

## Livelihood Strategies and Income Level of People of Modi Watershed, Nepal

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### Abstract

The analysis of livelihood strategies and income level of the people of Modi Khola watershed is the main purpose of this study. The study result is based on sampling of 360 households from 12 selected communities of the Modi Khola watershed having 676.8 km<sup>2</sup> area and 75,000 populations. The people of Modi Khola area adopt diverse livelihood strategies such as farming including livestock raising, service in government and non-governmental agencies, business, tourism, industrial activities, migration, wage labor, fishing, forest product collection and others. Livelihood strategies vary by household and localities as a result of spatial variation in terms of availability of assets, people's capabilities for exploiting the assets and environment. Household members adopt one or more activities to meet their household needs. Spatial variation is found in income distribution too. Households adopting diverse strategies have higher income and more secure livelihoods as compared to the households adopting single or lesser number of activities.

**Key words:** Livelihoods, strategies, options, capabilities, combination, sustainable, environment, diversity.

### Introduction

Livelihoods are the means people use to support themselves, to survive, and to prosper. According to Chambers and Conway (1991) "a livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living". The definition of livelihood provided by Scoones (1998), UNDP (1999), and DFID (1999) are very much similar to Chambers and Conway. Hoeck (2001) states that livelihood is an outcome of how and why people organize to transform the environment to meet their needs through technology, labor, power, knowledge and social relations.

Livelihood comprises a complex and diverse set of economic, social and physical strategies. The households and individuals pursue livelihood strategies based on the combination of assets they own and command and opportunities and restrictions created by the institutional environment (Pain and Lautze, 2002). These strategies are realized through the activities, assets, and entitlements by which individuals make a living (UNDP, 1999). Rural livelihood comprises one or more often several activities, which variously provide food, cash, and other goods to satisfy a wide variety of human needs (Chambers and Conway, 1991).

Enormous diversity of livelihood strategies exists (Bishop, 1990; Zoomers, 1999; Bhurtel, 2000; Dahal, 2001; Subedi & Pandey, 2002; Sullivan et al., 2004) at every

level within geographic areas, across sectors, within households and over time as a result of variation in environment, socio-economic and cultural factors. However, within any particular environment many choices and options are normally open to the people; the actual livelihood pattern is determined by the peoples' evaluation of the possibilities offered by these physical as well as socio-economic and cultural environments (Knowles and Wareing, 1996). Livelihoods are also shaped by political system within which they operate (Hoeck, 2001). Many livelihoods are largely predetermined by accident of birth by their parent's occupation and some are less predetermined and improvise through education and migration (Chambers and Conway, 1991). Caste is one of the factors that also determine livelihood strategies (Ham, 1995). The households in poor communities are primarily concerned with achieving food security and income in order to meet their basic needs, but the households and individual objectives go beyond physical needs. This might include the concept of 'well-being' and embraces a much wider set of social values, including freedom, choice of self-esteem (Pain and Lautze, 2002). The purpose of this paper is to analyze the livelihoods and income level of the mountain people especially of Modi Khola watershed, Nepal. The paper is organized into three sections. The first section presents general introduction along with study approach and methodology. The subsequent second section presents discussion and findings of the study and the final section presents concluding remarks.

### **Approach and Methods**

The study is mainly based on primary data collected through household survey and group discussion during September-October, 2002. For the purpose of data collection the Modi Khola watershed was divided into two sub-regions- the upstream sub-region and downstream sub-region, on the basis of water regime. The dam site of the Modi Hydropower Project was considered as the dividing line. All the VDCs lying below this limit were considered as part of the downstream sub-region and those lying upstream from this point as part of the upstream sub-region. Each sub-region was further sub-divided into different zones on the basis of altitude at a range of 1000 meters interval. The downstream sub-region constitutes three zones- i) upper zone (above 2000 m), ii) middle zone (1000-2000 m) and lower zone (below 1000 m) and two zones in the upstream sub region- i) upper zone (2000-3000 m) and ii) middle zone (between 2000-3000 m). The area (zone) without permanent human settlement (above than 3000m) is not considered as a separate zone.

A total of 360 households were covered for household survey and 12 formal group discussions were organized for data collection. In addition, a number of informal discussions were also organized. Both descriptive and analytic techniques are applied for analysis.



## Agriculture

Involvement in agriculture is one of the important strategies for people's livelihood. Though it has many challenges, it is the backbone and the main stay of local economy. Its contribution to household income is 16 percent and ranks second after remittance. In terms of employment, it ranks first among the sectors of employment. More than 70 percent of the economically active population of the watershed is engaged in this sector.

In response to natural condition varieties of crops are grown in this area. Among them paddy, maize, millet, wheat, barley and potato are considered major crops in terms of both area occupied and total production. The other crops grown in this area include different types of pulses, oilseeds and varieties of fruits and vegetables. The area, production and yield of major crops by zones are shown in table 1.

Table 1. Area, Production and Yield of Major Crops

Crops		Downstream			Upstream		Total
		Lower	Middle	Upper	Middle	Upper	
Paddy	Area	26.3	46.1	5.5	43.5	7.8	129.2
	Prod <sup>n</sup>	61.850	56.250	4.313	44.550	8.275	175.238
	Yield	2.350	1.220	0.784	1.025	1.056	1.356
Maize	Area	19.5	20.9	20.5	35.9	24.2	120.9
	Prod <sup>n</sup>	31.886	20.055	13.552	36.825	21.28	123.599
	Yield	1.633	9.60	0.662	1.026	0.880	1.022
Millet	Area	6.2	17.0	19.0	26.3	16.5	85.1
	Prod <sup>n</sup>	8.359	17.910	15.959	30.543	17.536	90.307
	Yield	1.341	1.055	0.838	1.161	1.062	1.061
Wheat	Area	7.7	11.5	0.4	3.7	3.3	26.5
	Prod <sup>n</sup>	13.739	8.954	0.272	2.622	2.877	28.465
	Yield	1.773	0.778	0.776	0.701	0.883	1.075
Barley	Area	0.8	0.2	0.6	2.0	7.7	11.4
	Prod <sup>n</sup>	2.145	0.187	0.204	1.566	7.525	11.628
	Yield	2.570	0.818	0.334	0.779	0.976	1.020
Potato	Area	2.4	3.2	10.3	2.3	10.5	28.6
	Prod <sup>n</sup>	11.420	8.655	20.400	6.960	27.435	74.870
	Yield	4.804	2.714	1.984	3.066	2.608	2.615

Source: Field Survey, 2002/03.

Note : Area in ha, prod<sup>n</sup> in MT, yield MT/ha.

Paddy ranks first in terms of both areas occupied and total production. Maize ranks second in terms of both area coverage and total production. Millet and potato rank third and fourth. Wheat and barley rank fifth and sixth respectively in terms of both area and production.

The area under paddy is high in the lower and middle zones of the downstream sub-region and the middle zone of the upstream sub-region. The natural conditions in these zones are favorable for paddy cultivation. In these zones the production of paddy ranks first. The area under maize is high in upper zones of both the sub-regions where natural conditions are not conducive for paddy cultivation. The production of potato is high in these zones. Likewise, the yield of different crops varies by zones. The lower zone of the downstream sub-region shows high yields of all crops. The availability of year-round irrigation facility and suitable flat lands are the responsible factors for high productivity in this zone. The upper zone of the downstream sub-region has the lowest productivity of crops except wheat. The low yield of crops in this zone is partly due to insufficient irrigation facility, sloppy land and higher altitude.

People adopted different product maximization strategies such as crop intensification, crop diversification and use of different inputs including improved varieties of seeds. Farmers grow up to three crops in this area. Mostly three crops are grown in year-round irrigated areas particularly in the lower valleys in the downstream sub-region and two crops are grown in the seasonal irrigated areas. In the higher altitudes a single crop is grown.

Local people use different agricultural inputs to increase crop production. These include labor, compost manure, chemical fertilizer and pesticides. Table 2 shows the total households growing different crops and households using agricultural inputs in their agricultural production.

Table 2. Households Producing Crops and Use of Inputs

Crops	Household	Labor		Manure		Fertilizer		Pesticides	
		No	%	No	%	No	%	No	%
Paddy	227	224	98.7	204	89.9	58	25.6	10	4.4
Maize	325	320	98.5	311	97.2	29	8.9	1	0.3
Wheat	135	119	88.1	75	55.6	53	39.3	3	2.2
Millet	295	291	98.6	-	-	43	14.6	1	0.3
Barley	66	66	100	13	19.7	5	7.6	1	1.5
Potato	252	227	90.1	91	36.1	48	19.0	10	4.0

Source: Field Survey, 2002/03.

Almost all the households growing crops use labor for different activities of crop cultivation. However, the proportion of households using labor varies by crops. The use of labor in wheat and potato is comparatively low as compared to the other crops.

The use of manure is extensive. Except for millet manure is used for all crops. Maize and paddy ranks first and second in terms of percentage of household using manure. People use fertilizer too to increase and maintain agricultural productivity. Wheat ranks first (39.3 percent) in terms of fertilizer use and paddy and potato rank second (25.6 percent) and third (19.0 percent) respectively. The proportion of households using pesticides is negligible. It is less than 5 percent in all six crops discussed above.

### **Livestock Raising**

Households of this area raise livestock along with crop production. Raising livestock is one of the means of sustaining livelihoods and food security in this area. But its contribution to household income is only about 2 percent. Local people use livestock products for both household consumption and for sale. The contribution of livestock to household income was high in the past. Due to development of tourism activities agriculture-livestock based economy is transformed to tourism-agriculture based economy. Cattle, buffaloes, goat/sheep and horse/mule are the common animals raised by the farmers. Poultry birds are also kept in the house. The distribution of livestock by types and zone is shown in table 3.

Including chicken an average number of livestock per household is 7.9. Buffalo is the most common animal followed by goat/sheep and cattle in this area. On an average 2 buffaloes, 1.7 goat/sheep, and 1.3 cattle are raised in one household. The number of buffaloes and goat/sheep per household are high in upstream sub-region as compared to the downstream sub-region. The availability of extensive pasturelands is the main reason for high concentration of buffaloes and goat/sheep in this region. The average number of cattle is high in the lower zone of the downstream sub-region. Raising cow is important for religious purpose particularly for Brahmin and Chhetries as they use cow dung and urine for different religious ceremonies and this zone is dominated by these castes. The number of chicken per household is 2.9. Mule/Horse is limited in the upstream sub-region and mostly used for transporting merchandise goods. Stall feeding and grazing are two common practices for raising livestock. Transhumance is also practiced particularly in the upper parts.

Table 3. Average Numbers of Livestock by Types and Zone

Types	Downstream			Upstream		Total
	Lower	Middle	Upper	Middle	Upper	
Cattle	1.5	1.1	1.5	1.1	1.3	1.3 (461)
Buffalo	1.2	1.7	1.6	2.4	2.6	2.0 (721)
Goat/sheep	0.8	1.3	1.7	1.7	2.0	1.7 (619)
Horse	-	-	-	-	-	- (13)
Sub-total	3.5	4.1	5.8	5.33	5.9	5.9 (1814)
Chicken	5.4	1.2	1.9	2.6	3.0	2.9 (1012)
Total	9.0	5.1	7.6	8.0	9.0	7.9 (2826)

Source: Field Survey, 2002/03.

Note: Figures in parenthesis indicates total number of livestock.

### Food Security

Fifty-six percent of the total households do not have sufficient production to meet their annual food requirements and only 44 percent of the households produce enough foods. The proportion of households having sufficient food is high in the downstream sub-region as compared to that of the upstream sub-region. The proportion of households with sufficient food production is low in the higher parts. The proportion of the households with food sufficiency is the lowest in the upper zone of the downstream sub-region (Table 3). It is mainly due to low productivity as well as low intensity of crops.

Table 4. Household's Food Sufficiency Status

Status	Downstream			Upstream		Total
	Lower	Middle	Upper	Middle	Upper	
Sufficient	51.7	53.3	23.3	44.4	45.6	43.9 (158)
Insufficient	48.3	46.7	76.7	55.6	54.4	56.1 (202)
Total	100	100	100	100	100	100 (360)

Source: Field Survey, 2002/03.

Note: Figures in parenthesis indicates total number of household.

The local people adapt a number of food deficit management practices in order to meet food deficiency (Table 5). The households either manage their food deficiency

through purchase of food items in local markets using earned income or borrowing of food items as well as use of wage receiving directly in terms of food items. Forty-three percent of the total food deficit households manage their deficit requirements through wage labor either by purchasing food items in the local markets or receiving crops as wage and 40.6 percent use their income from salaries and pension to purchase food items.

Table 5. Food Deficit Management Practices

Practices	Downstream			Upstream		Total
	Lower	Middle	Upper	Middle	Upper	
Wage labor	6.9	3.5	10.9	13.9	7.9	43.1 (87)
Salary/ Pension	5.0	5.4	10.4	9.9	9.9	40.6 (82)
Business	1.5	2.0	0.0	0.0	4.0	7.4 (15)
Borrowing	-	1.0	1.0	1.0	1.0	4.0 (8)
Others	1.0	2.0	0.5	-	1.5	5.0 (10)
Total	14.4	13.9	22.8	24.8	24.3	100 (192)

Source: Field Survey, 2002/03

Note: Figures in parenthesis indicates total number.

The proportion of households using business as a source for food deficit management is 7.4 percent followed by borrowing from others (4 %). Some of the locals borrow grains and repay after harvesting the next crop and some borrow cash on interest. The proportion of households using wage labor as source of food deficit management is high (13.9 %) in the middle zone of the upstream sub-region as compared to the others. Likewise the contribution of salary and pension to household food deficit management is high in the upper zone of the downstream sub-region. Similarly proportion of household using business, as source of food deficit management is comparatively high in the upper zone of the upstream sub-region. In this zone a significant proportion of the household is involved in tourism and related business.

## Tourism

Tourism is a flourishing economic activity and one of the sources of livelihoods for the local people of the Modi watershed. Tourism activity is flourished basically in the upper parts. The area possesses excellence of all the attractions of the mountain environments with diverse natural and cultural landscapes. The popular Annapurna and Machhapuchre Base camp (Sanctuary), Ghandruk and Ghodepani trekking areas lies in this watershed. Along with rich natural scenery, agreeable climate, clusters

of Gurung settlements and traditional costume are other assets attracting tourists. Easy access from Pokhara, renovation of bridges and trails, and establishments of hotel/lodges, restaurants and tea stalls along the trekking trail have acted as catalyst factors to draw more trekkers to this area and develop mountain tourism in this area.

Tourism contributes about 10.5 percent to the total annual household income and ranks fourth on total share on household income. Out of total surveyed households, 7.5 percent received some income from this activity last year (Table 6).

Table 6. Households Involved in Tourism Activities

Sub-region / Zones	Number	Percentage of total sample by zone
<b>Downstream</b>	<b>2</b>	<b>1.1</b>
Lower	1	1.7
Middle	1	1.7
Upper	-	-
<b>Upstream</b>	<b>25</b>	<b>13.9</b>
Middle	3	3.3
Upper	22	24.4
<b>Total</b>	<b>27</b>	<b>7.5</b>

Source: Field Survey 2002/03

The proportion of households involved in tourism activity is high in the upper zone of the upstream sub-region (24.4 %) as compared to the downstream sub-region. And none of the households in the upper zone in the downstream sub-region were involved in tourism activities.

A number of employment opportunities have emerged due to development of tourism and numbers of people of this region are involved directly or indirectly in tourism activities. The employment opportunities arising from tourism include hotels and lodges, shopkeepers, handicraft workers, carpenters, trekking and travel agents, NGO staffs working in various tourism related projects, guides and *sirdars*, cooks and porters.

## Migration

Migration is another livelihood strategy adapted by local people. The people of this area temporarily migrate to different places outside their own village in search of employment. Out of total 2,330 surveyed populations 352 persons are migrated. This figure constitutes 28 percent of the total employed population (Table 7).

Table 7. Number of People Working Outside Village

Place	Downstream			Upstream		Total
	Lower	Middle	Upper	Middle	Upper	
Within district	9.3	1.7	1.0	2.2	13.7	6.1 (77)
Within country	18.2	10.8	3.1	6.1	4.8	8.4 (106)
Other countries	12.0	10.3	16.1	13.8	14.0	13.5 (169)
Total	39.6	22.8	20.2	22.1	32.5	28.0 (352)
Employed pop <sup>n</sup>	100 (225)	100(232)	100(193)	100(312)	100(314)	100 (1256)

Source: Field survey, 2002/03.

Note: Figures in parenthesis indicates total number.

Of the migrants nearly half are migrated to foreign countries. The proportion of population working outside VDC but within country is one-sixth of the employed population. Rest of the population working outside village constitutes 8.4 percent of the employed population. The amount of remittances sent by them is remarkable. Its share in the total household income in the study area is more than 31 percent as compared to over 25 percent of the total national income as reported by Adhikari (2001). The proportion of population working outside is high in the lower zone of the downstream sub-region as compared to others. About 40 percent of the employed population of this zone is working outside VDC. Out of these 12 percent are working abroad and 18.2 percent within country outside their own district. The proportion of population working in other countries is slightly high in the upper zone of the upstream sub-region. Gurung communities dominate this region and are mostly employed in the British and Indian army. The proportion of population working outside VDC within district is also high in this zone. A large number of people from this zone are migrated to Pokhara for business and other purposes.

## Business

Business is one of the strategies adopted by local people for their livelihood security. The proportion of population age of 10 years and above involved in business activities is 2.8 percent. The involvement of household in business activities by zones and sub-region is given in Table 8. Nearly 11 percent of the surveyed households are

involved in business activities in the study area. The proportion of households involved in business is high in the lower zone (20.0 percent) and low in the upper zone (1.7 percent) of the downstream sub-region.

There are a number of shops along the trekking routes to Annapurna and Ghodepani and Pokhara-Baglun highways. These shops provide both wholesale and retailing services of varieties of goods such as groceries, cloths, medicine, hardware and others. Besides, there are a number of personal services such as hair cutting saloon, beauty parlor, tailoring, shoe making and a number of repairing workshops in this area providing specialized services to the local people. Many locals and outsiders are involved in these activities. The contribution of business to household income is 8.1 percent.

Table 8. Households Involved in Business Activities

Sub-region/ Zones	Number	Percentage of total sample of respective zones
<b>Downstream</b>	<b>21</b>	<b>11.7</b>
Lower	12	20.0
Middle	8	13.3
Upper	1	1.7
<b>Upstream</b>	<b>18</b>	<b>10.0</b>
Middle	5	5.6
Upper	13	14.4
<b>Total</b>	<b>39</b>	<b>10.8</b>

Source: Field survey 2002/03.

### Industrial Activities

The industrial activities in this area are limited. However, a number of cottage industries such as watermills, weaving and sewing, paper, bamboo, and metal products, woodcarving and furniture, brewing and others exist in this area. The contribution of industrial sector to household income and employment is negligible. However, local industrial products are quite important for household purpose.

Among different industries operated in this area the contribution of water mill is remarkable in the local livelihoods. People use watermills for grinding cereals from time immemorial as a cheap and convenient means of food processing. Mill operation is seasonal, with peaks in processing during festival and harvest times. There are altogether 55 watermills in operation and are distributed across the watershed (Table 9).

Table 9. Number of Watermill, Household Benefited and Income Per Mill

Description	Downstream			Upstream		Total
	Lower	Middle	Upper	Middle	Upper	
Watermill (No.)	2	2	-	39	12	55
HH benefited (No.)	200	200	-	1600	500	2500
Income per mill (Rs.)	2000	1800	-	1500	1500	1500

Source: Field Survey, 2002/03. HH=Household.

The distribution of watermills is uneven and mostly concentrated in the upstream sub-region. Out of the total 55 watermills, 93 percent (51) are located in this region with excessive concentration of 39 mills in the middle zone (1000-2000 m) of this sub-region. The concentration of watermills in the upstream parts is largely due to favorable water flows in the local tributaries, common practice of growing millet, wheat and maize requiring grinding and test preference of local people. There are only 4 watermills in the downstream sub-region. In this part there are some mills operated with other sources of energy such as diesel and electricity.

Number of households benefited from watermills is estimated to be 2,500. Out of the total households benefited, 84 percent lies in the upstream sub-region. The average monthly income per water mill in the watershed is estimated to be Rs 1500. The average income from mill varies by sub-region and zones. The average income per watermills is high in the lower zone as compared to others. One obvious reason is that the mills operated in the lower zone run throughout the year with relatively large number of mill users.

The involvement of people in weaving and sewing activity for commercial purpose is limited but its importance in local livelihood is significant. Local people make woolen materials such as *bakhu*, *radi* and others from sheep and goat wool using locally developed processing technique and handlooms. The production of woolen materials is limited to the upper parts mostly in communities like Ghandruk, Chhomrong, Melache, and Landruk. Along with woolen materials they also weave *bhangra* and other clothes. Mostly females are involved in weaving *Bhangra*. Some people especially *damai* are involved in sewing activities. It is their traditional occupation and means of livelihoods. They sew clothes of other people on yearly contract basis or rent. In market areas there are some people involved in tailoring.

Local people produce a number of bamboo goods and use both for household consumption and for sale. The use of bamboo products is common throughout the study area. Mostly poor people having skill are involved in this activity. It is one of the income sources of people especially of poor.

People use a number of produced locally metal products for their agricultural and household use. It is the traditional occupation of the blacksmiths. They are involved in the production as well as repairing of these materials. For this, they receive cash and kind from the costumers.

In terms of employment and source of income the share of woodcarving and furniture industry is very limited. There are a few woodcarving and furniture industries in the study area. Local *chadharoes* make wooden materials such as *theki*, *batta*, *chautho*, *harpe* and *tongbapot* for household use. They produce these materials either on order or for sale. Furniture industries are mostly concentrated in Kusma and other market areas.

The production of liquor is another activity performed by the local people. Some caste groups especially Gurung and Magar of this area produce liquor for household consumption and some of them sell these products in local markets. They prepare liquor from different cereals and fruits. The liquor is considered as most essential components for hospitality of guests as well as for different religious ceremonies.

### Fishing

Fishing is also a source of livelihood for some people; however, it is not extensive in terms of both number of people involved as well as amount of fish catch. In the past fishing was important in this area. At present, this activity has declined. There are only a few families involved in fishing especially in the lower parts of the river (Table 10). The people undertake fishing either as a recreation or as a part time job as a seasonal activity. The people residing close to the river are engaged in fishing practice.

Table 10. Households Involved in Fishing

Sub-region/Zone	Household	Fishing Place			
		Modi Khola	Bhurungdi Khola	Chane Khola	Pati khola
<b>Downstream</b>	<b>1</b>	-	-	-	<b>1</b>
Lower	-	-	-	-	-
Middle	1	-	-	-	1
Upper	-	-	-	-	-
<b>Upstream</b>	<b>12</b>	<b>9</b>	<b>2</b>	<b>1</b>	-
Middle	10	7	2	1	-
Upper	2	2	-	-	-
<b>Total</b>	<b>13</b>	<b>9</b>	<b>2</b>	<b>1</b>	<b>1</b>

Source: Field Survey, 2002/03.

Out of the total surveyed household 3.6 percent are involved in fishing. Among involved in fishing, 92 percent were from upstream sub-region. Modi Khola and its perennial tributaries such as Bhurungdi, Channe and Pati Khola are the main fishing places. The average catch of fish as reported is 2-3 kg per day per person. It is used for both household consumption and sale. Local fishermen sell it in the local markets at a cost of Rs. 150-200 per kg depending on season. Though, it is one of the sources of nutrient for some local people, its contribution to peoples' livelihoods in terms of income source and employment is negligible.

### **Other Activities**

The other activities include wage labor and forest production collection. Wage labor is one of the options for livelihood security especially of poor people. About 2 percent people of 10 years and above are involved in wage labor for varieties of works such as agricultural works, porter, construction and other activities. Labor market for agricultural works is available throughout the study area, while portering is highly flourished in the upstream sub-region with tourism activities, as it does not have road link. The transportation of different materials including tourists' luggage solely depends on people's back. The level of wage differs by types of labor work. The wage of porter carrying goods of the tourist is higher as compared to other porter. It ranges from Rs150 to 250 per day per person for portering of the luggage of tourist. Porter charge for carrying merchandise and other construction materials depends on distance and weight of goods carrying.

The collection of forest products is also an activity that local people use for livelihoods. Local people collect a number of forest products such as firewood, leaf and litter, timber, fruits, mushrooms and herbs. Almost all households collect forest products for household requirement but very few households (1.4 %) earn cash income by selling these products. The proportion of households involved in selling forest products is relatively high in the upper zone of the downstream sub-region as compared to others. The main selling items include firewood; vegetables like *tusa*, *niguro*, fruits like *kafal*, *katus* and herbs.

### **Income Level**

There are a number of sources of household income of the local people. The major ones include income from agriculture, service in government and non-government organization, tourism, income from pension and remittances, rental income, business, and wage labor. As in other areas, the contribution of these sources to household income is not uniform across households and localities. Per household annual average income from different sources for the surveyed household is given in Table 11.

Table 11. Household Incomes by Sources (in NRs.)

Sources	Downstream			Upstream		Total
	Lower	Middle	Upper	Middle	Upper	
Remittance	24113	21267	64375	34167	55378	40679 (31.2)
Agriculture	32094	26678	20305	16872	13977	20892 (16.0)
Service	36605	58100	3177	10784	7631	20918 (16.0)
Tourism	667	60	-	5111	48989	13646 (10.5)
Pension	2410	3793	10973	10424	21404	10820 (8.3)
Business	31843	15717	250	1656	8700	10557 (8.1)
Wage labor	3512	2933	6342	10133	4540	5799 (4.4)
Livestock	5183	3145	1840	1571	1713	2516 (1.9)
Rent	3047	-	-	1222	-	813 (0.6)
Industries	633	-	-	28	239	172 (0.1)
Wild product	250	-	35	111	80	95 (0.1)
Others	9665	9332	867	216	329	3447 (2.6)
Total	150023	141025	108164	92295	162979	130354 (100)

Source: Field Survey, 2002/03.

Note: Figures in parenthesis indicates total number.

The average total annual income of the surveyed household is Rs 130,354 and per capita income (family size 6.5 persons) Rs 20,054. Considering the per capita income of the hill region of Nepal for the year 2003/04 as reported in Nepal Living Standard Survey (Rs 19,823), the area shows slightly better condition.

The upper zone of the upstream sub-region has the highest average household income (Rs 162,979) and the middle zone of the same sub-region has the lowest (Rs 92,295) average annual income. Remittance is the main source of household income in this area. The contribution of remittances to the total household income is 31.2 percent followed by agriculture including livestock (17.9 %), service (16 %), tourism (10.5 %), and business (8.1 %). The share of the other activities in the household income is 16.3 percent.

The share of remittance is high in the upper zone of the downstream sub-region. Nearly 60 percent of the household income is contributed by remittances in this zone. The contribution of remittance to household income is 37 and 34 percent in the middle and upper zones of the upstream sub-region respectively. Service ranks first

in the share of household income in the middle and lower zones of the downstream sub-region. The contribution of service to household income is 41.2 percent in the middle zone of the downstream sub-region while it is 24.4 percent in the lower zone. The share of tourism in household income is high in the upper zone of the upstream sub-region. Tourism shares 30.1 percent in household income in this zone. Agriculture ranks second in the share of household income except in the upper zone of the upstream sub-region.

Households of the study area are grouped into four categories on the basis of the number of sources of income- having only one to four and above sources. Average income of the households by number of sources is given in Table 12.

Table 12. Average Yearly Incomes of Households by Number of Sources

(income in NRs.)

Number of Sources	Downstream			Upstream		Total
	Lower	Middle	Upper	Middle	Upper	
One	16650	16900	30550	12057	38033	22760
Two	107217	140200	80119	57703	155813	106014
Three	127334	162273	148240	113614	199150	149632
More than three	436786	159233	183824	316471	159496	247293
Total	150023	141025	108164	92295	162979	130354

Source: Field Survey, 2002/03.

Average income of the household increases with the increase of number of income sources. The average income of the households having single source is only Rs 22,760 which raises to Rs 247,293 for four and more than four sources. The average yearly income of the household having two sources is nearly five times higher than the households having single source. Among households having single source of income, the middle zone of the upstream sub-region has comparatively low level of income. The table also shows that the average household income increases with an increase in the number of income sources in all the zones except the middle one of the downstream sub-region and upper zone of the upstream sub-region.

A two-way Analysis of Variance test is applied to test two sets of hypothesis i) whether there is significant difference in level of household income by zones and ii) whether there is significant difference of household income in terms number of sources of household income. The results of the ANOVA are given in table 13.

Table 13. Results of F Test of Household Income by Number of Income Sources

Source of Variation	Sum of squares	df	Mean square	Variance Ratio
Between column	9154	4	2989	0.44
Between rows	132028	3	45009	8.65
Error	62472	12	5206	-
Total	206654	19	-	-

Source: Based on table 12.

The calculated variance ratio of the household income between zones is 0.44. The table value at  $df_1 = 4$  and  $df_2 = 12$  at 5% level of significance is 3.26. The calculated value is smaller than the table value. Thus, F statistic clearly shows that there is no significant difference in level of household income by zones. In the same time the calculated value between household income sources (8.65) is higher than table value (3.49) at  $df_1 = 3$  and  $df_2 = 12$  in 5% level of significance. This clearly shows that there is a significant difference between average incomes of the household by number of income sources. Household income significantly increases with the increase in number of sources. This means the more the sources of household income the higher the level of household income or vice versa.

On the basis of average annual income, households of the study area are grouped into six different income categories. Out of the total households, 37.5 percent of the households earn more than Rs 100,000 annually while nearly 10 percent households earn less than Rs 20,000. Majority of the households (52 percent) earn in between Rs 10,000 to Rs 80,000 annually.

The level of income varies by sub-region and zones. The proportion of households with more than Rs 100,000 annual income is high in the upper zone of the upstream sub-region as compared to the others. Fifty percent of the surveyed households in this zone earn more than Rs 100,000. The high level of household income in this part is largely due to tourism business in this zone. Similarly high proportion of households with this income level is also found in the lower and middle zones of the downstream sub-region sharing 40 to 45 percent households. Higher income for a large number of households in these zones is perhaps due to high agricultural production and high involvement in service activities. The middle zone of the upstream sub-region constitutes relatively small proportion (18.9 percent) of household with annual income above than Rs 100,000. The proportion of households with annual income of less than Rs 20,000 is high (16.7 percent) in the middle zone of the upstream sub-region as compared to the others.

Table 14. Percentage of Households by Annual Income Categories

Income (Rs)	Downstream			Upstream		Total
	Lower	Middle	Upper	Middle	Upper	
Below 20,000	8.3	8.3	5.0	16.7	13.3	9.7
20,000-40,000	13.3	8.3	31.7	22.2	6.7	16.9
40,000-60,000	8.3	21.7	20.0	22.2	12.2	16.1
60,000-80,000	13.3	16.7	11.7	14.4	8.9	12.8
80,000-100,000	11.7	5.0	5.0	5.6	8.9	6.9
Above 100,000	45.0	40.0	26.7	18.9	50.0	37.5
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: Field Survey, 2002/03

## Conclusion

The people of the Modi Khola area have adopted diverse strategies for their livelihood security. Household members adopt one or combination of activities to meet their household needs. These activities vary by household and localities resulting from variable effects of access to assets, capabilities of people and nature of the environment. In the upper parts of the watershed, people's livelihood is largely based on tourism activities and regular inflow of money in terms of pension and remittances while in the lower parts it is based on the combination of different activities mainly agriculture, business, service and remittances. The reason behind flourishing tourism in the upper parts is the richness in natural and cultural resources.

Household income of the local people is largely determined by types and number of income sources. Household income significantly increases with increasing number of livelihood activities. The households adopting diverse activities have higher household income and more secure and less vulnerable livelihoods as compared to the households adopting single or lesser number of activities. Livelihoods of households having diverse sources are more sustainable and the possibility of positive adaptation to changing circumstances is high.

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