the extent to which variables, or a set of variables, is consistent in what is intended to measure (Hair et al 1992), Reliability is about the capability of the data obtained to be trusted to provide the correct results. For example in the information regarding household land size may be underestimated or overestimated, this will lead to reliability problem because of lack of the land size data which represent the real measurements. Several reason my influence the reliability of data. These reasons may relate to the respondents, interpreters, and researcher as well. Misunderstanding of the questions and/or the answers is considered to be major reasons for data unreliability s well as the mistake in manipulation the data. To ensure reliable measure it is important to have prior information about the things the respondents are likely to know the answer and to ask the questions which are clear and straight forward.

The reasons which influences the reliability of data in the survey, are:

- Different conceptualisation of questions among interpreters and researcher may be caused by the unclear expression of the questions. This results in misunderstanding of questions by the respondents.
- The area had been subjected to many surveys, which made their reaction to the question to be mechanical. Some of the respondents did not put any effort in answering the questions in a proper way, instead they gave answer from the to p of their heads to finish the session as soon as possible.
- The farmers did not have motivation to answer questions due to lack of a substantial reward or benefit for them from the survey.
- The farmers gave the wrong information and in some case they withheld other information especially the information concerning income sources.

The data validity indicates how well the results reflect the real or accurate meaning of the concept under consideration. It measures whether systematic error of data exists. The failure of validity is systematic error. Systematic error can occur if the variables are forgotten or if variables, which have distraction effect on the model, are included. The existence of the low validity in the survey may be due to:

- The question were not specific enough for the respondents to understand
- Lack of sufficient knowledge about the study area culture that may result to inappropriate questions leading to inaccurate answers.

A measure can be accurate (valid) but not consistent (reliable), or consistent but not accurate (Babbie 1995). The existence of low reliability and validity in the data caused the study to be biased. It is very important to consider these problems when interpreting the results.

4.2 Limitation of the study

- Language was a big problem since a researcher could not speak 'Nepali'. Sometimes the interpreters were leading the respondents to certain answers or translating the answers the way they perceived them. And it may also be possible that some interpreters did not actually ask all the questions but filled the questionnaires, hence leading to an information gap. To minimize this a researcher participated in the interview and sometime the enumerators were required to clarify the questions.

- The farmers were very busy because it was the peak season (monsoon rain season). Most farmers were busy preparing the paddy fields and this made the whole exercise difficult. Some times we were supposed to conduct interviews early in the morning or late in the evening. Therefore, the quantity and the quality of data collected were not as good as it could have been if we had more time.

- The limited time available for fieldwork implied that I did not have time to interact with the villagers to get more qualitative information. It would also have been valuable to have more time to look for literature review from different sources regarding the study area.

- Most of the households had some difficulties in answering questions about income, expenditure production and assets. Most farmers undervalued their production and income

in order to be found poorer than they were in the reality, and other overvalued their expenditure in order to be seen as having higher status in the village. This leading to inaccurate information. Normally, it was observed that the expenditure was greater than the income. The cross checking were made by using keen members

- Most of the households were are using their local way of measuring crops, land etc. normally in the rural Nepal the common measurement used is pathi and this create difficulties in measurements of different crops and non-food expenditure. For example it was very difficult to know how many kilograms is one pathi of beans, paddy, potatoes etc. The conversions for different units were found by the discussion with some households and found the equivalent of local measurement to standard measurements (for example the conversions of pathi units in kilograms).

4.3 Econometric estimation methods

4.3.1. Multiple linear regression model

The multiple linear regression models are useful in estimating the model containing multiple explanatory variables, which may be continuous or dichotomous in character (Gujarati, 1995). The generic form of the linear regression model is:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \ldots\ldots\ldots\ldots + \beta_k X_{ki} + e_i$$

Where Y is the dependent variable or explained variables. $X_1 \ldots\ldots X_k$ are independent variables or explanatory variables and ***i*** index the ***K*** sample observation. The ordinary Least Square procedure then consists of choosing the value of unknown parameters that minimize the residual sum of the squares (RSS) $\sum e_i^2$. Under normality assumption the OLS estimators have a normal distributed residue e_i. This term represents the variables that are not included in the regression model. With normality assumption OLS estimators are unbiased, have a minimum variance, are consistent and the B_i's are normally distributed. If t ratio value for each explanatory variable exceed the critical t-value, the variable is significant for explaining the variation in the dependent variable (Gujarati, 1995). The R^2 value expresses the explanatory power the independent variables have, with respect to variation of dependent variable, if the model is correctly specified.

4.3.1.1 Multicollinearity

Multicollinearity arises when two or more variables are highly correlated with each other (Pyndyck and Rubinfeld, 1991). The presence of perfect multicollinearity among explanatory variables leads to indeterminate and undefined standard errors. The OLS estimators are BLUE but with large variance and covariance (Gujarati,1995). There are principal methods of detecting multicollinearity but if R^2 is very high with few or none of the regression coefficients statistically significant on the basis of convectional t-test then multicollinearity can be suspected.

The procedures used to reduce the problem of multicollinearity are the use of prior information, omission of high collinear variables, transformation of data and to obtain additional data.

4.3.1.2 Heteroscedasticity

Heteroscedasticity arises when the variances of the disturbance term e_i are not the same. It occurs when the conditional variance of Y_i increases (decreases) as X_i increases (decreases). Also this can be due to different reasons such as the presence of outliers (an outlying observation), which are observation that are very different (very small or large) and this mainly occurs when the conditional variance of Y_i increases as X_i increases. The misspecification of the model can also cause the problem of heteroscedasticity. The problem more often occurs in cross sectional data than time series data (Gujarati, 1995). In the cross-sectional data, one usually deals with members of a population at a given point of time, such as individual consumer of their families, firms etc. Therefore, the heteroscedasticity is more likely in household survey because of high probability of the presence of outliers and many times the household surveys` are concerned to be cross sectional data.

Some methods can be used to test the presence of heteroscedasticity, which include Park test, Spearman's rank correlation test, and the Goldfeld-Quandt test. If the computed t-value or F-value (Goldfelf-Quandt test) exceed the critical t-value ot F-value, the hypothesis of heteroscedasticity may be accepted. Heteroscedasticity can be corrected for by using the method of weighted least square, if the variances are known.

4.3.2 The probit model

The probit model is the model that achieves the objective of relating the choice of probability P_i to the explanatory factors in such a way the probability remains between 0 and 1 (Griffith, et al 1993). The model is used to analyse the migration activity and the factors that cause it. The nature of the household choices depends on both observable and unobservable characteristics of the individual, and the alternative available to the individual (Ibid). The model is presented as:

$$P_i = F(\alpha + \beta x_i) = F(Z_i)$$

Where $F(\alpha + \beta x_i)$ is the cumulative normal probability function and pi is the probability that the dependent variable will be 0 or 1, Z_i is assumed to be theoretical continuous index, which determined by an explanatory variable x_i. Observations on Z_i are not observable, but have data instead which distinguish whether individual observation falls into one category or in another.

Probit analysis solves the problem of how to obtain estimates for the parameter α and β and at the same time obtaining information about underlying index Z

$$Zi = 0 \text{ if } Z_i < Z_i^*$$

$$Z_i = 0 \text{ if } Z_i > Z_i^*$$

Where, Z_i^* is the observed critical cut off hypothetical variable to be observed. The probit model assumes that Z_i^* is a normally distributed random variable. The standardized cumulative normal function is written as:

$$P_i = F(Z_i) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{Z_i} e^{-s^2/2}\, ds \qquad 0<p_i<1$$

Where s is random variable, which is normally distributed with mean zero and unit variance. To obtain an estimate of the index Z_i inverse of cumulative normal function is applies so that.

$$Z_i = F^{-1}(P_i) = \alpha + \beta x_i + e_i$$

(Pindyck and Rudinfeld, 1991).

The probability P_i from the probit model can be interpreted as an estimate of conditional probability that the household will allocate its member on migration activities, given the

conditions for explanatory variables X_i's. Similarly probability P_i can be the probability that the household will have migrants and non-migrants.

4.3.2.1 The likelihood ratio test and goodness of fit test

A useful and convenient way to test whether certain parameter restriction are supported by the data (for example if some estimated parameter equal to zero) is the likelihood ratio test. If $L(\beta_{UR})$ represents the maximum value of log-likelihood function when the restrictions do not apply and $L(\beta_R)$ represents the maximum value when he restrictions do apply, then it can be shown that for large sample size (asymptotically),

$$-2[L(\beta_R) - L(\beta_{UR})] \sim \chi_m^2$$

Where m is the number of restrictions. If the χ_m^2 is greater than the critical value, we can reject the null hypothesis that the restrictions do not apply that is the β_i's are not zero.

To obtain a measure of goodness of fit analogous to R^2 of OLS models, the McFadden R^2 is used, which explains the prediction power of the probit model.

4.3.3 Simultaneous Equation Statistical model

Most of conceptual frameworks for understanding economic process and institutions recognize that there is feedback between economic variables and that in economics everything depends on everything else. Marschack (1950) commented that economic "data are generated by a systems of relations that are in general stochastic, dynamic and simultaneous".

Simultaneous statistical model were introduced to take into the account the simultaneous and interdependent nature of economic data generation schemes (Judge et al., 1988). The implication of such statistical model is that the classical least squares rule is no longer consistent because of the lack of statistical interdependence between random variables representing the equation errors and those right hand side economic variables whose values are determined within the system of equation.

The method of estimation for the simultaneous system equation in this case is the 3SLS, which was adapted from the Rozelle et al 1999. Three-stage square (3SLS) technique of the simultaneous equation was used as an estimation technique for estimating the impact of migration and remittances on production of rice in the study area.

A system of M equations may be written as :

$$\begin{bmatrix} y_1 \\ y_2 \\ . \\ y_M \end{bmatrix} = \begin{bmatrix} Z_1 & 0 & \cdots & 0 \\ 0 & Z_2 & \cdots & 0 \\ \vdots & \vdots & \vdots & \vdots \\ 0 & 0 & \cdots & Z_M \end{bmatrix} \begin{bmatrix} \delta_1 \\ \delta_2 \\ \vdots \\ \delta_M \end{bmatrix} + \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \vdots \\ \varepsilon_M \end{bmatrix}$$

or $\quad y = Z\delta + \varepsilon$

where $\quad E[\varepsilon] = 0$

and the variance-covariance matrix of disturbances is given by:

$$E[\varepsilon\varepsilon'] = \bar{\Sigma} = \begin{bmatrix} \sigma_{11}I & \sigma_{12}I & \cdots & \sigma_{1M}I \\ \sigma_{21}I & \sigma_{22}I & \cdots & \sigma_{2M}I \\ \vdots & \vdots & \vdots & \vdots \\ \sigma_{M1}I & \sigma_{M2}I & \cdots & \sigma_{MM}I \end{bmatrix} = \Sigma \otimes I$$

The 3SLS estimator is given by:

$$\delta = \left\{Z'\left(\Sigma^{-1} \otimes I\right)\right\}^{-1} \hat{Z}'(\Sigma^{-1} \otimes I)y$$

(Green 1993)

The 3SLS estimator takes into an account of the fact that structural equations may be disturbances related and makes the use of covariance matrix of disturbances among the equations within the framework of seemingly unrelated regression model. Therefore, 3SLS estimator is asymptotically efficient than 2SLS estimator (Judge et al., 1988)

4.3.4 A two sample t-test

A two sample t-test was used to test the difference in selected characteristics among migrants and non-migrants households. (see table). A two sample t- test is used for comparing two treatments or comparing two different kinds of subject to the same treatment. Stastically, data for two sample problems consist of two independent random sample $Z_1, Z_2, \ldots\ldots Z_n$ and $X_1, X_2 \ldots\ldots\ldots X_k$. Z's and X's both are coming from normal distribution. Two sample t-test is developed to assess the null hypothesis H_0: $\mu_Z = \mu_X$. The decision to accept or reject H_0 is based on the value of the test statistics obtained from the data.

4.4 Data analysis

4.4.1 Migration analysis

From the simplified conceptual framework and theoretical framework (chapter two), the variables used to analyse the factors caused people to migrate are as follows:

Household level variables: Which includes the total area of land farmed, number of adults in the household, household size, age of the household head, access to credit, wealth, mean education within the household (Household characteristics). The variables and their expected signs are presented in table 4.1.

Table 4.1 Explanatory variables selected for the migration decision

Dependent variable MIG	Migration	
Explanatory variable	**Description**	**Expected sign**
AGE	Age of the household head	?
SLAND	Size of land cultivated	?
OFFINC	Off-farm income/consumer unit	?
ADS	Adults members in the household	+
CR	Credit obtained/consumer units	+
EDU	Mean education of household members between 15-55 years old (years of education)	+

It is very difficult to predict the prior effect of land on migration. Land is positively correlated with income in most rural less developed Countries, and it has frequently been observed that higher income people have greater propensity to migrate (Stahl, 1982). However. Land ownership entails responsibilities, which well may inhibit migration among landowners. By the same token landless implies fewer ties to communities; therefore landless people especially the agricultural workers may be more likely to migrate (El-Dib, et al., 1984).

The value of household off-farm income may have positive or negative effect on migration. The desire to migrate is reduced the higher the income level of the rural area. Adams (1993) and Faini et al., 1993 find that as income level increases the propensity to migrate at first increases and then decreases. This suggests that the initial rise in income provides potential migrants with the finance the migration costs that previously were unavailable due to imperfect of credit markets.

The number of adults (ADULTS) in the family may have positive effect on migration. According to migration literature, large families with more adults especially men have higher propensity to produce migrants (Roberts, 1982). In this case it is assumed that the adults coefficient will be positive.

The credit will have positive impact on migration. The ability to migrate or feasibility of any migration depends on the access to financial resources. The households who have access to credit are likely to produce migrants than those who have no any access to credit.

The education will have positive impact on migration. Education encourages migration if it either increases wages at migrant's destination relative to migrant's original area. In most third world countries it has been assumed that the young and educated who tend to become migrants (Adam, 1991) , In this study , it is assumed that education will have positive impact on migration.

Age of the household head will have the positive effect on migration. The families with older household heads should have a higher propensity to produce migrants. The older the household head, the less likely will it be for him to migrate.

4.4.2 Production analysis

The objective in this section is to estimate the impact of remittances and migration on rice production. If production is constrained, then migration and remittances are important in shaping production, and rice output may depend on Migration and remittances.

Following the Rozelle et al (1999), the model assume that migration and remittances are important factors in shaping the production. In this case output depends on migration and remittances. The following is the core equation

$$Y = \gamma_0 + \gamma_1 M + \gamma_2 R + \gamma_3 Z_y + \varepsilon_y$$

The remittances income depends on the allocation of family member in migration. The remittances equation looks as follows:

$$R = \alpha_0 + \alpha_1 M + \alpha_2 Z_y + \varepsilon_R$$

And the migration equation is as follows:

$$M = \beta_0 + \beta_1 Z_M + \varepsilon_M$$

Where Y is the output, R is remittances and M is migration which indicate the number of migrants, and Z_i, i = Y, R, M includes household demographic, human and physical –capital variables. These three equations constitute a recursive system and this made the equation to be estimated by using Three stage least square methods.

Table 4.2 show the variables included in the three equation and their expected signs. The predicted signs based on previous studies. An increased area of rice production (PLOT) will probably have positive impact on rice production. The larger the area cultivated, the higher the output.. Increased number of migrants (MIGRANTS) my have negative impact on rice production because migrants create labour shortage in the family. This may lead to hence reduction in total production output and under utilized of productive land. Remittances (REMINC) may have positive or negative impacts. The increased income from migrants, may lead to the relax cash constraint, which in turn increase production. In this case the increase in income will lead to hire more labour for farm production activities. However if the income from migrants is investing in other activities rather than production it may lead to a decrease in output production. Other variables are expected to have positive impact on the production of rice

Table 4.2 Explanatory variables selected for farm production

Dependent variable Output	**Rice output in Muri**	
Explanatory Variables	**Description**	**Expected sign**
MIGRANTS	Number of migrants	-
REMINC	Remittance income	+/-
AGE	Age of household head	+
EDU	Education of household head	+
ASSETS	Value of durable assets	+
PLOT	Size of plot planted rice	+
ADULTS	Number of adults in the household	+
Dependent variable Remittance		
MIGRANTS	Number of migrants	+
LAND	Size of total land cultivated	+
ASSETS	Value of durable assets	+
DEPEND	Number of dependants in the household	-
Dependent variable Migrants		
CREDIT	Credit obtained	+
OFFINC	Off-farm income	+
AGE	Age of household head	+
HHSIZE	Number of people in the household	+
LAND	Size of total land cultivated	?
EDU	Education of household head	+
ASSETS	Value of durable assets	+
CASTE (dummy)	If lower cast =1 otherwise =0	+/-

4.4.3. Migration and expenditure

The consumption analysis will be used to see how migration can have an effect on total expenditure. In the analysis the aggregate expenditure of food and non-food items are taken to account. Table 4.3 shows a summary of explanatory variables and expected signs.

The presence of migrants will have positive or negative impact, and this will depend on the household's decision in the use of remittances from migrants. Some households may opt to use the remittance in their consumer goods and others may decide to use the remittances in

other expenditure like buying houses rather than spend the money in the consumer goods.. Table 4.3 shows a summary of the explanatory variables and their expected signs.

Table 4.3 Explanatory variable selected for per capita consumption of the consumer goods

Dependent variable		
Total per capita expenditure		
Explanatory variable	**Description**	**Expected sign**
MIGRANTS	Number of migrants	+/-
CU	Consumption Units	-
WC	Labour unit	+
SLAND	Size of cultivated land	+
SAU[12]	Standard animal unit	+
CREDIT	Amount of credit obtained	-/+
EDU	Education of the household head	+
AGE	Age of the household head	+

The increase in the size of per capita land cultivated will have positive impact on per capital total expenditure of the household. This is due to fact that the increase in size of land to be cultivated implies that the increase in agricultural cost to do land conservation and farming activities.

The increase in consumer units will have negative impact on the total per capita expenditure. The increase in consumer units will lead to decrease in the total per capita expenditure. The increase in labour-consumption ratio will have positive impact on total per capita expenditure. The higher labour-consumption ratio implies that there are more workers in the household, which lead to increase in production, and hence increased income. The increased income may lead to increase in total per capita expenditure

[12] SAU are calculated using the following convection ratios (RONCO Consulting Corp.and AGRI-BI-CON International, 1991, Annex IV, P. 29)
SAU=(male cattle 1,3)+(female cattle1)+(young cattle*0.5)+(sheep and goat*0.19)+(male buffalo*1.5)+(female buffalo*1.25)+(young buffalo*0.5)

The increase in standard animal units may have positive impact on the total per capital expenditure. The more the animals household had, may have positive impact on the total expenditure

Education and age may have positive impact on the total per capita expenditure. These variables indicate the possibility of getting more income and the increased in income cause the change in total expenditure

The availability of the credit for the household in the rural areas will have negative or positive impact on total per capita expenditure of consumer goods. The impact of the credit will depend on how t he household decides to use the credit. Other may use the credit obtained to finance other activities such as migration activities, which in turn will have negative impact on total expenditure.

4.4.4 Income and migration

The income analysis was used to see the impact of migration on household per capita income. In rural areas where migrants' income is the most important source of income as in the study area, the increase in migration activities will have positive impact on the per capita income. Households with migrants are expected to have more income than the households without migrants. Table 4 shows a summary of explanatory variables and their expected signs.

Table 4.4 Explanatory variables selected for per capita household income analysis and their expected sign

Dependent variable		
Total per capita income		
Explanatory variable	**Description**	**Expected sign**
MIGRANTS	Number of migrants	+
CU	Consumption Units	-/+
WC	Labour unit	+
SLAND	Size of cultivated land	+
SAU	Standard animal unit	+
CREDIT	Amount of credit obtained	-/+
EDU	Education of the household head	+

The household characteristics such as age and education of the household's head may be the important factor in the income determination in the households. In this study the older households head are expecting to earn more income than the younger ones. The age of the households will have positive impact on the household per capital income.

It is expected that the household head with more years spent in school are more likely to utilize resource in an efficient way and have more production, hence increase household income. The relation between education and income is positive.

Land is the important factor of production in most of third world countries.. The size of land owned by households may have impact on the household income. The return to land depends on the return to scale. If there is decreasing return to scale, it means that the output is decreasing when there is increasing in land input. This will lead to lower production, hence decrease in income. The land input in this case may have negative relationship with household income. When there is increasing return to scale, the production increases as the land input increase, hence increased in income. The increase in land will have positive impact on the income.

The increase in labour per consumption will have positive impact of the per capita income. The more labour in the family means that the more the income due to fact that most of the work force can be used in the household production activities, hence more income.

Household size will have positive impact on household income if there is increase in the number of adults (labour force) in the households. This means that household with more adults are likely to have more income. The workers can be able to work in the farm and increase production or others can do off-farm activities, hence increase the household income. In the other hand, increase in household size may have negative impact on the income if the re is increase in number of dependants in the household. This implies that the consumption units in the households increased and more time is needed to take care of children. This leads to decrease in household income. Therefore, the increased in number of adults in the households will have positive impact while the increase in number of dependants may have negative impact.

Access to credit will have positive impact on the household income. The households with access to credit will be able to get loans and purchase farm inputs or hire more labour for the farming activities. This will lead to increase production, hence increased household income. Standard animal unit may have positive impact on the total per capita income. The more number of animals the household has reflect the use of manure and oxen in the agricultural activities, which in turn increase production. Thus, the standard animal unit is expected to influence per capita income positively.

4.4.4.1 Migration and income distribution

Income difference between households in the rural areas is an important indicator of social differentiation in the villages. From the prior knowledge it was believed that the people who are poor in the village are those who do not have land. Household from lower caste had less land and durable assets in comparison to other castes/ ethnic group.

The Gini-coefficient was calculated to capture how income is distributed within the three VDCs by using the following equation:

$$G = \frac{2}{N * \bar{y}}\left(-\frac{Y(N+1)}{2} + \sum y_i r_i\right) = \frac{2}{N\bar{y}}\text{cov}(y, r)$$

Where r_i is the rank of individual i when the population is ordered by increasing, y_i is the share of individual i in the total income Y, N is the total of the population, $\bar{y}$ is the mean income and cov(.) is the covariance between the income and rank series.

4.4.4.2 Decomposition of Income inequality by Source of Income

The impact of remittances on rural inequality can be measures by the examination of the contribution of remittances to overall inequality. The inequality decomposition based on the coefficient of variation can be developed following the Shorrocks (1982) and Ercelawn (1984). Let total income, Y, consists of income the total of y^s where y^s is the total income from s sources. The decomposition of the variance of income Y is written:

$$Var(Y) = \sum \text{var}(y^s) + \sum \text{cov}(y^s, y^{s'}) = \sum \text{cov}(y^s, Y).$$

In the above expression, the covariance between income y^s and total income Y measure the contribution of income y^s to the variance of income Y. The corresponding decomposition of the coefficient of variation is expressed as:

$$\text{cv}(Y)0\frac{\text{var}\,Y}{\sigma(Y)\bar{y}} = \sum_s \frac{\bar{y_s}}{\bar{y}} \frac{\text{cov}(y^s, Y)}{\sigma(Y)\sigma(y^s)} \frac{\sigma(y^s)}{\bar{y}} = \sum_s \frac{\bar{y^s}}{\bar{y}} \rho(y^s, Y)\text{cv}(y^s)$$

Where $\rho(y^s, Y)$ is the coefficient of correlation between y^s and Y. Hence, a source of income y^s will increase income inequality cv(Y) if it is positively correlated to overall income Y. the importance of its contribution increases with its own inequality $\text{cv}(y^s)$, its correlation with total income $\rho(y^s, Y)$, and its share in income $\frac{\bar{y^s}}{\bar{y}}$. An income source s is defined as inequality increases (decreases) if enlarging its share in total income increases (decreases) total inequality.

Turning to the inequality decomposition of Gini-coefficient, Pyatt, Chen and Fei (1980) have shown that the Gini coefficient of total income, G can be written as:

$$G = \frac{2}{N\bar{y}}\text{cov}(Y, r) = \frac{2}{N\bar{y}}\sum_s \text{cov}(y^s, r) = \sum_s \frac{\bar{y^s}}{\bar{y}} R_s G_s$$

Where G_s is the Gini coefficient of the s^{th} source of income and R_s is the correlation ratio expressed as:

$$R_s = \frac{\text{cov}(y^s, r)}{\text{cov}(y^s, r^s)}$$

The decomposition of the Gini coefficient can also be written:

$$\sum_s w_s g_s = 1 \text{ Where, } w_s = \frac{\bar{y^s}}{\bar{y}} \text{ and } g_s = \frac{R_s G_s}{G}.$$

Contribution of the sth source to total inequality is hence measured by the factor inequality weight $w_s g_s$. From the Gini coefficient decomposition, the sth source of income inequality increasing (decreasing) if its concentration coefficient g_s is greater (less) than unity. Decomposing the coefficient of variation and the Gini coefficient provides two ways of measuring the contribution of remittances to overall income inequality. First, it helps determine whether the inequality in remittances income serves to increases or decrease overall income inequality. Second, it helps identify how much of the overall income inequality is due to remittance income.

Chapter Five: Results and Discussion

The chapter begins with a briefly description of the surveyed households in section 5.1. The results from the surveyed related to the objectives and hypotheses are presented and discussed in section 5.2, and section finally section 5.3 presents the hypothesis testing.

5.1 Basic characteristics of surveyed households

Most of the households' families had five to eight members. Migrants were identified from the survey as either children of the household head who left the household to work elsewhere or household members who left the household to work else where for at least six months during the year. Out of the 200 households, 96 households, (48%), were found to participate in migration. Of the latter, 53 households (55.2%) of all migrants households receive remittances from household migrants. In the study area remittance play a critical role in the household economies. The share of remittance in the total gross household income for all 200 households is 26.8%. For migrant households, such remittances account for 45% of total actual gross income. These figures are not surprising because the migrants' wage outside or within the country is higher than the wage if they opted to stay in the villages

Migrants had on average attended school for two years. Out of all migrants 89.9% were male. Most of the migrants were single (77.9%).

The selected characteristics of migrants and non-migrants households are compared in table 5.1. Households with migrants are significantly larger on average (5.6 persons) than households without migrants (5 persons), and they are significantly having more females over 15 years of age on average. (2.0 compared with 1.6). This contributes to the significant large consumer units of migrants' household than non-migrants households (4.2 compared with 3.8). The households with migrants have significant more land than household without migrants. This suggests that the migrants' household are richer and they have enough money to buy the land and manage it. As indicated in table 5.1 the migrants' households have large per capital income including remittances and have large total expenditure compared to non-migrants households. In this case it can be said that most of migrants households belong to the wealthy social group.

Table 5.1 Selected characteristics of migrants and non-migrants households (the comparison by using two sample t-test)

Variable (s)	Non-migrants households N=104	Migrants households N=96	P-value*
Household Characteristics			
Households size	5.07	5.61	**0.063**
Age of household head	51.2	53.9	**0.19**
Gender of Household Head (0=male, 1=female)	0.154	0.323	**0.005**
Number of adults over 15 years old	3.03	3.45	**0.033**
Consumption units	3.79	4.17	**0.069**
Labour units	2.47	2.64	**0.299**
Consumption worker ratio	1.603	1.727	**0.158**
Number of female over 15 years old	1.596	1.969	**0.005**
Standard animal unit	3.27	3.74	**0.267**
Access to resources			
Size of cultivated land (in ropani)	6.92	9.7	**0.121**
Per capita durable assets (in Nepalese Rupees)	46537	80485	**0.124**
Per capita credit obtained (in Nepalese Rupees)	1621	6845	**0.001**
Income (In Nepalese rupees)			
Per capita off-farm income (excluding remittances)	7740	4885	**0.004**
Per capita income (excluding remittance)	15788	13564	**0.125**
Per capita income (including remittance)	15788	21161	**0.004**
Expenditure (in Nepalese rupees)			
Per capita total expenditure	51114	63566	**0.026**
Land conservation expenditure	2749	5252	**0.021**
Per capita non food expenditure	21921	30795	**0.023**
Agricultural cost	2841	4158	**0.103**

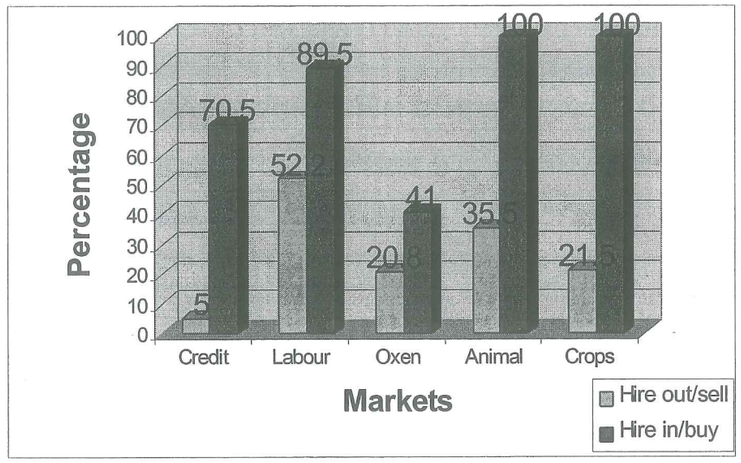
*** This show the significance difference between the two groups (migrants and non migrants)**

5.2. Market participation

The assumption from the theoretical farm household model discussed in chapter two was that factor and commodity markets are imperfect. This makes the consumption and production decision to depend on each other (they are non separable). In this case the factor and commodity prices are endogenous because they are determined within the household and not with the supply and demand in the market. This induces the household to be self-sufficient because there are wide price bands between the selling price and the buying price (the households are selling their commodities and factors at lower prices and are buying those

types of factors and commodities at higher prices). Figure 5.1 shows the extent of the participation of the households in different markets.

Figure 5.1 Participation of surveyed households in various commodities and factor markets (Percentage)



5.2.1 Commodity markets

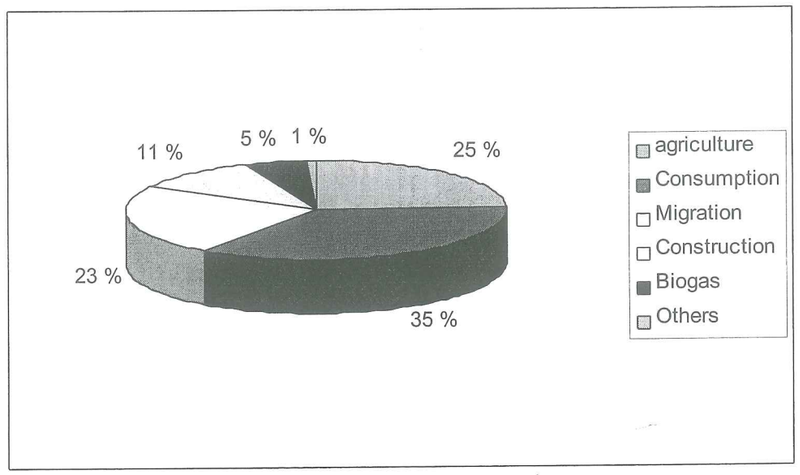
Most food produced by the households was used for their own consumption. A part of it goes to hired labour during cultivation and planting seasons. The household with surplus production sold their products within the village. In the study area more households were engaged in crops and livestock buying activities than selling activities (about 35.5% engaged in livestock selling activities and 21,5% in crop selling activities). The small share selling crops/animals should be seen in the light of many households in the study area being on remittance as source of cash (see table 2.8).

5.2.2 Credit market

In the study 70.5% of the surveyed households were involved in credit buying activities, and 5% in credit selling activities (figure 5.2). The most prominent source of credit was credit supplied by informal sector. The sector supplied more than 81% of the total loans obtained by the surveyed households. The informal sources include loans from village moneylender, mother groups, relatives and friends. The large proportion of informal loans was for consumption and migration purposes. The 44% of all loans from informal source was used for consumption. Out of 40 loans supplied by formal sector, 98% was for agricultural purposes,

and no loan was given for consumption purpose. The common formal source is Small Farmer's Development Program (SFDP) run by the Agricultural Development Bank. Out of all loans obtained 35% was for consumption purposes (see figure 16). The results indicate that the credit market is imperfect.

Figure 5.2 Distribution of Loan by purpose



5.2.3 Labour market

In the study area the low caste represented the major hired labour force, whose standard of living was mainly determined by their participation in the labour market. In the agricultural sector the lower castes own an important resource or input factor for production, namely their own work force, which to a large degree is being utilized by other castes. In the study area it was observed that there were different systems of labour exchange, which existed and the mostly common used are.

(1). **Payment for hired labour**. In this transaction labour may be hired individually for a day's work and paid on the basis of time worked. Most people preferred to be paid in cash instead of being paid in kind (food and drinks). The wage rates vary according to the task done and the sex of the worker. Normally payments for men are 45% higher than that of women, even though the work performed may be equal. The types of work the labour force was hired for and the amount of hired labour force varied between the villages. Women are normally hired for work like weeding, planting, threshing, carrying manure, cutting and carrying loads, while men were mostly hired for the more hard work like ploughing, carrying

heavy loads, and repairing terraces. Some households needed to hire labour for ploughing due to the absence of males capable for performing the task.

(2) Work Organization: People in the study area were involved in several existing forms of work organization namely the *pareli, perma* and *mujuri* system.

(i) *Pareli* is based on the fact that two households own a pair of oxen or four households own a pair of oxen. They agree to use the oxen when needed instead of borrowing or hiring from others. Furthermore, households may often extend the practice to combine labour force. One or two members from each household come together and work on each other's fields in turn. The benefit is that the households involved can use the same ploughman, and save time in searching for another. This system implies that there is reduced cash outflow from the household in form of payment, since the household member is working.

Figure 5.3 Pareli system

(ii) *Perma* system of labour exchange, which involves the provision of labour by one household to help another household. The households organize themselves to work on each other's terraces or fields in turn. Labour of this sort may or may not involve feeding the labourers; it may involve one meal or three meals; and the particular households whose terrace or fields are tilled cover the expenses. Also it is assumed that in the long run a household will provide as much labour as it received. The advantage of this system of labour exchange is that efforts in searching labour are reduced and the payments to labourers are

made in kind. This system is only practised within the caste or ethnic group due to the lower castes (which are regarded as untouchables) prevailing among the society.

Figure 5.4 Women planting rice by using perma system of labour exchange in Rivan.

(iii) *Mujuri* is the system, in which the payment given to the ploughman for his work performance within certain period of year is unhusked rice. The land area ploughed is measured in *hal*[13]. This forms a base of calculating the mujuri payment. The orally based contact between the households and the ploughman can be renewed each year. Mujuri payment varies depending on the area that he ploughed (in hal) and the frequencies of ploughing. The benefit of this system is that the household does not need to search for ploughman when the ploughing season begins. Since the payment is done on unhusked rice instead of cash, even households with little cash support can afford to hire a ploughman.

5.2.4. Division of labour

Generally women and men share a great deal of responsibilities ranging from land preparation to crop harvesting and storage. However there were certain roles that are differentiated and performed by one sex only. In the study area, the cultural and religious norms shaped the gender roles. Certain types of work were prohibited for either males or females due to cultural and religious constraints. The female labour force was often confined to work type such as weeding, hoeing, planting, cutting and carrying. It is believed that if a female use the plough

[13] 1 hal equal to 0.2 hectare of land and it takes a day to plough it.

the yield will not be good. Similarly for males, they must not perform the initial planting. The males labour force were performed work on such as ploughing, carrying manure, threshing, maintaining the terraces and carrying heavy loads.

5.2.5. Land tenure system

Most of the land was privately owned. One land tenure system used in the study area is share tenancy system. This system of the land tenure is known as *adhiya*[14]. A household that rents in land has to pay a proportion, most commonly half of the value of gross output, as land rent to the owner. In most case fertilizers, if used and seed are provide by landowner. Usually the low caste people are the one who rent land from other castes because they hold little land and sometimes they do not have anything at all.

5.3 Interpretation with caution

Results from the regression models should be interpreted with caution. The results assume that all the data used in the estimation from the sample were of good quality, but in reality they were not good in representing the real situation. The choice of functional form might be inappropriate, or function, which describes better the real situation, may not exist. This also may affect the results obtained. In the estimated model there was a problem of normality of the disturbance term. The normality assumption was rejected in all models (see appendix A1). The existence of these problems may cause the test statistics based on the estimators to be highly misleading.

5.4 Results for the first objective.

Objective 1: To identify possible factors influencing migration out of agricultural sector in the area.

A Probit, model as presented in chapter four, was used to estimate the factors influencing the migration decision in the study area. The model relates the probability of a household to engage in migration to different explanatory variables. The dependent variable for this

[14] Meaning half in Nepalese language.

estimation takes the value of one if there is migration and zero if there is no migration within the household.

The correlation matrix table 5.2 shows that off farm income (OFFY) is negatively correlated with the migration. All other variables are positively correlated with the dependent variable. The correlation matrix showed that the variables are not strongly correlated, that is, the risk of multicollinearity is reduced.

Table 5.2 Correlation matrix of variables for the migration decision model (200 observation)

Variable	Correlation factor						
Migration (MIG)	**1.000**						
Age of household head (AGE	**0.103**	1.000					
Size of cultivated Land (SLAND)	**0.117**	0.107	1.000				
Off-farm income (OFFY)	**-0.213**	0.101	-0.091	1.000			
Number of Adults (ADS)	**0.113**	0.175	0.322	0.233	1.000		
Credit obtained (CREDIT)	**0.153**	0.260	0.204	0.070	0.153	1.000	
Education of household Head (EDU)	**0.250**	-0.010	-0.020	-0.047	0.065	0.032	1.000
	MIG	**AGE**	**SLAND**	**OFFY**	**ADS**	**CREDIT**	**EDU**

Results of the estimation of probit model are presented in table 5.3. The estimated likelihood ratio of the probit estimation at 6 degrees of freedom was 36.78, which is greater than the table χ^2 value of 13.36 at 10% confidence level. So the null hypothesis of the explanatory variables jointly being equal to zero can be rejected. Prediction success is the measure of goodness of fit for probit model. This is the predictive power of the model, which tells us the percent of right prediction by the estimated model. The results show that a percentage of right prediction is 65.5%, which indicated that the model had a fairly good prediction power.

Table 5.3 Results of probit estimation to identify factors influencing the decision to migrate or not at the household level

Explanatory Variable	Variable Name	Estimated coefficient	T-Ratio
Age	AGE	9.62E-03	1.4068
Size of land	SLAND	6.37E-03	0.5346
Off farm income	OFFY	-5.32E-05	-3.4107*
Adults member	ADS	1.23E-06	1.4781***
Credit obtained	CREDIT	1.12E-01	1.5165***
Mean education in the household	EDU	4.71E-05	3.0768**
Constant	CONSTANT	-8.83E-01	-2.2559
LOG-LIKELIHOOD (0) = -138.38			
PERCENTAGE OF RIGHT PREDICTIONS = 0.65500			

* significant at 1% level of significance

** significant at 5% level of significance

** * significant at 10 level of significance

Dummy dependent variable Y=1 if the household have migrants and Y=0 if the household have no migrants

The probit model included the household characteristics variables (AGE, SLAND OFFY, CREDIT, ADS and EDUC). The results indicated that the effect of number of adults (ADS) on migration was positive and significant at the 10% level of significance. The coefficient of off farm income was negative and significant at 1% level. This indicates higher off farm income has negative impact on labour out migration. An increase in off farm income will reduce the probability of migration in the households. This may be so because most of migrants are coming from the Lower caste groups. Out of 96 households 29% are lower caste households' migrants. The household from this group do not have enough cash to sustain their life. The off farm income is regarded as substitute of remittances income.This indicated that the households with migrants decide to allocate their labour into migration activities in order to diversify their income, which is in line with migration theory of labour.

The coefficient of number of adults (ADS) was positive and significant at 10% level of significant. The results seem to imply that, having many adults (members between 15-55 years old) in the households increase the probability of migration.

The education of the household head (EDU) seem to influence migration positively it was significant at 5% level of significance. The educated family members move from the rural area to urban area to secure employments, which have higher wages compared to the wages in the rural areas. This finding is consistent with the previous study by Lucas (1985).

The coefficient of the credit was positive and statistically significant at 10% level of significance. The availability of credit from informal sectors lead to higher probability of migrating. Section 5.2.2 showed that, out of the 172 loans which have been taken by households from informal sources, 28% was for migration purpose. Todaro model showed that if the cost of migration is decreasing the probability of one member of family to migrate is increasing. In this case the availability of credit to cover the cost will lead to an increase in migration (section 3.1.1).

The household characteristics are important in the decision to migrate. The hypotheses (see section 1.6), the households with more adults members, with educated members in household are more likely to migrate may hold true. The availability of credit to finance migration activities, also lead to an increase in the probability of migration. It was hypothesized that household with more income from off farm activities may likely to migrate but the results indicated the opposite because the availability of off farm employment will reduce the probability of migration. Local off farm income is a substitute for migration income (remittance).

5.5. Result for the second objective

Objective 2: To examine the impact of labour out migration and remittance on the production of rice in the area

The production analysis was developed in order to study the interdependence between migration and remittance and its impact on the rice production, A three stage least square (3SLS) regression was used to test for effect of migration and remittances on the household production. The method was used because of the assumption that the migration and remittance are endogenous variables (see section 4.4.2) Socio economic, demographic factors and market imperfections are likely to affect the household decisions. Using the three stages least squares, the section attempts to determine the factors, which affect the rice production. Results from the three least square estimation are shown in table 5.4.

The results in migrants' equation (equation 1 in table 15) show that the variables, which were significant, were credit (CREDIT) at 10% level, household size (HHSIZE) at 5% level, durable assets (ASSETS) at 1% level and Caste (CASTEDUM) at 5% level. The estimated

coefficient for the credit, durable assets and household size were positive. These coefficients tell that the households with more assets have access to credit, large household size and the ones from higher caste lead to increase in migrants. The sign of the Education of the household head (EDU), age (AGE), off farm income (OFFY) were negative which indicated that the increase of the education and age of the household head, and the increase of households' income from off farm activities lead to the reduction of number of migrants. The EDU and AGE variables were not found to be significant in explaining factors, which causes migration. The results in the equation 1 are different from that obtained in section 5.5 because of the use of different variables and the sample of 106 households (households participating in rice production)

In the remittance equation (equation 2 in table 5.4) four variables were used as independent variables, which included MIGRANTS, LAND, ASSETS and DEPEND. The MIGRANTS variable was statistically significant at 10% level, which is quite obvious. Other variable were not statistically significant. In other words, the model variables are better explain if they migrate, but not how much income they get which seems reasonable

The results of output of rice equation (equation 3 in table 5.4), which capture the effect of migrants and remittances on the production of rice showed that MIGRANTS and ASSETS were significant at 10% level, REMINC at 5% level and ADULTS at 1% level. However, contrary to the expectation, MIGRANTS was found to have positive sign on production of rice while it was hypothesized to have negative sign, probably because household with migrants have more members, so the movement of one member do not affect the production activities. Another explanation is that the household can hire labour because of the existence of labour market. Given the small size of land holding it was easier for the households with larger family size and standard labour unit to carry out their farm activities without any significant loss in productivity even with the migration of one or more of household members.

Remittance variable found to have negative sign, while in the theories suggested contradictory effect. From chapter 3 it has been found that remittances may have positive or negative impact on the production (see section 3.3.3). The negative sign is because remittance was used in other activities rather than be invested in the production of rice activities. Although MIGRANTS and ASSETS variable had the significant but their effect on the production of rice were very small.

Table 5.4 Estimation of the impact of migrants and remittances on the production of rice using Three Stage Least squares

Number of migrants Equation 1			
Explanatory Variables	**Name of the variable**	**Estimated coefficient**	**p-value**
Credit obtained	CREDIT	4.25E-06	0.074
Off-farm income	OFFINC	-5.16E-06	0.143
Age of the household Head	AGE	-1.28E-03	0.285
Household size	HHSIZE	1.22E-01	0.019
Education	EDU	-2.19E-02	0.518
Durable assets	ASSETS	2.01E-06	0.000
Land cultivated	LAND	2.45E-02	0.274
Caste Dummy	CASTEDUM	8.62E-02	0.020
Constant	CONSTANT	-2.49E-01	0.477
Remittances equation 2			
Explanatory Variables	**Name of the variable**	**Estimated coefficient**	**p-value**
Number of Migrants	MIGRANTS	19699	0.0950
Land Cultivated	LAND	-70.587	0.1590
Durable assets	ASSETS	-9.62E-05	0.9980
Number of dependants	DEPEND	1.68E-05	0.2990
Constant	CONSTANT	-973.45	0.9230
Rice output equation 3			
Explanatory Variables	**Name of the variable**	**Estimated coefficient**	**p-value**
Number of Migrants	MIGRANTS	4.0075	0.077
Remittances	REMINC	-9.08E-05	0.025
Age of the household head	AGE	2.63E-02	0.615
Education level in the household	EDU	0.37182	0.220
Durable assets	ASSETS	1.03E-05	0.097
Plot size	PLOT	-1.08E-06	0.601
Number of adults	ADULTS	9.70E-01	0.000
Constant	CONSTANT	1.87E+00	0.462
Note : Sample size = 106 households; System R2 = 0.8372; Chi-square (df) = 192.42 (19)			

The results obtained from the study conducted by Rozelle et al (1999) in China had the opposite results on the effect of migration and remittance on households' rice production. The results indicated that migration had negative impact on the production of rice while remittances had the positive impact. A one-person increase in migration was associated with

461,63 jin[15] per Mu[16] decrease in production of rice. The results indicated that an additional yuan remitted increases yield by 0,44 jin per mu. the results from this study supported the NELM[17] hypothesis that migration loosen the capital constraint in the crop production.

In summary, it can be stated that the direct effect of labour out migration on output is significant and positive. Output increased as each family member leaves the households, an indication that on farm labour market are not absent in this part of Nepal. An increase in migration of one member is associated with 4.0 muri increase in rice output. The results also show that remittances had the negative effects on the outputs. The increase in one Nepalese rupees remitted decrease output by 0.00009 muri. This may be due to fact that household in the study area do not invest in agricultural activities; they normally use the remittance to buy consumption good or to build houses in the urban areas. These results indicated that in the study area households with migrants have do not depend on production of rice as their source of income.

5.6 Results for the third objective

Objective 3: To examine the impact of labour out migration on the consumption

The consumption analysis was carried in order to see how the households behave in term of expenditure and to solve the problem of the discrepancy between expenditure and income. In this case the expenditure tells us more about the income, which itself viewed as the more important determinant of consumption behaviour.

Correlation matrix

The correlation matrix in table 5.5 shows that the consumption unit (CU) is negatively correlated with the independent variable all other explanatory variables are positively correlated with the independent variables, which was expected. When it comes to correlation between the explanatory variables, age and education of household head are highly negatively correlated (-0.417), this may increase the risk of multicollinearity. Apart from the mention correlations, the other variables have low correlation between themselves.

[15] 1 jin is roughly equal to 0,5 kilogram
[16] 1 hectare is 15 Mu
[17] New economics of labour migration

Table 5.5 Correlation matrix of variable

Variables	Correlation Factor								
Total expenditure per CU (EXP)	**1.000**								
Number of migrants (MIGRANTS)	**0.310**	1.000							
Consumption units (CU)	**-0.280**	0.055	1.000						
Labour per CU (WC)	**0.114**	0.033	-0.072	1.000					
Size of cultivated land (SLAND)	**0.231**	0.173	-0.068	0.018	1.000				
Credit obtained (CREDIT)	**0.099**	0.283	-0.057	0.094	-0.006	1.000			
Age of household Head (AGE)	**0.084**	0.151	0.028	0.064	0.011	-0.010	1.000		
Education of household head (EDU)	**0.050**	-0.033	0.038	-0.065	0.052	0.000	**-0.417**	1.000	
Standard animal Unit (SAU)	**0.088**	0.171	-0.118	-0.136	-0.019	-0.051	0.013	-0.203	1.000
	EXP	**MIGRANTS**	**CU**	**WC**	**SLAND**	**CREDIT**	**AGE**	**EDU**	**SAU**

Results from the regression models

The OLS basic estimation technique was used. From table 4.2 it has been shown that the household with migrants have more per capital expenditure than those without migrants, the table reveals that that household with migrants are better off than those without. The remittance ranged from 800 NRs to 300,000 NRs.

Table 5.6 shows the results from two models (linear and log-log function). The linear model indicates that number of migrants (MIGRANTS) was positive and significant at 10% level of significance. From the results it can be concluded that migration lead to an increase of total per capita expenditure. The sign of consumption units was negative and significant at 5% level of significant. This indicates that the increase in the consumption units in the household lead to a decrease in the total household per capita expenditure. The land per capital was positive correlated with total household per capita expenditure and was significant at 1% level

of significant. The explanation of the significant of land is that the increases of size of land per capital lead to the increase in the agricultural costs in maintain the land and undertaking farming activities. Other variables were not significant but they had expected sign.

In the log – log regression model, consumption units and education were significant at 1% level of significant. The sign of the consumption was negative as in linear model. Education had the positive sign, which indicates that, the increase in the education within the household lead to increase in per capital expenditure. Credit, age of the household head and standard animal unit had a positive sign and were significant at 5% percent level of significant. Other variables were not significant.

In both case the R^2 was small (0.2285 for linear model and 0.1838 for log –log model.). In this case the linear model was better in explaining the variation in the dependent variable. It can be concluded that migration lead to increase in total per capita expenditure within the households. The increase in one migrant within the family causes an increase of 3898.3 Nepalese rupees in total per capita expenditure according to the linear model. This conclusion is also supported by the finding that out of all migrants households who receive remittances, 65.3% used it for consumption, 30.5% use for paying back the loan and the remaining share used it for starting a business or buying a land.

Table 5.6 Regression analysis to estimate total household per capita expenditure for all households

Explanatory Variables	**Linear Model R^2 = 0.2285**			**Log-log Model R^2= 0.1838**	
	Estimated coefficient	Elasticity at means	p-value	Estimated coefficient	p-value
Number of migrants (MIGRANTS)	3898.3	0.1831	0.089	9.74E-03	0.461
Consumption units (CU)	-2742.8	-0.6863	0.004	-0.43454	0.001
Labour per CU (WC)	8931.2	0.364	0.25	0.31011	0.199
Size of cultivated land (SLAND)	622.96	0.0851	0.037	-2.49E-02	0.316
Credit obtained (CREDIT)	-1.22E-03	-0.0003	0.991	1.33E-02	0.018
Age of household Head (AGE)	81.424	0.2692	0.223	4.17E-01	0.014
Education of household head (EDU)	644.02	0.0688	0.211	3.66E-02	0.003
Standard animal Unit (SAU)	1661.3	0.0246	0.434	2.59E-01	0.017
Constant	10975	0.6918	0.032	8.59E+00	0.000

Note: in all models the heteroscedasticy was corrected by using White's (1980) HETeroscedasticity-Consistent COVariance matrix estimation (the HETCOV option in SHAZAM).

In summary, it can be said that migration has positive impact on per capita expenditure. The households with migrants seem to have higher per capital expenditure than those with no migrants.

5.7 Results for the fourth objective

Objective 4: To examine the impact of migratory remittances on income and distribution of income within rural areas households

In the income analysis, per capita income per household including remittance was estimated from the all households. The correlation matrix table 5.7 shows that the consumptions unit is strongly negatively correlated with per capita income. Other explanatory variables are positively correlated with the dependent variable.

Table 5.7 Correlation matrix

Variables	**Correlation Factor**								
Total income per CU (INCOME)	**1.0000**								
Number of migrants (MIGRANTS)	**0.2638**	1.000							
Consumption units (CU)	**-0.0960**	0.055	1.000						
Labour per CU (WC)	**0.1820**	0.033	-0.072	1.000					
Size of cultivated land (SLAND)	**0.0620**	0.173	-0.068	0.018	1.000				
Credit obtained (CREDIT)	**0.0083**	0.283	-0.057	0.094	-0.006	1.000			
Age of household Head (AGE)	**0.0740**	0.151	0.028	0.064	0.011	-0.010	1.000		
Education of household head (EDU)	**0.1080**	-0.033	0.038	-0.065	0.052	0.000	**-0.417**	1.000	
Standard animal Unit (SAU)	**0.0556**	0.171	-0.118	-0.136	-0.019	-0.051	0.013	-0.203	1.000
	INCOME	**MIGRANTS**	**CU**	**WC**	**SLAND**	**CREDIT**	**AGE**	**EDU**	**SAU**

The explanatory variables included in the model explained only 14.4% of the total variation of the response variables in the linear model while in the log-log model the total variation is explained by 12.9%. In this case the linear model is better in explaining the variation in the dependent variable caused by the independent variables.

The results of the linear model showed that number of migrants is positive and significant at 1% level of significant, this shows that migration had a positive impact in the household per capita income (table 5.8). The movement of household members outside the village will lead to an increase in the household per capital income due to remittance. As it has been seen in section 4.1.2 share of remittance income in total gross income is 45%. This indicates that remittance income is the main source of income to the household living in the study area. The sign of Labour per consumption unit (WC) was positive and significant at 1% level. The increase in labour per consumption ratio will lead to increase in per capital income, this indicates that as the number of labour force increase in the household, the per capita income increases because of increase in output. Education of the household head was positive and significant at 5 % percent level. Other variables were not statistically significant.

In the log-log model number of migrants, consumption units, Labour per consumption, age of the household head and education of the household head were statistically significant at 5%, 5%, 1%, 10%, 1% level of significant respectively. The sign of the consumption units was negative which indicate that the consumption unit have negative impact on the per capita income.

From the results it can be concluded that labour out migration has positive impact on household per capita income. The households with remittances have more income than those without remittances.

The results in the consumption and income analysis showed that labour out migration has a positive impact on the total per capita expenditure and total per capita income. The coefficient of number of migrants in total per capita expenditure analysis is big than in the per capita income model. This implies there was a discrepancy between the income and expenditure data. Households underestimated their income. In the situation like this, expenditure is likely to be a better indication of permanent income. The good way of getting the income data is to use expenditure data because of the large discrepancy between income and expenditure.

Table 5.8 Regression analysis to estimate household per capita income including remittances for all households surveyed

Explanatory Variables	Linear Model $R^2 = 0.1448$			Log-log Model $R^2 = 0.1285$	
	Estimated coefficient	elasticity at Means	p-value	Estimated coefficient	p-value
Number of migrants (MIGRANTS)	3235.6	0.1602	0.008	3.72E-02	0.012
Consumption units (CU)	-925.89	-0.2442	0.128	-0.25963	0.036
Labour per CU (WC)	14047	0.6035	0.006	0.59941	0.002
Size of cultivated land (SLAND)	-71.89	-0.0103	0.788	1.10E-02	0.754
Credit obtained (CREDIT)	-0.10554	-0.0289	0.244	8.23E-04	0.906
Age of household Head (AGE)	87.843	0.3062	0.141	0.34552	0.069
Education of household head (EDU)	786.06	0.0885	0.017	3.74E-02	0.008
Standard animal Unit (SAU)	44.596	0.0007	0.98	5.53E-02	0.670
Constant	1873.4	0.1245	0.702	8.8199	0.000

Note: in all models the heteroscedasticy was corrected by using White's (1980) HETeroscedasticity-Consistent COVariance matrix estimation (the HETCOV option in SHAZAM).

5.7.2 Income distribution

From the income analysis, the results showed that labour out migration has a positive impact on per capital income through remittance. The migration through remittances led to unequal distribution of income between households. Figure (5.5) shows a Lorenz curve for the household in the study area. The curve illustrates the percent of total income accounted for by any cumulative percent of households. The shape of this curve indicates the degree of inequality in the income distribution. The Gini-coefficient is calculated to be 0,48, which indicates a skewed income distribution in the area

From figure 5.5 it can be seen that the top 20% of the population distribution receive 46% of the total income in the area, while the lowest 20% of the households only had 5% of the total income. The income varies from 1571 to 81411 per annum.

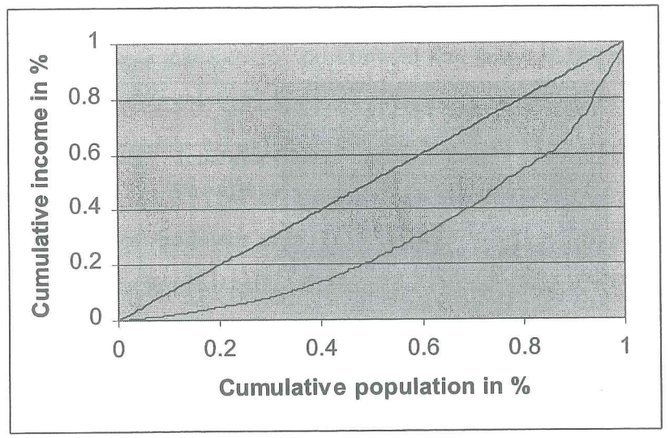


Figure 5.5 Lorenz curve: Total income (including remittances) distribution

In figure (5.6), shows the Lorenz curve when remittances are excluded from the total per capita households income. The Gini coefficient reduced to 0,40. From the figure it can be seen that the top 20% of the population receive 48% of the total income, and the lowest 20% of the population receive 4% of the total income. It terms of the Gini coefficient it can be concluded that remittance increased the income distribution inequality.

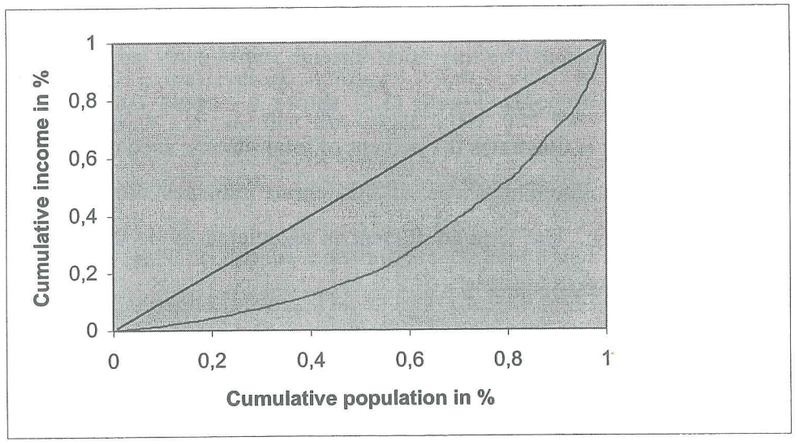


Figure 5.6 Lorenz curve: Total income (excluding remittances) distribution

The decomposition of the coefficient of variation and the Gini coefficient were used in order to see if the remittance income in the study increases or decreases inequality, and also to show how much percentage the income inequality decreases or increases. The results are reported in table 5.9. By using the decomposition and the coefficient variation and composition of Gini

Coefficient showed that Rent income decreased inequality in both cases. In agriculture income the coefficient of variation revealed that agricultural income decreases inequality while the decomposition of Gini coefficient indicated that agricultural income increases inequality. In both cases the results showed that remittances income increases inequality

From the relative factor inequality weights, which measure the contribution of a particular income source to overall income inequality indicated that remittance income have Gini coefficient of 0.3297 which is smaller than the coefficient of Labour and Oxen (0.5569), Other sources of income (0.5886) and Farm income (0.4536). However, the remittances income makes the largest contribution to overall inequality (37.93%) despite its small Gini coefficient because it represents the second important source of income in the area of study.

Table 5.9 Full remittance-effect : Gini decomposition results

Variables	labour and Oxen	Employment	Remittances	Other source of income	Farming income	Livestock
Share in total household income(ws)	0.152	0.086	0.242	0,256	0.204	0.059
Gini Coefficient for income source(Gs)	0.557	0.202	0.330	0.589	0.454	0.290
Gini correlation with total income rank (R_s)	-0.007	2.648	2.068	0.663	1.031	1.726
Contribution to Gini of total income ($w_sG_sR_s$)	-0.001	0.046	0.165	0.100	0.095	0.030
Percent share in Gini of total income (%of $w_sG_sR_s/G$)	-0.001	0.106	0.379	0.230	0.219	0.068
Gini concentration coefficient (g_s)	-0.009	1.226	1.566	0.896	1.074	1.147
Mean per capita income	2823.92					
Total Gini coefficient (G)	**0.44**					

5.8 Summary

1. Household characteristics and labour out migration.

This hypothesis tested based on the coefficient of the characteristics, which determine whether the household member engaged in the migration activities, or not. From the results, number of adults, mean education in the household, credit obtained and the availability of off-farm income were statistically significant in explaining the household decision in engaging in

migration activities. Testing the hypothesis in this case was based on goodness of fit measure (likelihood ratio test), prediction success and the overall test of significance of sample regression of the probit model. The hypothesis that said that higher education, the larger number of adults' members and access to credit increase probability of migration could not be rejected. The hypothesis, which postulates that availability of off-farm income increase the probability of migration, could be rejected. (**H_1** see section 1.3)

2. *Migrants income (remittance) and rice production*

From the 3SLS (Three stage least square) model, the coefficient of remittance was negative. Implying that with other variables kept constant, an additional Nepalese rupees increase from remittances income would lead to 0.00009 muri[18] decrease in rice production. Although the coefficient is very small but its impact is significant. Therefore, remittances had negative impact on rice production and the hypothesis that remittance has positive impact can be rejected (**H_2** see section 1.3). The hypothesis, which hypothesized negative impact of remittances on the rice production, can not be rejected. (**H_4** see section 1.3). Most of the remittance obtained used to smooth consumption rather than being invested in the agricultural activities

3. *Number of migrants and production of rice*

It was assumed that an increase in number of migrants would have a negative impact on rice production because of the decrease in labour supply within the household. This hypothesis was tested using the results from the three stage least squares in table (17). The results showed that the coefficient of migrants in the rice output equation was positive and statistically significant. An increase in movement of one member of the household was associated with 4 muri increase in rice production. The explanation behind this was that increases in the number of migrants within the household, would lead to increase in production of rice. This may be due to fact that, the household with migrants does not face the problem of labour shortage because they have large family size and income to hire more labour. The hypothesis, which hypothesized, that the increased number of migrants has negative effect on production of rice is rejected (**H_3** see section1.3).

[18] 1 muri = 48.8 kilograms of rice

4. *Labour out migration and consumption.*

It was hypothesized that an increase in migration would have a positive impact on household consumption. From table (19) showed that migration had a positive impact on total per expenditure. An increase of one migrant in the household would lead to 3898.3 Nepalese rupees increase in total per capita expenditure of the household which support the hypothesis (**H_5** see section 1.3), hence the hypothesis 5 can not be rejected

5. *Labour out migration, per capital income and income distribution*

It was hypothesized that remittance income increase inequality due to fact the migration has positive impact on the per capita income. . From the income analysis, it can be observed that migration have positive impact on the households per capita income. An increase of one migrant in the households is associated with 3235.6 Nepalese rupees increase in total per capita income. This may explain that the main source of income in the study area was remittances from migrants. In the decomposition of the coefficient of variation and Gini coefficient analysis showed that remittances increase inequality. The hypothesis 6 cannot be rejected (**H_6 see section 1.3)**

Chapter Six: Conclusion

6.1 Conclusion

In this study, an assessment of how labour out migration affects farmer household in Mardi watershed area is presented. The study found that 96 (48%) of the 200 surveyed households had at least one member living outside the village. The total number of migrants was found to be 149. In the mid-hill where the study area is situated, households have relied on agricultural production to sustain their livelihood. However, recently migration has become a major support source of income. Most migrants went to Middle East countries.

The study found that the household size, age of the households' heads, off-farm income, credit and caste were the important factors for the migration decision of the farm households in the study area. Household with large family size, access to credit, the one from the higher caste and with the older households heads had higher propensity of migrating than those with less of these variables. Households with lower off farm income were also found to have more migrants.

The results indicated that number of migrants and remittances were significantly affecting rice production. The impact of migrants on rice production was positive. This indicates that households with migrants did not have labour shortage to do farming activities. It was found that the larger the household size, the higher the probability of one or more of the household members to migrate. The remittance impact on production was negative, indicating that the households with migrants did not invest in the production of rice. They rather invested in other income generating activities (such as small businesses, building of houses in the urban centres especially Pokhara). The results also indicated that the migrant's households did not have cash constraints. This conclusion was reached because none of the indictors of wealth like assets position, and total cultivatable land of the households were statistically significant. Another explanation was that migrant's households can use the remittance in consumption activities; hence decreased the amount of family labour in the production of rice. This can result in decreased rice production

In addition, the study indicated that the impact of migration on expenditure of consumer goods were positive. The aggregate per capital total expenditure proved that households with migrants were better off than the non-migrants households. The mean total households per capital of migrants' households and non-migrants households were Nepalese Rupees 63566 and 51114, respectively. This difference was found to be statistically significant at 5%. This was also a result from econometric estimation, which indicates that migration coefficient was positive and significant at 1% level of significance. An increase in one migrant led to an increase of total per capita expenditure by 3898.3 Nepalese rupees. The extra income that resulted in differences in consumption was supposed to have come from the remittances that migrants' households received. It can be concluded that remittances were used as a mechanism to smooth the households' consumption pattern in the study area.

The study further revealed that migration impact on the household income was positive. Econometrics estimation indicated that an increase in 1 migrant in the household led to increased total per capital income by 3235.6 Nepalese rupees. While remittances had a positive impact on the total per capital income, they had negative effect on income distribution. When the remittances were included in households' income, the Gini coefficient, a measure of inequality increased by 12.8 % from 0.39 to 0.44.

Moreover, decomposing the sources of income inequality showed that income from remittances made a large contribution to the overall income inequality. it contributed for about 24.2% in the total per capital income. The remittance income was itself distributed very unequally this means that not all household with migrants had remittances. Out of the 96 households with migrants, 44.7% did not have remittances income. Out of the household wit h remittances, 23% had low remittances, which constituted for less than 40% in the total household income. According to the findings from the present study, income from remittances was the dominant source of overall income inequality. The result also showed that income from hiring out labour and Oxen led to decreased inequality. This was because most of households from lower caste were the one who engaged in renting out their labour. They mainly depended on the labour for their own survival. This implied that the availability of off farm income would increase welfare of households from lower castes because their per capita income will increase.

The overall conclusion from the present study is that, labour out migration in the study area did not benefit the poorest of the poor. There have been big differences in access to outside employment through migration and village resources between ethnic groups. The households from higher caste (such as Brahmin, Chettri and Gurung) ethnic groups have been favoured. Members of the lower caste continued to be disadvantaged, because of the lack of access to resource and education. This led to increased disparities in income and ownership of assets (mainly land). Households with access to resources were in better position than those who did not have access (mainly the households from lower caste).

The situation in the Watershed area is alarming and need proper arrangements from the Government and Non Governmental Organizations (NGOs). Labour out migration and rural development have an interdependence relationship. Labour out migration is both determined by and has consequences in the growth and spatial distribution of the social economic opportunity. Policies that encourage a neglect of the rural small farm sector are bound to bring about large out migration. As long as rural development has its aim to increase households' welfare in rural areas, it will in future encourage people to remain in rural areas

The findings presented in the study imply that relevant policies are needed to decrease the labour out migration in the study area. The results indicated that availability of off farm employment might lead to a decreased rate of migration. Promoting policies that coordinating improvements in farming and non-farm activities is important. Improvements in technology, especially those that increase production and provide increased employment for small farmers and the implementation of employment generating programs will sustain the lives of the households who are poor and landless. Moreover, employment opportunities can also be created by encouraging people who generate savings from outside work, to invest in more profitable farming activities or in other off farm activities in the village or in near by town. By implementing these policies the government can reduce the out migration and income distribution inequality in the area.

In general all policies, which favour rural development (such as the policies which increase rural income and job opportunities through consolidations of fragmented holdings, small-scale irrigation construction, credit and extension services, improved transportation and market) are important for addressing the labour out migration problem.

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APPENDICES

APPENDIX A1: QUESTIONNAIRE

Questionnaire for Household Survey

Kaski District, Mardi Watershed, Pokhara Valley, Nepal

The information collected will be used for research purposes. It will be treated as confidential and will not be used by tax authorities or other assistance

Name of VDC _____
Village _____
Ward Number _____
Household Number _____
Name of Household head _____

Enumerator's Name:	
Date of First Interview:	
Date of Second Interview:	

Data Checked by	When	Status		Comments
		OK	Return	

Data Punched	When	Who	Comments
Pages			
Pages			
Pages			
Pages			
Pages			

Farm household survey: Household characteristics

No. of Household members _____ Cast group _____

Members living in the household during the last year _____

Ser. No	Name	Rel. to head	Sex	Age	Education	Occupation	Months of presence
1		Head					
2							
3							
4							
5							
6							
7							
9							
10							
11							
12							
13							
14							

Rel. To head: 1=Wife, 2=Child, 3=Grand child,4= Brother, 5= Sister, 6=Hired labour 7= Daughter in law, 0=of Sex: 1=Female, 0=Male. Agee: years,

Education: # of years, I=illiterate, L=Literate. Occupation: 0=Student, 1=Agriculture, 2=Private service,3=Public Service, 4=Business, 5= Turism, 6=Industry, 8=Without any occupation, 9=Other, Specify.

Did any member of the family live outside home during the last year for more than a month? Yes ☐ No ☐

If Yes,

Ser. No	Name	Rel. to Head	Age	Marital Status	Education	Destination	Period (interval)	Purpose	Migration Remittances during the last year: Assets	Migration Remittances during the last year: Cash	If no remittances, Give reason	Remi ces u for
1												
2												
3												
4												
5												
6												

Have any member of the family who migrated few years back come back? Yes ☐ No ☐

If yes, state reason _____

What are the negative effects when a person migrates/moves from the family? _____

How do the workload in household change when the person moved out? _____

Who gets higher work load? _____

Who gets small workload? _____

If childrens get higher workload, does this affect

	Yes	No	Improved	Stayed constant	Declines
attendance to school?					
time spend on home work?					
drop out of school completely					

Did the consumption of food per person change when the person moved out? Yes ☐ No ☐

arm Household Survey: Conservation Practices

ow is the soil fertility status on your farm in general?

Decreasing ☐ Increasing ☐ Constant ☐ Don't know ☐

ive reason if Decreasing _____

ive reason if Increasing _____

there any soil degradation problem on your farm? Yes ☐ No ☐

yes, Rank indicators as follows:

Degradation Indicators	Very severe	Severe	Less severe	Not a problem
Rill erosion				
Gully formation/expansion				
Shallow stony plot				
Siltation on down slope				
Lack of vegetation				
Tree roots exposure				
seeds washed away				
land slides				
Hailstorms				
riser failure				
Others, specify_____				

you carry out soil conservation activities? Yes ☐ No ☐

es, show conservation technologies used and expenditure:

Type of activity	Total labour needed in days	Own labour	Hired labour	Other form of expenditure ((total value in Rs)	Land conserved used for (crop)
id slide treatment in farm land(retaining wall, check dam, dry stone)					
adcasting of seed on land slide area					
nting of Bamboo/Napir Grass					
ching					
ly control					
all dam construction in stream side					
ch Terracing/Maintaining terraces					
ers (specify)					

o, give reason _____

you use chemical fertilizer on your farm land? Yes ☐ No ☐

o, state reason _____

e you ever had training on soil conservation uses and practices? Yes ☐ No ☐

s, when _____ by whom_____

o, why?

do not have time ☐ There was no opportunity for training ☐

Other, specify _____

dholding

e	Size (ropani)		Sources of change						
	Current year	Last year	purchase	sharecropping	Rent out	Rent in	Sale	Inheritance	Gift
vated land									
ing land									
oductive land									
st land									
l land									

Farm Household Survey: Watershed Management

Please, give your opinion for the following statements on the watershed management

Statement	Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
Soils are exhausted due to shortening of fallow periods					
Top soils are removed by erosion					
Rotational cropping decrease soil fertility					
Mixed cropping and legumes destroy soil fertility					
Terraces helps to avoid soil degradation					

How is the trend of crop yieldover the last 5 years?

Decreasing ☐ Increasing ☐ Constant ☐

Why?

_____

_____

_____

_____

If decreasing, what do you do to cope with decreasing crop yields? _____

_____

_____

_____

What is your attitude towards conservation technologies that affect the levels of soil erosion?

Attitude	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
I would pay more for any inovation that could reduce soil damage even if it does not increase my income					
I would contribute more labor for any inovation that could reduce soil damage even if it does not increase my income					
I would not adopt any innovation that could cause soil damage even if it could increase my income					

Farm household survey: Household consumption expenditures

Commodity	Quantity		Per
	Own prod.	Bought	
Rice			
Paddy			
Wheat			
Maize			
Millet			
Potato			
Beans			
Soyabean			
Cauliflower			
Cabbage			
Onion			
Tomato			
Meat			
Fish			
Egg			
Milk			
Ghee			
Milk products			
Curd			
Salt			
Massala			
Tea			
Banana			
Sugar			
Others			

Household consumption expenditures: Non-food items

Commodity	Total Cost per year
Medicine	
Clothing	
Footwear	
Education	
Statinary	
Cigarette/Tobacco	
Fuel	
Fests and Festivals	
Soap	
Cosmotics	
Others	

Farm household survey: Crop Selling activities- 2055 B.S

Did you sell any crop in the last year? Yes ☐ No ☐
If yes, fill the following table

Type of crop	Total quantity produced (Kg)	Amount consumed (kg)	Amount sold quantity (Kg)	Total income from sale	Purpose of sale
Paddy					
Rice					
Maize					
Wheat					
Millet					
Potato					
Pulses					
Ginger					
Spices					
Soyabeans					
Fruits					
Parel					
Dhuto					
Nal					
Mustard					
Vegetables					
Other, specify					

Farm household survey: Crop Selling activities- 2056 B.S

Type of crop	Total quantity produced (Kg)	Amount consumed (kg)	Amount sold quantity (Kg)	total income from sale	purpose of sale
Paddy					
Rice					
Maize					
Wheat					
Millet					
Potato					
Pulses					
Soyabeans					
Ginger					
Spices					
Fruits					
Parel					
Dhuto					
Nal					
Mustard					
Vegetables					
Other crop, specify					

Yes ☐ No ☐

Farm Household Survey: Credit
Have you obtained credit for investments or other purposes?
If yes, give details for the 5 last years:

Source	Who took?	Year obtained	Purpose	Amount	Repayment conditions: Frequency	Repayment conditions: Duration	Repayment conditions: Interest	Repayment conditions: Completed	Collateral Requirements	What was the credit actually used for?

Source: 1=Governmental bank, 2=Village money lender, 3=Relatives, 4=Mother group, 5= SFDP, 6=others, specify
Duration: length of loan period
Frequency: Number of times repayment has to be made during the loan period **Completed:** 1=Yes, No=0
Who took? 1=Wife, 2=Child, 3=Grand child,4= Brother, 5= Sister, 6= Daughter in law, 8=others
If you want, are you able to obtain credit for

Source	Purpose: Investment	Purpose: Consumption	Purpose: Family events	Purpose: Migration	Max amount	Interest rate	Duration	Collateral requirement
Government bank								
Village money lender								
Relatives								
Mother group								
SFDP								

Farm Household Survey: Credit

If you don't take credits, state the reasons:

a) I have enough cash from other sources of income
b) I am afraid of risk and repayment problems
c) Interest rate is too high
d) I can't provide collateral
e) There is no credit available
f) There is no credit available for the purpose I need

Are you satisfied with the credits you obtained? Yes No

If no, fill the following table

source	reason for dissatisfaction			
	Not enough amount	collateral requirement is too high	interest rate is too high	Others

Household survey: Other sources of income (2055 B.S)

source	Quantity	Price/wage	Total Income
Hiring out oxen			
Hire out labour			
Employment			
Labour: assistance received			
Rent out land			
Pension			
Total Remittance Income			
Senior citizen allowances			
Widows allowances			
Disability allowances			
Government Transfers			
Gifts			
Interest from loans			

Sources of Income with input costs 2055 B.S

Source	Input costs	Quantity	Price	Total Income
Sale of handicraft				
Sale of beverages				
Other services				
Other business				

What durable commodities and implements does the household have?

Household Assests	Number	Current value
Property elsewhere, specify		
Vehicle,specify		
Radio/Casset player		
Wrestwatch		
biogas plant		
jwellery		
Furnitures		
Utensils		
others, specify		

Over the last 8-10 years,have the living condition of the household: Improved / been stable / Worsened

If changed, what are the reasons for the change?

Household survey: Other sources of income-2056 B.S

source	Quantity	Price/wage	Total Income
Hiring out oxen			
Hire out labour			
Employment			
Labour: assistance received			
Rent out land			
Pension			
Total Remittance Income			
Senior citizen allowances			
Widows allowances			
Disability allowances			
Government Transfers			
Gifts			
Interest from loans			

Sources of Income with input costs 2056 B.S

Source	Input costs	Quantity	Price	Total Income
Sale of handicraft				
Sale of beverages				
Other services				
Other business				

How many years have you spent in farming? _____

Fill land information for each plot

	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7
Distance from home							
Size							
Soil type							
Rent In							
Rent out							
Rent amount							
Share cropping/Adhiya							

rm Household Survey: Crop Production

ousehold Number_____ Plot number _____

ow is the soil fertility status on this plot?

creasing _____ Increasing _____ Constant _____ Don't know _____

nd type: Irrigated Khet_____ Unirrigated Khet _____ Bari _____ Other _____

nual crop rotation_____

Month	Input Activity	Quantity: Own resource	Quantity: Purchased	Yield of the crop *(Write it at the end of the crop rotation month)*
Baisakh				
Jestha				
Asar				
Srawan				
Bhadra				
Ashoj				
Kartik				
Mangsir				
Paush				
Magh				
Falgun				
chaitra				

Farm household survey: Forest related issues

Do you own forest land? Yes ☐ No ☐

Expenditure on tree planting (2055 B.S)

Type of tree	Labour required in days		Number of seedlings	Other form of expenditure (Rs)
	Own labour	Hired labour		

Expenditure on tree planting (2056 B.S)

Type of tree	Labour required in days		Number of seedlings	Other form of expenditure(Rs)
	Own labour	Hired labour		

Income from sale of forest products: (2055 B.S)

Type of product	Quantity sold	Total income	Income used for
Fuelwood			
Timber			
Fodder			
Other,specify			

Income from sale of forest products: (2056 B.S)

Type of product	Quantity sold	Total income	Income used for
Fuelwood			
Timber			
Foder			
Other,specify			

Farm Household Survey: Institutions (Asked to the household head)

Is your household influenced by mother group activities? Yes ☐ No ☐

If yes, how does mother group activities positively/negatively influence your household?

Are any females in your household represented in the local mothergroup?

Yes ☐ No ☐

If yes, who (relation to head)?_____

If yes, do you like or dislike her/their involvement in the mother group?

Dislike ☐ Like ☐

Why (because of the activities or because of other reasons)?

How does ACAP contribute to womens development?

What ACAP activities have you been involved in, and how is the household benefitting from these?

Activity	+, 0, -, don't know	Reason

Are there any ACAP activities you would have liked to be involved in?

Yes ☐ No ☐

If yes, why didn't you participate?

Farm Household Survey: Institutions(Ask to a selected female)

What is your relation to head of household? _____

Are you represented in the local mother group? Yes ☐ No ☐

Is your household influenced by mother group activities? Yes ☐ No ☐

If yes, how does mother group activities positively/negatively influence your household?

Can you personally obtain loan if you want? Yes ☐ No ☐

If yes, state source and amount

Source	Max. amount you can obtain

If you have not obtained loan, state reason

Did you get any assistance from Amma Samoa during the last 5 years?

Yes ☐ No ☐

If yes, for what reasons? _____

How important was the assistance to you?

Not important at all	Not Important	Neutral	Important	Very Important

How does ACAP contribute to womens development?

What ACAP activities have you been involved in, and how is the household benefitting from these?

Activity	+, 0, -, don't know	Reason

Are there any ACAP activities you would have liked to be involved in?

Yes ☐ No ☐

If yes, why didn't you participate?

APPENDIX A2 TWO SAMPLE T-TEST

Test for difference in household size

0 = households without migrants

1 = households with migrants

```
MIGR.          N      Mean      StDev    SE Mean
0            104      5,07       1,97       0,19
1             96      5,61       2,15       0,22

Difference = mu (0) - mu (1)
Estimate for difference:  -0,547
95% CI for difference: (-1,124; 0,030)
T-Test of difference = 0 (vs not =): T-Value = -1,87  P-Value = 0,063  DF = 192
```

Test for difference in education level of household head

0 = households without migrants

1 = households with migrants

```
Two-sample T for AGHH

MIGR.          N      Mean      StDev    SE Mean
0            104      51,2       14,0        1,4
1             96      53,9       15,6        1,6

Difference = mu (0) - mu (1)
Estimate for difference:  -2,72
95% CI for difference: (-6,87; 1,43)
T-Test of difference = 0 (vs not =): T-Value = -1,29  P-Value = 0,197  DF = 191
```

Test for differences on the size of cultivated land

0 = households without migrants

1 = households with migrants

```
Two-sample T for SLAND

MIGR.          N      Mean      StDev    SE Mean
0            104      6,92       7,45       0,73
1             96       9,7       16,1        1,6

Difference = mu (0) - mu (1)
Estimate for difference:  -2,81
95% CI for difference: (-6,37; 0,75)
T-Test of difference = 0 (vs not =): T-Value = -1,56  P-Value = 0,121  DF = 131
```

Test for differences in off-farm *in*come

0 = households without migrants

1 = households with migrants

```
Two-sample T for OFFinc/CU

MIGR.          N      Mean      StDev    SE Mean
0            104      7740       7527        738
```

```
1            96      4885      6244       637

Difference = mu (0) - mu (1)
Estimate for difference:  2854
95% CI for difference: (931; 4778)
T-Test of difference = 0 (vs not =): T-Value = 2,93  P-Value = 0,004  DF = 195
```

Test for differences in assets.

0 = households without migrants

1 = households with migrants

```
Two-sample T for ASSETS/CU

MIGR.        N      Mean     StDev   SE Mean
0          104     46537    100229      9828
1           96     80485    192311     19628

Difference = mu (0) - mu (1)
Estimate for difference:  -33948
95% CI for difference: (-77346; 9450)
T-Test of difference = 0 (vs not =): T-Value = -1,55  P-Value = 0,124  DF = 140
```

Test for differences in number of adults members

0 = households without migrants

1 = households with migrants

```
Two-sample T for ADS

MIGR.        N      Mean     StDev   SE Mean
0          104      3,03      1,28      0,13
1           96      3,45      1,46      0,15

Difference = mu (0) - mu (1)
Estimate for difference:  -0,419
95% CI for difference: (-0,804; -0,034)
T-Test of difference = 0 (vs not =): T-Value = -2,15  P-Value = 0,033  DF = 189
```

Test for differences in credit obtained.

0 = households without migrants

1 = households with migrants

```
Two-sample T for credit/CU

MIGR.        N      Mean     StDev   SE Mean
0          104      1621      4470       438
1           96      6845     14146      1444

Difference = mu (0) - mu (1)
Estimate for difference:  -5224
95% CI for difference: (-8213; -2234)
T-Test of difference = 0 (vs not =): T-Value = -3,46  P-Value = 0,001  DF = 112
```

Test for differences in education of household head


```
Two-sample T for EDHH

MIGR.        N      Mean     StDev   SE Mean
0          104      1,70      2,84      0,28
1           96      1,69      2,60      0,27

Difference = mu (0) - mu (1)
Estimate for difference:  0,014
95% CI for difference: (-0,745; 0,773)
T-Test of difference = 0 (vs not =): T-Value = 0,04  P-Value = 0,970  DF = 197
```

Test for difference in Labour units

0 = households without migrants

1 = households with migrants

```
Two-sample T for LU

MIGR.        N      Mean     StDev   SE Mean
0          104      2,47      1,09      0,11
1           96      2,64      1,16      0,12

Difference = mu (0) - mu (1)
Estimate for difference:  -0,166
95% CI for difference: (-0,482; 0,149)
T-Test of difference = 0 (vs not =): T-Value = -1,04  P-Value = 0,299  DF = 193
```

Test for differences in consumer units.

0 = households without migrants

1 = households with migrants

```
Two-sample T for CU

MIGR.        N      Mean     StDev   SE Mean
0          104      3,79      1,42      0,14
1           96      4,17      1,51      0,15

Difference = mu (0) - mu (1)
Estimate for difference:  -0,379
95% CI for difference: (-0,788; 0,029)
T-Test of difference = 0 (vs not =): T-Value = -1,83  P-Value = 0,069  DF = 194
```

Test for difference in worker-consumption ratio.

0 = households without migrants

1 = households with migrants

```
Two-sample T for w/c

MIGR.        N      Mean     StDev   SE Mean
0          104     0,661     0,156     0,015
1           96     0,631     0,154     0,016

Difference = mu (0) - mu (1)
Estimate for difference:  0,0306
95% CI for difference: (-0,0125; 0,0738)
T-Test of difference = 0 (vs not =): T-Value = 1,40  P-Value = 0,163  DF = 197
```

Test for differences in consumption worker ratio

0 = households without migrants

1 = households with migrants

Two-sample T for C/W

MIGR.	N	Mean	StDev	SE Mean
0	104	1,603	0,416	0,041
1	96	1,727	0,751	0,077

Difference = mu (0) - mu (1)
Estimate for difference: -0,1234
95% CI for difference: (-0,2950; 0,0482)
T-Test of difference = 0 (vs not =): T-Value = -1,42 P-Value = 0,158 DF = 145

Test for differences in household head gender

0 = households without migrants

1 = households with migrants

Two-sample T for HHSEX

MIGR.	N	Mean	StDev	SE Mean
0	104	0,154	0,363	0,036
1	96	0,323	0,470	0,048

Difference = mu (0) - mu (1)
Estimate for difference: -0,1691
95% CI for difference: (-0,2869; -0,0512)
T-Test of difference = 0 (vs not =): T-Value = -2,83 **P-Value = 0,005** DF = 178

Test for differences in farming experience

0 = households without migrants

1 = households with migrants

Two-sample T for FARMEXP

MIGR.	N	Mean	StDev	SE Mean
0	104	30,3	16,0	1,6
1	96	32,7	17,1	1,7

Difference = mu (0) - mu (1)
Estimate for difference: -2,39
95% CI for difference: (-7,02; 2,24)
T-Test of difference = 0 (vs not =): T-Value = -1,02 **P-Value = 0,309** DF = 193

Test for differences in land conservation expenditure.

0 = households without migrants

1 = households with migrants

Two-sample T for LANDCONS.

MIGR.	N	Mean	StDev	SE Mean
0	104	2749	3940	386
1	96	5252	9814	1002

Difference = mu (0) - mu (1)
Estimate for difference: -2503
95% CI for difference: (-4628; -378)
T-Test of difference = 0 (vs not =): T-Value = -2,33 **P-Value = 0,021** DF = 122

Test for differences in food expenditure

0 = households without migrants

1 = households with migrants

Two-sample T for FOODEX

MIGR.	N	Mean	StDev	SE Mean
0	104	23603	19306	1893
1	96	23362	15222	1554

Difference = mu (0) - mu (1)
Estimate for difference: 240
95% CI for difference: (-4590; 5071)
T-Test of difference = 0 (vs not =): T-Value = 0,10 **P-Value = 0,922** DF = 193

Test for differences in non-food expenditure

0 = households without migrants

1 = households with migrants

Two-sample T for NONFEX

MIGR.	N	Mean	StDev	SE Mean
0	104	21921	16526	1620
1	96	30795	34249	3496

Difference = mu (0) - mu (1)
Estimate for difference: -8873
95% CI for difference: (-16494; -1253)
T-Test of difference = 0 (vs not =): T-Value = -2,30 **P-Value = 0,023** DF = 134

Test for differences in animal standard units

0 = households without migrants

1 = households with migrants

Two-sample T for SAU

MIGR.	N	Mean	StDev	SE Mean
0	104	3,27	2,80	0,27
1	96	3,74	3,08	0,31

Difference = mu (0) - mu (1)
Estimate for difference: -0,465
95% CI for difference: (-1,287; 0,358)
T-Test of difference = 0 (vs not =): T-Value = -1,11 **P-Value = 0,267** DF = 192

Test for differences in number of male worker

0 = households without migrants

1 = households with migrants

Two-sample T for MAL

MIGR.	N	Mean	StDev	SE Mean
0	104	1,433	0,760	0,075
1	96	1,479	0,917	0,094

Difference = mu (0) - mu (1)
Estimate for difference: -0,046

95% CI for difference: (-0,283; 0,190)
T-Test of difference = 0 (vs not =): T-Value = -0,39 **P-Value = 0,698** DF = 185

Test for differences in number of female worker

0 = households without migrants

1 = households with migrants

Two-sample T for FEL

MIGR.	N	Mean	StDev	SE Mean
0	104	1,596	0,887	0,087
1	96	1,969	0,945	0,096

Difference = mu (0) - mu (1)
Estimate for difference: -0,373
95% CI for difference: (-0,629; -0,116)
T-Test of difference = 0 (vs not =): T-Value = -2,87 **P-Value = 0,005** DF = 193

Test for differences in agricultural costs

0 = households without migrants

1 = households with migrants

Two-sample T for agricost

MIGR.	N	Mean	StDev	SE Mean
0	104	2841	5458	535
1	96	4158	5895	602

Difference = mu (0) - mu (1)
Estimate for difference: -1317
95% CI for difference: (-2905; 271)
T-Test of difference = 0 (vs not =): T-Value = -1,64 **P-Value = 0,103** DF = 193

Test for differences in total expenditure

0 = households without migrants

1 = households with migrants

Two-sample T for total exp

MIGR.	N	Mean	StDev	SE Mean
0	104	51114	32386	3176
1	96	63566	44675	4560

Difference = mu (0) - mu (1)
Estimate for difference: -12453
95% CI for difference: (-23421; -1485)
T-Test of difference = 0 (vs not =): T-Value = -2,24 P-Value = 0,026 DF = 172

Test for differences in total income (excluding remittances).

0 = households without migrants

1 = households with migrants

Two-sample T for totalicn

MIGR.	N	Mean	StDev	SE Mean
0	104	15788	10042	985
1	96	13564	10335	1055

Difference = mu (0) - mu (1)
Estimate for difference: 2224
95% CI for difference: (-622; 5070)
T-Test of difference = 0 (vs not =): T-Value = 1,54 **P-Value = 0,125** DF = 195

Test for differences in total income (including remittances)

0 = households without migrants

1 = households with migrants

Two-sample T for totalincwr

MIGR.	N	Mean	StDev	SE Mean
0	104	15788	10042	985
1	96	21161	15439	1576

Difference = mu (0) - mu (1)
Estimate for difference: -5373
95% CI for difference: (-9042; -1703)
T-Test of difference = 0 (vs not =): T-Value = -2,89 **P-Value = 0,004** DF = 161

APPENDIX A3 Econometrics Estimation

Probit Model

```
|_sample 1 200
 |_read (c:\migration1.txt) mig caste hhsize age sland offy  ads credit educ/rewind
    9 VARIABLES AND      200 OBSERVATIONS STARTING AT OBS       1


 |_stat mig   age sland offy ads credit educ/pcor
```

NAME	N	MEAN	ST. DEV	VARIANCE	MINIMUM	MAXIMUM
MIG	200	0.47500	0.50063	0.25063	0.0000	1.0000
AGE	200	52.460	14.817	219.55	25.000	90.000
SLAND	200	8.2658	12.441	154.79	0.0000	146.00
OFFY	200	6369.7	7069.4	0.49977E+08	0.0000	36923.
ADS	200	62832.	0.15213E+06	0.23144E+11	0.0000	0.12195E+07
CREDIT	200	3.2300	1.3844	1.9167	1.0000	8.0000
EDUC	200	4128.3	10617.	0.11271E+09	0.0000	87180.

CORRELATION MATRIX OF VARIABLES - 200 OBSERVATIONS

MIG	1.0000				
AGE	0.10317	1.0000			
SLAND	0.11671	0.10724	1.0000		
OFFY	-0.21295	0.10105	-0.90728E-01	1.0000	
ADS	0.11323	0.17534	0.32220	0.23304	1.0000
CREDIT	0.15334	0.26012	0.20401	0.69884E-01	0.15304
	1.0000				
EDUC	0.25045	-0.95849E-02	-0.19881E-01	-0.46527E-01	0.64563E-01
	0.32389E-01	1.0000			
	MIG	AGE	SLAND	OFFY	ADS
	CREDIT	EDUC			

```
|_probit mig   age sland offy ads  credit educ/IMR=MIGIMR PITER=0

REQUIRED MEMORY IS PAR=      19 CURRENT PAR=      500
FOR MAXIMUM EFFICIENCY USE AT LEAST PAR=      32
PROBIT ANALYSIS     DEPENDENT VARIABLE =MIG       CHOICES =   2
     200. TOTAL OBSERVATIONS
      95. OBSERVATIONS AT ONE
     105. OBSERVATIONS AT ZERO
  25 MAXIMUM ITERATIONS
CONVERGENCE TOLERANCE =0.00100

LOG OF LIKELIHOOD WITH CONSTANT TERM ONLY =     -138.38
BINOMIAL  ESTIMATE = 0.4750
ITERATION  4      LOG OF LIKELIHOOD FUNCTION =    -119.99

ITERATION  4 ESTIMATES
 0.96232E-02 0.63714E-02-0.53205E-04 0.12295E-05 0.11166      0.47131E-04
-0.88299

                                ASYMPTOTIC                          WEIGHTED
VARIABLE     ESTIMATED          STANDARD      T-RATIO    ELASTICITY    AGGREGATE
  NAME      COEFFICIENT           ERROR                   AT MEANS     ELASTICITY
AGE           0.96232E-02   0.68405E-02    1.4068       0.41311       0.36375
SLAND         0.63714E-02   0.11918E-01   0.53460       0.43096E-01   0.35749E-01
OFFY         -0.53205E-04   0.15599E-04   -3.4107      -0.27732      -0.21852
ADS           0.12295E-05   0.83179E-06    1.4781       0.63215E-01   0.44597E-01
CREDIT        0.11166       0.73631E-01    1.5165       0.29513       0.26088
EDUC          0.47131E-04   0.15318E-04    3.0768       0.15922       0.84025E-01
CONSTANT     -0.88299       0.39141       -2.2559      -0.72256      -0.63596


LOG-LIKELIHOOD FUNCTION =  -119.99
LOG-LIKELIHOOD(0)  =    -138.38
LIKELIHOOD RATIO TEST  =     36.7750    WITH      6  D.F.

MADDALA R-SQUARE                0.1680
CRAGG-UHLER R-SQUARE            0.22413
MCFADDEN R-SQUARE               0.13288
     ADJUSTED FOR DEGREES OF FREEDOM          0.10592
     APPROXIMATELY F-DISTRIBUTED     0.17878      WITH         6  AND      7  D.F.
CHOW R-SQUARE                   0.16548

         PREDICTION SUCCESS TABLE
                    ACTUAL
                0              1

          0     78.            42.
PREDICTED 1     27.            53.

NUMBER OF RIGHT PREDICTIONS =          131.
PERCENTAGE OF RIGHT PREDICTIONS =     0.65500

EXPECTED OBSERVATIONS AT 0  =         104.8   OBSERVED =     105.0
EXPECTED OBSERVATIONS AT 1  =          95.2   OBSERVED =      95.0
SUM OF SQUARED "RESIDUALS" =           41.622
WEIGHTED SUM OF SQUARED "RESIDUALS" =      198.60

HENSHER-JOHNSON PREDICTION SUCCESS TABLE
                                                  OBSERVED     OBSERVED
                    PREDICTED  CHOICE               COUNT        SHARE
        ACTUAL          0          1
          0           63.193     41.807          105.000       0.525
          1           41.638     53.362           95.000       0.475

PREDICTED COUNT      104.831     95.169          200.000       1.000
PREDICTED SHARE        0.524      0.476            1.000
PROP. SUCCESSFUL       0.603      0.561            0.583
```



```
SUCCESS INDEX            0.079       0.085       0.082
PROPORTIONAL ERROR      -0.001       0.001
NORMALIZED SUCCESS INDEX                         0.164
|_end

..INPUT FILE COMPLETED..TYPE A NEW COMMAND OR TYPE: STOP
TYPE COMMAND
```

3-Stage regression model

```
|_SYSTEM 3 CREDIT OFFINC AGE HHSIZE EDU ASSETS LAND   PLOT ADULTS DEPEND CASTEDUM
/DN
 |_OLS MIGRANTS  CREDIT OFFINC AGE HHSIZE EDU ASSETS LAND  CASTEDUM
 |_OLS REMINC MIGRANTS LAND ASSETS DEPEND
 |_OLS OUTPUT MIGRANTS REMINC AGE EDU ASSETS  PLOT ADULTS

 THREE STAGE LEAST SQUARES--     3 EQUATIONS
  11 EXOGENOUS VARIABLES
   3 POSSIBLE ENDOGENOUS VARIABLES
  19 RIGHT-HAND SIDE VARIABLES IN SYSTEM
 MAX ITERATIONS =        1         CONVERGENCE TOLERANCE =    0.10000E-02
      106 OBSERVATIONS
 DN OPTION IN EFFECT - DIVISOR IS N

 ITERATION      0 COEFFICIENTS
   0.49911E-05 -0.50601E-05 -0.14187E-02  0.10687      -0.22364E-01  0.19832E-05
   0.27436E-01  0.83469E-01   18889.       -68.166       0.18078E-02  0.16634E-04
    2.8910      -0.57465E-04  0.13335E-01  0.33569       0.11163E-04 -0.55847E-06
   0.97553

 ITERATION     0 SIGMA
   0.81459
   -4337.6       0.20883E+10
   -1.8289        79048.        61.712

 BREUSCH-PAGAN LM TEST FOR DIAGONAL COVARIANCE MATRIX
    CHI-SQUARE =     13.365      WITH     3 DEGREES OF FREEDOM
 LOG OF DETERMINANT OF SIGMA=    25.256

 ITERATION     1 SIGMA INVERSE
    1.3186
   0.13238E-05  0.50458E-09
   0.37381E-01 -0.60709E-06  0.18090E-01

 ITERATION      1 COEFFICIENTS
   0.42533E-05 -0.51582E-05 -0.12840E-02  0.12198      -0.21857E-01  0.20128E-05
   0.24547E-01  0.86183E-01   19699.       -70.587      -0.96247E-04  0.16825E-04
    4.0075      -0.90803E-04  0.26259E-01  0.37182       0.10277E-04 -0.10785E-05
   0.96989

 ITERATION     1 SIGMA
   0.81614
   -5570.0       0.20949E+10
   -2.3983       0.15350E+06    71.566
 LOG OF DETERMINANT OF SIGMA=    25.255

 SYSTEM R-SQUARE =   0.8372 ... CHI-SQUARE =    192.42      WITH  19 D.F.

 VARIABLE        COEFFICIENT     ST.ERROR        T-RATIO
 CREDIT       0.42533E-05    0.23843E-05      1.7839
 OFFINC      -0.51582E-05    0.35243E-05     -1.4636
 AGE         -0.12840E-02    0.12002E-02     -1.0698
 HHSIZE       0.12198        0.51800E-01      2.3549
 EDU         -0.21857E-01    0.33776E-01     -0.64711
 ASSETS       0.20128E-05    0.54684E-06      3.6807
 LAND         0.24547E-01    0.22454E-01      1.0932
```

```
CASTEDUM     0.86183E-01    0.37048E-01     2.3262
MIGRANTS      19699.         11816.         1.6671
LAND         -70.587         50.080        -1.4095
ASSETS      -0.96247E-04    0.35704E-01   -0.26957E-02
DEPEND       0.16825E-04    0.16198E-04     1.0387
MIGRANTS      4.0075         2.2684         1.7667
REMINC      -0.90803E-04    0.40647E-04    -2.2339
AGE          0.26259E-01    0.52170E-01     0.50333
EDU          0.37182        0.30347         1.2252
ASSETS       0.10277E-04    0.61897E-05     1.6603
PLOT        -0.10785E-05    0.20627E-05    -0.52285
ADULTS       0.96989        0.73858E-01     13.132
 EQUATION  1 OF  3 EQUATIONS
DEPENDENT VARIABLE = MIGRANTS            106 OBSERVATIONS

 R-SQUARE =   0.3632
VARIANCE OF THE ESTIMATE-SIGMA**2 =  0.81614
STANDARD ERROR OF THE ESTIMATE-SIGMA =  0.90340
SUM OF SQUARED ERRORS-SSE=   86.511
MEAN OF DEPENDENT VARIABLE =  0.89623


                              ASYMPTOTIC
VARIABLE   ESTIMATED  STANDARD   T-RATIO        PARTIAL STANDARDIZED ELASTICITY
  NAME    COEFFICIENT   ERROR    --------   P-VALUE CORR. COEFFICIENT  AT MEANS
CREDIT    0.42533E-05 0.2384E-05   1.784     0.074 0.178     0.1369     0.0811
OFFINC   -0.51582E-05 0.3524E-05  -1.464     0.143-0.147    -0.1174    -0.1546
AGE      -0.12840E-02 0.1200E-02  -1.070     0.285-0.108    -2.9127    -0.4072
HHSIZE    0.12198     0.5180E-01   2.355     0.019 0.233     0.3747     0.7961
EDU      -0.21857E-01 0.3378E-01 -0.6471     0.518-0.066    -0.0515    -0.0451
ASSETS    0.20128E-05 0.5468E-06   3.681     0.000 0.350     0.3252     0.1869
LAND      0.24547E-01 0.2245E-01   1.093     0.274 0.110     2.9546     0.4220
CASTEDUM  0.86183E-01 0.3705E-01   2.326     0.020 0.230     0.1815     0.3983
CONSTANT -0.24861     0.3494      -0.7116    0.477-0.072     0.0000    -0.2774
 EQUATION  2 OF  3 EQUATIONS
DEPENDENT VARIABLE = REMINC              106 OBSERVATIONS

 R-SQUARE =   0.1317
VARIANCE OF THE ESTIMATE-SIGMA**2 =  0.20949E+10
STANDARD ERROR OF THE ESTIMATE-SIGMA =   45770.
SUM OF SQUARED ERRORS-SSE=  0.22206E+12
MEAN OF DEPENDENT VARIABLE =   22600.


                              ASYMPTOTIC
VARIABLE   ESTIMATED  STANDARD   T-RATIO        PARTIAL STANDARDIZED ELASTICITY
  NAME    COEFFICIENT   ERROR    --------   P-VALUE CORR. COEFFICIENT  AT MEANS
MIGRANTS   19699.     0.1182E+05   1.667     0.095 0.164     0.4540     0.7812
LAND       -70.587     50.08      -1.409     0.159-0.139    -0.1958    -0.0481
ASSETS   -0.96247E-04 0.3570E-01 -0.2696E-02 0.998 0.000    -0.0004    -0.0004
DEPEND    0.16825E-04 0.1620E-04   1.039     0.299 0.103     0.0978     0.3104
CONSTANT  -973.45     0.1003E+05 -0.9707E-01 0.923-0.010     0.0000    -0.0431
 EQUATION  3 OF  3 EQUATIONS
DEPENDENT VARIABLE = OUTPUT              106 OBSERVATIONS

 R-SQUARE =   0.6648
VARIANCE OF THE ESTIMATE-SIGMA**2 =   71.566
STANDARD ERROR OF THE ESTIMATE-SIGMA =   8.4596
SUM OF SQUARED ERRORS-SSE=   7586.0
MEAN OF DEPENDENT VARIABLE =   12.349


                              ASYMPTOTIC
VARIABLE   ESTIMATED  STANDARD   T-RATIO        PARTIAL STANDARDIZED ELASTICITY
  NAME    COEFFICIENT   ERROR    --------   P-VALUE CORR. COEFFICIENT  AT MEANS
MIGRANTS   4.0075      2.268       1.767     0.077 0.176     0.3105     0.2908
REMINC   -0.90803E-04 0.4065E-04  -2.234     0.025-0.220    -0.3053    -0.1662
AGE       0.26259E-01 0.5217E-01   0.5033    0.615 0.051     4.6155     0.6044
```



```
EDU          0.37182      0.3035        1.225      0.220 0.123      0.0679      0.0557
ASSETS       0.10277E-04  0.6190E-05    1.660      0.097 0.165      0.1287      0.0693
PLOT        -0.10785E-05  0.2063E-05   -0.5229     0.601-0.053     -4.7900     -0.5531
ADULTS       0.96989      0.7386E-01    13.13      0.000 0.799      0.7435      0.5476
CONSTANT     1.8718       2.546        0.7353     0.462 0.074      0.0000      0.1516
|_END

 ..INPUT FILE COMPLETED..TYPE A NEW COMMAND OR TYPE: STOP
TYPE COMMAND
```

Regression models for consumption analysis

Linear regression model

```
|_READ (A:\EXP.txt) EXP MIGRANTS CU WC SLAND CREDIT AGE EDU SAU /REWIND
    9 VARIABLES AND       200 OBSERVATIONS STARTING AT OBS        1

|_STAT EXP MIGRANTS CU WC SLAND CREDIT AGE EDU SAU /PCOR
NAME         N     MEAN         ST. DEV      VARIANCE      MINIMUM       MAXIMUM
EXP          200    15865.       14410.      0.20766E+09    2742.8      0.14938E+06
MIGRANTS     200   0.74500       1.0370       1.0754        0.0000        4.0000
CU           200    3.9697       1.4684       2.1562       0.78000        8.7750
WC           200   0.64662      0.15516      0.24075E-01   0.12821        1.0256
SLAND        200    2.1669       3.3948        11.525       0.0000        42.628
CREDIT       200    4128.3       10617.      0.11271E+09    0.0000        87180.
AGE          200    52.460       14.817        219.55       25.000        90.000
EDU          200    1.6950       2.7220        7.4090       0.0000        14.000
SAU          200   0.23500      0.42506       0.18068       0.0000        1.0000

 CORRELATION MATRIX OF VARIABLES -       200 OBSERVATIONS


EXP          1.0000
MIGRANTS    0.31042       1.0000
CU         -0.27967      0.55240E-01    1.0000
WC          0.11388      0.32688E-01 -0.71748E-01    1.0000
SLAND       0.23097      0.17345      -0.67759E-01  0.17947E-01    1.0000
CREDIT      0.99373E-01  0.28277      -0.57456E-01  0.93952E-01 -0.55169E-02
             1.0000
AGE         0.84195E-01  0.15092       0.27702E-01  0.63665E-02  0.11325
           -0.95849E-02   1.0000
EDU         0.58457E-01 -0.33033E-01   0.37571E-01 -0.64963E-01  0.52174E-01
           -0.31094E-03 -0.41689        1.0000
SAU         0.88166E-01  0.17083      -0.11779      -0.13647      -0.19336E-01
           -0.50985E-01 -0.13261E-01 -0.20268        1.0000
               EXP          MIGRANTS      CU            WC            SLAND
               CREDIT       AGE           EDU           SAU

|_OLS EXP MIGRANTS CU WC SLAND CREDIT  AGE EDU SAU /RSTAT LM GF

REQUIRED MEMORY IS PAR=       33 CURRENT PAR=      500
 OLS ESTIMATION
     200 OBSERVATIONS     DEPENDENT VARIABLE = EXP
...NOTE..SAMPLE RANGE SET TO:       1,    200

 R-SQUARE =   0.2285     R-SQUARE ADJUSTED =   0.1962
VARIANCE OF THE ESTIMATE-SIGMA**2 =  0.16692E+09
STANDARD ERROR OF THE ESTIMATE-SIGMA =   12920.
SUM OF SQUARED ERRORS-SSE=  0.31882E+11
MEAN OF DEPENDENT VARIABLE =   15865.
LOG OF THE LIKELIHOOD FUNCTION = -2172.49


VARIABLE   ESTIMATED  STANDARD    T-RATIO        PARTIAL STANDARDIZED ELASTICITY
  NAME    COEFFICIENT   ERROR     191 DF    P-VALUE CORR. COEFFICIENT  AT MEANS
MIGRANTS   3898.3       975.9      3.995     0.000 0.278     0.2805     0.1831
CU        -2742.8       638.0     -4.299     0.000-0.297    -0.2795    -0.6863
```

```
WC          8931.2       6042.        1.478      0.141 0.106      0.0962      0.3640
SLAND       622.96       278.4        2.238      0.026 0.160      0.1468      0.0851
CREDIT   -0.12183E-02 0.9141E-01 -0.1333E-01 0.989-0.001     -0.0009     -0.0003
AGE         81.424       70.23        1.159      0.248 0.084      0.0837      0.2692
EDU         644.02       385.8        1.669      0.097 0.120      0.1216      0.0688
SAU         1661.3       2322.       0.7153      0.475 0.052      0.0490      0.0246
CONSTANT    10975.       6530.        1.681      0.094 0.121      0.0000      0.6918

DURBIN-WATSON = 1.9132     VON NEUMANN RATIO = 1.9228     RHO =  0.04178
RESIDUAL SUM =  0.10859E-08  RESIDUAL VARIANCE =  0.16692E+09
SUM OF ABSOLUTE ERRORS=  0.15910E+07
R-SQUARE BETWEEN OBSERVED AND PREDICTED = 0.2285
RUNS TEST:   89 RUNS,   85 POS,    0 ZERO,  115 NEG  NORMAL STATISTIC = -1.4143
COEFFICIENT OF SKEWNESS =   3.8225 WITH STANDARD DEVIATION OF 0.1719
COEFFICIENT OF EXCESS KURTOSIS =  29.1418 WITH STANDARD DEVIATION OF 0.3422

JARQUE-BERA NORMALITY TEST- CHI-SQUARE(2 DF)= 7195.6644 P-VALUE= 0.000

     GOODNESS OF FIT TEST FOR NORMALITY OF RESIDUALS - 15 GROUPS
 OBSERVED   0.0   0.0   2.0   3.0   5.0 29.0 58.0 37.0 32.0 17.0   8.0   3.0   1.0   2.0
3.0
 EXPECTED   0.9   1.8   4.4   9.0 15.6 23.1 29.3 31.7 29.3 23.1 15.6   9.0   4.4   1.8
0.9
 CHI-SQUARE =   62.4994 WITH  4 DEGREES OF FREEDOM, P-VALUE= 0.000

 |_OLS EXP MIGRANTS CU WC SLAND CREDIT  AGE EDU SAU /  PCOR

 REQUIRED MEMORY IS PAR=      33 CURRENT PAR=     500
  OLS ESTIMATION
     200 OBSERVATIONS     DEPENDENT VARIABLE = EXP
 ...NOTE..SAMPLE RANGE SET TO:      1,    200

  R-SQUARE =    0.2285     R-SQUARE ADJUSTED =    0.1962
VARIANCE OF THE ESTIMATE-SIGMA**2 =  0.16692E+09
STANDARD ERROR OF THE ESTIMATE-SIGMA =   12920.
SUM OF SQUARED ERRORS-SSE=  0.31882E+11
MEAN OF DEPENDENT VARIABLE =   15865.
LOG OF THE LIKELIHOOD FUNCTION = -2172.49


VARIABLE   ESTIMATED  STANDARD   T-RATIO      PARTIAL STANDARDIZED ELASTICITY
  NAME    COEFFICIENT   ERROR    191 DF   P-VALUE CORR. COEFFICIENT  AT MEANS
MIGRANTS   3898.3      975.9      3.995     0.000 0.278     0.2805     0.1831
CU        -2742.8      638.0     -4.299     0.000-0.297    -0.2795    -0.6863
WC         8931.2      6042.      1.478     0.141 0.106     0.0962     0.3640
SLAND      622.96      278.4      2.238     0.026 0.160     0.1468     0.0851
CREDIT  -0.12183E-02 0.9141E-01 -0.1333E-01 0.989-0.001    -0.0009    -0.0003
AGE        81.424      70.23      1.159     0.248 0.084     0.0837     0.2692
EDU        644.02      385.8      1.669     0.097 0.120     0.1216     0.0688
SAU        1661.3      2322.     0.7153     0.475 0.052     0.0490     0.0246
CONSTANT   10975.      6530.      1.681     0.094 0.121     0.0000     0.6918

CORRELATION MATRIX OF COEFFICIENTS
MIGRANTS   1.0000
CU        -0.11425      1.0000
WC        -0.46949E-01  0.84923E-01   1.0000
SLAND     -0.17498      0.94344E-01 -0.12191E-01   1.0000
CREDIT    -0.31147      0.89198E-01 -0.63082E-01  0.64033E-01   1.0000

AGE       -0.16035     -0.23681E-01  0.46040E-01 -0.11988      0.58930E-01
           1.0000
EDU       -0.68988E-01 -0.18864E-01  0.10509     -0.98584E-01  0.26832E-01
           0.44415      1.0000
SAU       -0.22994      0.14460      0.16721      0.38399E-01  0.11425
           0.14187      0.24491      1.0000
CONSTANT   0.11182     -0.43660     -0.67164     -0.31594E-01 -0.71365E-01
          -0.61335     -0.41150     -0.32880      1.0000
              MIGRANTS     CU           WC           SLAND        CREDIT
```



```
             AGE          EDU          SAU          CONSTANT
|_DIAGNOS/HET

REQUIRED MEMORY IS PAR=      41 CURRENT PAR=     500
DEPENDENT VARIABLE = EXP            200 OBSERVATIONS
REGRESSION COEFFICIENTS
   3898.26117726      -2742.80928772       8931.21399747       622.959017063
 -0.121831369684E-02   81.4244718207       644.024967684       1661.28660257
   10975.4096588

HETEROSKEDASTICITY TESTS
                              CHI-SQUARE     D.F.   P-VALUE
                            TEST STATISTIC
E**2 ON YHAT:                      20.152      1     0.00001
E**2 ON YHAT**2:                   24.342      1     0.00000
E**2 ON LOG(YHAT**2):              11.092      1     0.00087
E**2 ON X (B-P-G) TEST:
         BASED ON R2:              31.002      8     0.00014
         BASED ON SSR:            471.057      8     0.00000
E**2 ON LAG(E**2) ARCH TEST:        0.078      1     0.78037
LOG(E**2) ON X (HARVEY) TEST:      38.524      8     0.00001
ABS(E) ON X (GLEJSER) TEST:        79.216      8     0.00000

|_OLS EXP MIGRANTS CU WC SLAND CREDIT AGE EDU SAU /HETCOV

REQUIRED MEMORY IS PAR=      33 CURRENT PAR=     500
 OLS ESTIMATION
     200 OBSERVATIONS     DEPENDENT VARIABLE = EXP
...NOTE..SAMPLE RANGE SET TO:      1,    200

USING HETEROSKEDASTICITY-CONSISTENT COVARIANCE MATRIX

 R-SQUARE =    0.2285     R-SQUARE ADJUSTED =    0.1962
VARIANCE OF THE ESTIMATE-SIGMA**2 =  0.16692E+09
STANDARD ERROR OF THE ESTIMATE-SIGMA =   12920.
SUM OF SQUARED ERRORS-SSE=  0.31882E+11
MEAN OF DEPENDENT VARIABLE =   15865.
LOG OF THE LIKELIHOOD FUNCTION = -2172.49


VARIABLE   ESTIMATED  STANDARD   T-RATIO      PARTIAL STANDARDIZED ELASTICITY
  NAME    COEFFICIENT   ERROR    191 DF   P-VALUE CORR. COEFFICIENT  AT MEANS
MIGRANTS   3898.3      2282.      1.708     0.089 0.123     0.2805     0.1831
CU        -2742.8      932.2     -2.942     0.004-0.208    -0.2795    -0.6863
WC         8931.2      7742.      1.154     0.250 0.083     0.0962     0.3640
SLAND      622.96      295.9      2.105     0.037 0.151     0.1468     0.0851
CREDIT  -0.12183E-02 0.1056     -0.1153E-01 0.991-0.001    -0.0009    -0.0003
AGE        81.424      66.65      1.222     0.223 0.088     0.0837     0.2692
EDU        644.02      513.3      1.255     0.211 0.090     0.1216     0.0688
SAU        1661.3      2119.     0.7840     0.434 0.057     0.0490     0.0246
CONSTANT   10975.      5075.      2.163     0.032 0.155     0.0000     0.6918
|_END
```

Log-log regression model

```
|_SAMPLE 1 200

|_READ (C:\EXPLOG.TXT) EXP MIGRANTS CU WC SLAND CREDIT AGE EDU SAU /REWIND
UNIT 88 IS NOW ASSIGNED TO: C:\EXPLOG.TXT
   9 VARIABLES AND      200 OBSERVATIONS STARTING AT OBS       1


|_OLS EXP MIGRANTS CU WC SLAND CREDIT AGE EDU SAU /RSTAT LM GF

REQUIRED MEMORY IS PAR=      34 CURRENT PAR=     500
 OLS ESTIMATION
     200 OBSERVATIONS     DEPENDENT VARIABLE = EXP
```

```
...NOTE..SAMPLE RANGE SET TO:       1,     200

 R-SQUARE =    0.1838     R-SQUARE ADJUSTED =    0.1497
VARIANCE OF THE ESTIMATE-SIGMA**2 =  0.34578
STANDARD ERROR OF THE ESTIMATE-SIGMA =  0.58803
SUM OF SQUARED ERRORS-SSE=    66.044
MEAN OF DEPENDENT VARIABLE =    9.4466
LOG OF THE LIKELIHOOD FUNCTION = -172.988


VARIABLE    ESTIMATED   STANDARD    T-RATIO        PARTIAL STANDARDIZED ELASTICITY
  NAME     COEFFICIENT    ERROR     191 DF   P-VALUE CORR. COEFFICIENT  AT MEANS
MIGRANTS  0.97424E-02 0.1209E-01  0.8058     0.421 0.058     0.0554    -0.0036
CU        -0.43454    0.9985E-01 -4.352     0.000-0.300    -0.2944    -0.0597
WC         0.31011    0.1611      1.925     0.056 0.138     0.1290    -0.0154
SLAND     -0.24910E-01 0.2195E-01 -1.135     0.258-0.082    -0.0758     0.0002
CREDIT     0.13347E-01 0.5733E-02  2.328     0.021 0.166     0.1587    -0.0008
AGE        0.41740     0.1529      2.731     0.007 0.194     0.1928     0.1731
EDU        0.36578E-01 0.1230E-01  2.975     0.003 0.210     0.2142    -0.0092
SAU        0.25939     0.1064      2.439     0.016 0.174     0.1729     0.0065
CONSTANT   8.5859      0.6197     13.86      0.000 0.708     0.0000     0.9089

DURBIN-WATSON = 1.8222    VON NEUMANN RATIO = 1.8313    RHO =  0.08688
RESIDUAL SUM =  0.15987E-12  RESIDUAL VARIANCE =  0.34578
SUM OF ABSOLUTE ERRORS=   90.296
R-SQUARE BETWEEN OBSERVED AND PREDICTED = 0.1838
RUNS TEST:   97 RUNS,   97 POS,    0 ZERO,  103 NEG  NORMAL STATISTIC = -0.5549
COEFFICIENT OF SKEWNESS =   0.1543 WITH STANDARD DEVIATION OF 0.1719
COEFFICIENT OF EXCESS KURTOSIS =   0.3648 WITH STANDARD DEVIATION OF 0.3422

JARQUE-BERA NORMALITY TEST- CHI-SQUARE(2 DF)=    1.6672 P-VALUE= 0.434

     GOODNESS OF FIT TEST FOR NORMALITY OF RESIDUALS - 15 GROUPS
 OBSERVED   1.0   2.0   4.0   7.0 12.0 24.0 36.0 29.0 34.0 24.0 13.0   5.0   6.0   1.0
2.0
 EXPECTED   0.9   1.8   4.4   9.0 15.6 23.1 29.3 31.7 29.3 23.1 15.6   9.0   4.4   1.8
0.9
 CHI-SQUARE =    8.2685 WITH  4 DEGREES OF FREEDOM, P-VALUE= 0.082

|_OLS EXP MIGRANTS CU WC SLAND CREDIT AGE EDU SAU /  PCOR

REQUIRED MEMORY IS PAR=      34 CURRENT PAR=     500
 OLS ESTIMATION
     200 OBSERVATIONS     DEPENDENT VARIABLE = EXP
...NOTE..SAMPLE RANGE SET TO:       1,     200
 R-SQUARE =    0.1838     R-SQUARE ADJUSTED =    0.1497
VARIANCE OF THE ESTIMATE-SIGMA**2 =  0.34578
STANDARD ERROR OF THE ESTIMATE-SIGMA =  0.58803
SUM OF SQUARED ERRORS-SSE=    66.044
MEAN OF DEPENDENT VARIABLE =    9.4466
LOG OF THE LIKELIHOOD FUNCTION = -172.988


VARIABLE    ESTIMATED   STANDARD    T-RATIO        PARTIAL STANDARDIZED ELASTICITY
  NAME     COEFFICIENT    ERROR     191 DF   P-VALUE CORR. COEFFICIENT  AT MEANS
MIGRANTS  0.97424E-02 0.1209E-01  0.8058     0.421 0.058     0.0554    -0.0036
CU        -0.43454    0.9985E-01 -4.352     0.000-0.300    -0.2944    -0.0597
WC         0.31011    0.1611      1.925     0.056 0.138     0.1290    -0.0154
SLAND     -0.24910E-01 0.2195E-01 -1.135     0.258-0.082    -0.0758     0.0002
CREDIT     0.13347E-01 0.5733E-02  2.328     0.021 0.166     0.1587    -0.0008
AGE        0.41740     0.1529      2.731     0.007 0.194     0.1928     0.1731
EDU        0.36578E-01 0.1230E-01  2.975     0.003 0.210     0.2142    -0.0092
SAU        0.25939     0.1064      2.439     0.016 0.174     0.1729     0.0065
CONSTANT   8.5859      0.6197     13.86      0.000 0.708     0.0000     0.9089

 CORRELATION MATRIX OF COEFFICIENTS
 MIGRANTS   1.0000
 CU        -0.11518       1.0000
```



```
WC         0.49644E-01  0.43040E-01   1.0000
SLAND      0.98271E-03 -0.34023E-01 -0.62095E-02   1.0000
CREDIT    -0.12581     -0.16194     -0.12727E-01 -0.88866E-02   1.0000

AGE       -0.14640     -0.23377E-01 -0.37862E-03 -0.13567      0.15806
           1.0000
EDU       -0.73462E-01  0.30994E-01  0.13235     -0.18026     -0.45217E-01
           0.30754       1.0000
SAU       -0.23551      0.15204      0.16870     -0.56312E-01  0.71699E-01
           0.12396       0.24534      1.0000
CONSTANT   0.24488     -0.19476      0.11574      0.13384     -0.12865
          -0.96161     -0.25610     -0.17560      1.0000
              MIGRANTS     CU           WC           SLAND         CREDIT
              AGE          EDU          SAU          CONSTANT
|_DIAGNOS/HET

REQUIRED MEMORY IS PAR=      43 CURRENT PAR=     500
DEPENDENT VARIABLE = EXP              200 OBSERVATIONS
REGRESSION COEFFICIENTS
  0.974235165612E-02 -0.434542127212       0.310110567145      -0.249096259280E-01
  0.133469848253E-01  0.417404272836       0.365784724177E-01   0.259387435294
   8.58594831556

HETEROSKEDASTICITY TESTS
                                CHI-SQUARE      D.F.    P-VALUE
                              TEST STATISTIC
E**2 ON YHAT:                        4.169       1     0.04116
E**2 ON YHAT**2:                     4.302       1     0.03807
E**2 ON LOG(YHAT**2):                4.034       1     0.04458
E**2 ON X (B-P-G) TEST:
          BASED ON R2:              13.512       8     0.09542
          BASED ON SSR:             15.714       8     0.04667
E**2 ON LAG(E**2) ARCH TEST:         1.248       1     0.26389
LOG(E**2) ON X (HARVEY) TEST:        9.804       8     0.27902
ABS(E) ON X (GLEJSER) TEST:         10.942       8     0.20502

|_OLS EXP MIGRANTS CU WC SLAND CREDIT AGE EDU SAU /HETCOV

REQUIRED MEMORY IS PAR=      34 CURRENT PAR=     500
 OLS ESTIMATION
     200 OBSERVATIONS     DEPENDENT VARIABLE = EXP
...NOTE..SAMPLE RANGE SET TO:       1,     200

USING HETEROSKEDASTICITY-CONSISTENT COVARIANCE MATRIX

 R-SQUARE =    0.1838     R-SQUARE ADJUSTED =    0.1497
VARIANCE OF THE ESTIMATE-SIGMA**2 =  0.34578
STANDARD ERROR OF THE ESTIMATE-SIGMA =  0.58803
SUM OF SQUARED ERRORS-SSE=    66.044
MEAN OF DEPENDENT VARIABLE =    9.4466
LOG OF THE LIKELIHOOD FUNCTION = -172.988


VARIABLE    ESTIMATED   STANDARD    T-RATIO        PARTIAL STANDARDIZED ELASTICITY
  NAME     COEFFICIENT    ERROR     191 DF   P-VALUE CORR. COEFFICIENT  AT MEANS
MIGRANTS  0.97424E-02 0.1319E-01  0.7387     0.461 0.053     0.0554    -0.0036
CU        -0.43454    0.1296     -3.352     0.001-0.236    -0.2944    -0.0597
WC         0.31011    0.2407      1.288     0.199 0.093     0.1290    -0.0154
SLAND     -0.24910E-01 0.2478E-01 -1.005     0.316-0.073    -0.0758     0.0002
CREDIT     0.13347E-01 0.5601E-02  2.383     0.018 0.170     0.1587    -0.0008
AGE        0.41740     0.1679      2.485     0.014 0.177     0.1928     0.1731
EDU        0.36578E-01 0.1216E-01  3.008     0.003 0.213     0.2142    -0.0092
SAU        0.25939     0.1076      2.410     0.017 0.172     0.1729     0.0065
CONSTANT   8.5859      0.7168     11.98      0.000 0.655     0.0000     0.9089
|_END
```

Regression models for income analysis

Linear regression model

```
|_SAMPLE 1 200
 |_READ (C:\EXP.txt) INCOME MIGRANTS CU WC SLAND CREDIT AGE EDU SAU /REWIND
UNIT 88 IS NOW ASSIGNED TO: C:\EXP.txt
   9 VARIABLES AND      200 OBSERVATIONS STARTING AT OBS        1

 |_STAT INCOME MIGRANTS CU WC SLAND CREDIT AGE EDU SAU /PCOR
NAME         N     MEAN        ST. DEV      VARIANCE     MINIMUM      MAXIMUM
INCOME       200    15051.      11831.     0.13998E+09   1571.0       81411.
MIGRANTS     200   0.74500      1.0370      1.0754        0.0000       4.0000
CU           200    3.9697      1.4684      2.1562       0.78000       8.7750
WC           200   0.64662     0.15516     0.24075E-01   0.12821       1.0256
SLAND        200    2.1669      3.3948      11.525        0.0000       42.628
CREDIT       200    4128.3      10617.     0.11271E+09    0.0000       87180.
AGE          200    52.460      14.817      219.55        25.000       90.000
EDU          200    1.6950      2.7220      7.4090        0.0000       14.000
SAU          200   0.23500     0.42506     0.18068        0.0000       1.0000

 CORRELATION MATRIX OF VARIABLES -      200 OBSERVATIONS


INCOME      1.0000
MIGRANTS   0.26381       1.0000
CU        -0.95969E-01  0.55240E-01   1.0000
WC         0.18120      0.32688E-01 -0.71748E-01   1.0000
SLAND      0.62040E-01  0.17345     -0.67759E-01  0.17947E-01   1.0000
CREDIT     0.83229E-02  0.28277     -0.57456E-01  0.93952E-01 -0.55169E-02
           1.0000
AGE        0.73958E-01  0.15092      0.27702E-01  0.63665E-02  0.11325
          -0.95849E-02   1.0000
EDU        0.10796     -0.33033E-01  0.37571E-01 -0.64963E-01  0.52174E-01
          -0.31094E-03 -0.41689       1.0000
SAU        0.55597E-02  0.17083     -0.11779     -0.13647     -0.19336E-01
          -0.50985E-01 -0.13261E-01 -0.20268       1.0000
              INCOME       MIGRANTS      CU            WC            SLAND
              CREDIT       AGE           EDU           SAU

|_OLS INCOME MIGRANTS CU WC SLAND CREDIT  AGE EDU SAU /RSTAT LM GF

REQUIRED MEMORY IS PAR=      34 CURRENT PAR=     500
 OLS ESTIMATION
     200 OBSERVATIONS     DEPENDENT VARIABLE = INCOME
...NOTE..SAMPLE RANGE SET TO:      1,    200

 R-SQUARE =    0.1448     R-SQUARE ADJUSTED =    0.1090
VARIANCE OF THE ESTIMATE-SIGMA**2 =  0.12472E+09
STANDARD ERROR OF THE ESTIMATE-SIGMA =    11168.
SUM OF SQUARED ERRORS-SSE=  0.23822E+11
MEAN OF DEPENDENT VARIABLE =    15051.
LOG OF THE LIKELIHOOD FUNCTION = -2143.34


VARIABLE    ESTIMATED  STANDARD    T-RATIO        PARTIAL STANDARDIZED ELASTICITY
  NAME     COEFFICIENT   ERROR      191 DF    P-VALUE CORR. COEFFICIENT  AT MEANS
MIGRANTS     3235.6       843.5       3.836      0.000 0.267     0.2836      0.1602
CU           -925.86      551.5       -1.679     0.095-0.121     -0.1149     -0.2442
WC            14047.      5222.       2.690      0.008 0.191     0.1842      0.6035
SLAND        -71.890      240.6      -0.2987     0.765-0.022     -0.0206     -0.0103
CREDIT     -0.10554     0.7902E-01    -1.336     0.183-0.096     -0.0947     -0.0289
AGE           87.843      60.71       1.447      0.150 0.104     0.1100      0.3062
EDU           786.06      333.5       2.357      0.019 0.168     0.1808      0.0885
SAU           44.596      2008.      0.2221E-01  0.982 0.002     0.0016      0.0007
CONSTANT      1873.4      5645.      0.3319      0.740 0.024     0.0000      0.1245

DURBIN-WATSON = 2.1173    VON NEUMANN RATIO = 2.1280    RHO = -0.05899
```



```
RESIDUAL SUM =  0.59299E-09  RESIDUAL VARIANCE =  0.12472E+09
SUM OF ABSOLUTE ERRORS=  0.16139E+07
R-SQUARE BETWEEN OBSERVED AND PREDICTED = 0.1448
RUNS TEST:   98 RUNS,   82 POS,    0 ZERO,  118 NEG  NORMAL STATISTIC =  0.0352
COEFFICIENT OF SKEWNESS =   1.5118 WITH STANDARD DEVIATION OF 0.1719
COEFFICIENT OF EXCESS KURTOSIS =   3.0885 WITH STANDARD DEVIATION OF 0.3422

JARQUE-BERA NORMALITY TEST- CHI-SQUARE(2 DF)=  149.1475 P-VALUE= 0.000

     GOODNESS OF FIT TEST FOR NORMALITY OF RESIDUALS - 15 GROUPS
OBSERVED   0.0   0.0   0.0   4.0 10.0 45.0 43.0 35.0 22.0 19.0   6.0   5.0   2.0   2.0
7.0
EXPECTED   0.9   1.8   4.4   9.0 15.6 23.1 29.3 31.7 29.3 23.1 15.6   9.0   4.4   1.8
0.9
CHI-SQUARE =   90.0043 WITH  4 DEGREES OF FREEDOM, P-VALUE= 0.000

 |_OLS INCOME MIGRANTS CU WC SLAND CREDIT  AGE EDU SAU /  PCOR

REQUIRED MEMORY IS PAR=      34 CURRENT PAR=     500
 OLS ESTIMATION
     200 OBSERVATIONS     DEPENDENT VARIABLE = INCOME
...NOTE..SAMPLE RANGE SET TO:      1,    200

 R-SQUARE =    0.1448     R-SQUARE ADJUSTED =    0.1090
VARIANCE OF THE ESTIMATE-SIGMA**2 =  0.12472E+09
STANDARD ERROR OF THE ESTIMATE-SIGMA =    11168.
SUM OF SQUARED ERRORS-SSE=  0.23822E+11
MEAN OF DEPENDENT VARIABLE =    15051.
LOG OF THE LIKELIHOOD FUNCTION = -2143.34


VARIABLE    ESTIMATED  STANDARD    T-RATIO        PARTIAL STANDARDIZED ELASTICITY
  NAME     COEFFICIENT   ERROR      191 DF    P-VALUE CORR. COEFFICIENT  AT MEANS
MIGRANTS     3235.6       843.5       3.836      0.000 0.267     0.2836      0.1602
CU           -925.86      551.5       -1.679     0.095-0.121     -0.1149     -0.2442
WC            14047.      5222.       2.690      0.008 0.191     0.1842      0.6035
SLAND        -71.890      240.6      -0.2987     0.765-0.022     -0.0206     -0.0103
CREDIT     -0.10554     0.7902E-01    -1.336     0.183-0.096     -0.0947     -0.0289
AGE           87.843      60.71       1.447      0.150 0.104     0.1100      0.3062
EDU           786.06      333.5       2.357      0.019 0.168     0.1808      0.0885
SAU           44.596      2008.      0.2221E-01  0.982 0.002     0.0016      0.0007
CONSTANT      1873.4      5645.      0.3319      0.740 0.024     0.0000      0.1245

CORRELATION MATRIX OF COEFFICIENTS
MIGRANTS    1.0000
CU         -0.11425       1.0000
WC         -0.46949E-01  0.84923E-01   1.0000
SLAND      -0.17498      0.94344E-01 -0.12191E-01   1.0000
CREDIT     -0.31147      0.89198E-01 -0.63082E-01  0.64033E-01   1.0000

AGE        -0.16035     -0.23681E-01  0.46040E-01 -0.11988      0.58930E-01
            1.0000
EDU        -0.68988E-01 -0.18864E-01  0.10509     -0.98584E-01  0.26832E-01
            0.44415      1.0000
SAU        -0.22994      0.14460      0.16721      0.38399E-01  0.11425
            0.14187      0.24491      1.0000
CONSTANT    0.11182     -0.43660     -0.67164     -0.31594E-01 -0.71365E-01
           -0.61335     -0.41150     -0.32880       1.0000
              MIGRANTS     CU           WC           SLAND        CREDIT
              AGE          EDU          SAU          CONSTANT
|_DIAGNOS/HET

REQUIRED MEMORY IS PAR=      43 CURRENT PAR=     500
DEPENDENT VARIABLE = INCOME          200 OBSERVATIONS
REGRESSION COEFFICIENTS
   3235.57676946      -925.862805635       14047.4851252       -71.8899801078
 -0.105536826169       87.8428754011       786.057595022       44.5958574248
   1873.39764423
```

```
HETEROSKEDASTICITY TESTS
                              CHI-SQUARE      D.F.    P-VALUE
                            TEST STATISTIC
E**2 ON YHAT:                      15.297       1     0.00009
E**2 ON YHAT**2:                   19.718       1     0.00001
E**2 ON LOG(YHAT**2):              11.971       1     0.00054
E**2 ON X (B-P-G) TEST:
          BASED ON R2:             16.948       8     0.03065
          BASED ON SSR:            42.218       8     0.00000
E**2 ON LAG(E**2) ARCH TEST:        0.669       1     0.41327
LOG(E**2) ON X (HARVEY) TEST:      14.763       8     0.06392
ABS(E) ON X (GLEJSER) TEST:        26.250       8     0.00095

|_OLS INCOME MIGRANTS CU WC SLAND CREDIT AGE EDU SAU /HETCOV

REQUIRED MEMORY IS PAR=      34 CURRENT PAR=     500
 OLS ESTIMATION
     200 OBSERVATIONS     DEPENDENT VARIABLE = INCOME
...NOTE..SAMPLE RANGE SET TO:      1,    200

USING HETEROSKEDASTICITY-CONSISTENT COVARIANCE MATRIX

 R-SQUARE =    0.1448     R-SQUARE ADJUSTED =    0.1090
VARIANCE OF THE ESTIMATE-SIGMA**2 =  0.12472E+09
STANDARD ERROR OF THE ESTIMATE-SIGMA =   11168.
SUM OF SQUARED ERRORS-SSE=  0.23822E+11
MEAN OF DEPENDENT VARIABLE =   15051.
LOG OF THE LIKELIHOOD FUNCTION = -2143.34


VARIABLE   ESTIMATED  STANDARD   T-RATIO       PARTIAL STANDARDIZED ELASTICITY
  NAME    COEFFICIENT   ERROR     191 DF   P-VALUE CORR. COEFFICIENT  AT MEANS
MIGRANTS   3235.6      1203.      2.690     0.008 0.191     0.2836     0.1602
CU        -925.86      606.2     -1.527     0.128-0.110    -0.1149    -0.2442
WC         14047.      5069.      2.771     0.006 0.197     0.1842     0.6035
SLAND     -71.890      266.9     -0.2694    0.788-0.019    -0.0206    -0.0103
CREDIT   -0.10554    0.9024E-01  -1.169     0.244-0.084    -0.0947    -0.0289
AGE        87.843      59.43      1.478     0.141 0.106     0.1100     0.3062
EDU        786.06      327.0      2.404     0.017 0.171     0.1808     0.0885
SAU        44.596      1796.     0.2484E-01 0.980 0.002     0.0016     0.0007
CONSTANT   1873.4      4880.      0.3839    0.702 0.028     0.0000     0.1245
|_END
```

Log- log regression model

```
|_SAMPLE 1 200
 |_READ (C:\INCLOG.TXT) INCOME MIGRANTS CU WC SLAND CREDIT AGE EDU SAU /REWIND
UNIT 88 IS NOW ASSIGNED TO: C:\INCLOG.TXT
   9 VARIABLES AND      200 OBSERVATIONS STARTING AT OBS       1


 |_OLS INCOME MIGRANTS CU WC SLAND CREDIT AGE EDU SAU /RSTAT LM GF

 REQUIRED MEMORY IS PAR=      33 CURRENT PAR=     500
  OLS ESTIMATION
      200 OBSERVATIONS     DEPENDENT VARIABLE = INCOME
 ...NOTE..SAMPLE RANGE SET TO:      1,    200

  R-SQUARE =    0.1285     R-SQUARE ADJUSTED =    0.0920
 VARIANCE OF THE ESTIMATE-SIGMA**2 =  0.50424
 STANDARD ERROR OF THE ESTIMATE-SIGMA =  0.71010
 SUM OF SQUARED ERRORS-SSE=    96.309
 MEAN OF DEPENDENT VARIABLE =    9.3498
 LOG OF THE LIKELIHOOD FUNCTION = -210.713
```



```
VARIABLE   ESTIMATED  STANDARD   T-RATIO       PARTIAL STANDARDIZED ELASTICITY
  NAME    COEFFICIENT   ERROR     191 DF   P-VALUE CORR. COEFFICIENT  AT MEANS
MIGRANTS   0.37234E-01 0.1460E-01   2.550     0.012 0.181     0.1813    -0.0139
CU        -0.25963     0.1206     -2.153     0.033-0.154    -0.1505    -0.0360
WC         0.59941     0.1946      3.081     0.002 0.218     0.2133    -0.0300
SLAND      0.10959E-01 0.2651E-01  0.4134    0.680 0.030     0.0285    -0.0001
CREDIT     0.82301E-03 0.6923E-02  0.1189    0.905 0.009     0.0084    -0.0001
AGE        0.34552     0.1846      1.872     0.063 0.134     0.1366     0.1448
EDU        0.37356E-01 0.1485E-01  2.516     0.013 0.179     0.1872    -0.0095
SAU        0.55267E-01 0.1284      0.4303    0.667 0.031     0.0315     0.0014
CONSTANT   8.8199      0.7483      11.79     0.000 0.649     0.0000     0.9433

DURBIN-WATSON = 2.0291    VON NEUMANN RATIO = 2.0393    RHO = -0.01565
RESIDUAL SUM = -0.24580E-12  RESIDUAL VARIANCE =  0.50424
SUM OF ABSOLUTE ERRORS=   116.51
R-SQUARE BETWEEN OBSERVED AND PREDICTED = 0.1285
RUNS TEST:  110 RUNS,  100 POS,    0 ZERO,  100 NEG  NORMAL STATISTIC =  1.2760
COEFFICIENT OF SKEWNESS =  -0.0676 WITH STANDARD DEVIATION OF 0.1719
COEFFICIENT OF EXCESS KURTOSIS =  -0.7134 WITH STANDARD DEVIATION OF 0.3422

JARQUE-BERA NORMALITY TEST- CHI-SQUARE(2 DF)=    4.5372 P-VALUE= 0.103

     GOODNESS OF FIT TEST FOR NORMALITY OF RESIDUALS - 15 GROUPS
 OBSERVED   0.0   1.0   5.0 13.0 13.0 24.0 29.0 25.0 32.0 27.0 14.0 10.0   7.0   0.0
0.0
 EXPECTED   0.9   1.8   4.4   9.0 15.6 23.1 29.3 31.7 29.3 23.1 15.6   9.0   4.4   1.8
0.9
 CHI-SQUARE =   10.5882 WITH  4 DEGREES OF FREEDOM, P-VALUE= 0.032

 |_OLS INCOME MIGRANTS CU WC SLAND CREDIT AGE EDU SAU /  PCOR

 REQUIRED MEMORY IS PAR=      33 CURRENT PAR=     500
  OLS ESTIMATION
      200 OBSERVATIONS     DEPENDENT VARIABLE = INCOME
 ...NOTE..SAMPLE RANGE SET TO:      1,    200
  R-SQUARE =    0.1285     R-SQUARE ADJUSTED =    0.0920
 VARIANCE OF THE ESTIMATE-SIGMA**2 =  0.50424
 STANDARD ERROR OF THE ESTIMATE-SIGMA =  0.71010
 SUM OF SQUARED ERRORS-SSE=    96.309
 MEAN OF DEPENDENT VARIABLE =    9.3498
 LOG OF THE LIKELIHOOD FUNCTION = -210.713


VARIABLE   ESTIMATED  STANDARD   T-RATIO       PARTIAL STANDARDIZED ELASTICITY
  NAME    COEFFICIENT   ERROR     191 DF   P-VALUE CORR. COEFFICIENT  AT MEANS
MIGRANTS   0.37234E-01 0.1460E-01   2.550     0.012 0.181     0.1813    -0.0139
CU        -0.25963     0.1206     -2.153     0.033-0.154    -0.1505    -0.0360
WC         0.59941     0.1946      3.081     0.002 0.218     0.2133    -0.0300
SLAND      0.10959E-01 0.2651E-01  0.4134    0.680 0.030     0.0285    -0.0001
CREDIT     0.82301E-03 0.6923E-02  0.1189    0.905 0.009     0.0084    -0.0001
AGE        0.34552     0.1846      1.872     0.063 0.134     0.1366     0.1448
EDU        0.37356E-01 0.1485E-01  2.516     0.013 0.179     0.1872    -0.0095
SAU        0.55267E-01 0.1284      0.4303    0.667 0.031     0.0315     0.0014
CONSTANT   8.8199      0.7483      11.79     0.000 0.649     0.0000     0.9433

CORRELATION MATRIX OF COEFFICIENTS
MIGRANTS   1.0000
CU        -0.11518       1.0000
WC         0.49644E-01  0.43040E-01   1.0000
SLAND      0.98271E-03 -0.34023E-01 -0.62095E-02   1.0000
CREDIT    -0.12581     -0.16194     -0.12727E-01 -0.88866E-02   1.0000

AGE       -0.14640     -0.23377E-01 -0.37862E-03 -0.13567      0.15806
            1.0000
EDU       -0.73462E-01  0.30994E-01  0.13235     -0.18026     -0.45217E-01
            0.30754       1.0000
SAU       -0.23551      0.15204      0.16870     -0.56312E-01  0.71699E-01
```

```
          0.12396       0.24534       1.0000
CONSTANT  0.24488      -0.19476       0.11574       0.13384      -0.12865
         -0.96161      -0.25610      -0.17560       1.0000
             MIGRANTS      CU            WC            SLAND         CREDIT
             AGE           EDU           SAU           CONSTANT
|_DIAGNOS/HET

REQUIRED MEMORY IS PAR=       41 CURRENT PAR=      500
DEPENDENT VARIABLE = INCOME          200 OBSERVATIONS
REGRESSION COEFFICIENTS
  0.372336040301E-01 -0.259632946045       0.599413013367       0.109592868385E-01
  0.823013446199E-03  0.345520006536       0.373564211881E-01   0.552667431295E-01
   8.81990220973

HETEROSKEDASTICITY TESTS
                           CHI-SQUARE     D.F.    P-VALUE
                         TEST STATISTIC
E**2 ON YHAT:                   0.528      1     0.46764
E**2 ON YHAT**2:                0.527      1     0.46803
E**2 ON LOG(YHAT**2):           0.530      1     0.46676
E**2 ON X (B-P-G) TEST:
          BASED ON R2:         17.901      8     0.02198
          BASED ON SSR:        11.407      8     0.17971
E**2 ON LAG(E**2) ARCH TEST:    0.078      1     0.77994
LOG(E**2) ON X (HARVEY) TEST:   8.126      8     0.42126
ABS(E) ON X (GLEJSER) TEST:    11.408      8     0.17963

|_OLS INCOME MIGRANTS CU WC SLAND CREDIT AGE EDU SAU /HETCOV

REQUIRED MEMORY IS PAR=       33 CURRENT PAR=      500
 OLS ESTIMATION
     200 OBSERVATIONS      DEPENDENT VARIABLE = INCOME
...NOTE..SAMPLE RANGE SET TO:       1,     200

USING HETEROSKEDASTICITY-CONSISTENT COVARIANCE MATRIX

 R-SQUARE =    0.1285      R-SQUARE ADJUSTED =    0.0920
VARIANCE OF THE ESTIMATE-SIGMA**2 =  0.50424
STANDARD ERROR OF THE ESTIMATE-SIGMA =  0.71010
SUM OF SQUARED ERRORS-SSE=    96.309
MEAN OF DEPENDENT VARIABLE =    9.3498
LOG OF THE LIKELIHOOD FUNCTION = -210.713


VARIABLE    ESTIMATED   STANDARD    T-RATIO        PARTIAL STANDARDIZED ELASTICITY
  NAME     COEFFICIENT    ERROR      191 DF    P-VALUE CORR. COEFFICIENT  AT MEANS
MIGRANTS  0.37234E-01 0.1475E-01    2.523      0.012 0.180      0.1813     -0.0139
CU        -0.25963      0.1231      -2.109      0.036-0.151     -0.1505     -0.0360
WC         0.59941      0.1889       3.174      0.002 0.224      0.2133     -0.0300
SLAND     0.10959E-01 0.3489E-01   0.3141      0.754 0.023      0.0285     -0.0001
CREDIT    0.82301E-03 0.6947E-02   0.1185      0.906 0.009      0.0084     -0.0001
AGE        0.34552      0.1893       1.826      0.069 0.131      0.1366      0.1448
EDU        0.37356E-01 0.1391E-01    2.686      0.008 0.191      0.1872     -0.0095
SAU        0.55267E-01 0.1295       0.4268      0.670 0.031      0.0315      0.0014
CONSTANT    8.8199      0.7892       11.18      0.000 0.629      0.0000      0.9433
|_END
```

APPENDIX A4 Consumer Units Conversion Factors

Age 0-5 years		age 6-10 years		age 11-15 years		age 16-20 years		age 21-55 years		above 55 years	
Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
0.38	0.38	0.66	0.59	0.8	0.69	0.95	0.72	0.98	0.78	0.95	0.78

APPENDIX A5 Labour units conversion Factors

Sex age and age category)	Condition*	Labour unit
>8 or >80	All	0
Children (8-15)	1	0.5
	2	0.25
Adults males (15-65)	1	1
	2	0.5
Old men (66-80)	1	0.5
	2	0.25
House wives (15-65)	2	0.5
House wives (66-80)	2	0.25
Adults females(15-65)	1	0.8
	2	0.4
Old women (66-80)	1	0.4
	2	0.2

* Condition refers to the amount of time a family member spends on household farming activities and off-farm activities.. Condition 1 assign to the family member who works as full time worker in the farm. Condition 2 assign to the members who are part time worker in the agricultural activities because they have other tasks to fulfill. These members of the families include students, housewives, farmers with social administrative responsibility, physical disable farmers and so on.

Source: Compiled by the researcher.