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Livelihood Impacts of Micro-Hydro Electricity Project of Rural People of Nepal

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Abstract

Micro-Hydropower (MHP) is generally defined as a decentralized small scale water power plant that generate electricity power up to 100kw and server nearby householders thoughts a local grid for power generation up to 100kw. This study analyzes the livelihood impacts of the micro-hydro-electricity projects of the rural people on Taplejung district of Nepal. There are twelve micro-hydroelectricity projects constructed as well as they generated and supply the electricity power of the local people without connected in national grid of the NEA. P*rimary data were used for the study for the information and descriptive statistics were used for data analysis. To measure livelihood impacts of the project, different indicators like housing and sanitation condition, electricity used, industrial situation, agro-product pricing and wage rate of the labour had been used. The completion of the different MHPs in the sample area shows the result that the MHPs had positive impacts upon the surrounding community people's income and living standard, which shows the positive impacts on their livelihood in the Taplejung district. The result encourages the different stages of governance as well as other investors for the implementation of the micro-hydroelectricity project in the situation of the Nepalese context.*

Keywords: micro-hydro power, livelihood impact, electricity, income, living standard.

Introduction

The hydro-electricity projects directly or indirectly affected the livelihood situation of the surrounding community people at the time of construction and operation. Micro-Hydropower (MHP) is generally defined as decentralized small scale water power plant that generate electricity power up to 100 KW and server nearby householders thoughts a local grid for power generation up to 100 KW. Micro-Hydro Project have gained enormous popularity in developing countries last of four decades this included Pico-hydro schemes up to 5 KW capacities. Due measures of establishing decentralized small-scale water power or micro-hydro schemes can prove it as an effective eco-friendly source of power generation as international funds for green energy are available that can be a great appreciation for government to explore this option (Razn, 2012).

Micro-Hydro power technology is electrical energy generation system from water resources with installed capacity respectively up to 100 KW to 3 MW of electric power this technology has been effectively to encompass and clarify rural electrification. It originated in Srilanka for cases many micro-hydro plants have been initially installed primarily to

improve the quality of life by proving electric light. In the scenario of Peru the key question for many project developments was, "how long wills the plan last crater or how quickly the capital will be back". Similarly in Nepal there are 3300 micro hydro projects, having capacity less than 100 KW, installed in Nepal a major role in rural electrification (Ranjitkar, 2014).

MHP is generally defined as decentralized small scale water power plant that generate electricity power up to 100 KW and server nearby householders think a local grid for power generation up to 100 KW. MHP have gained enormous popularity in developing countries for last four decades this included Pico-hydro schemes up to 5 KW capacities. The main reason for the breakdown of micro hydro station, particularly Girding is lack of preventive maintenance in regular schedule, insufficient technical human resource, and lack of knowledge, weak policy in off grid/not connected area, lack of standardization of components and lack of testing of components (Agrawal, 2019).

Micro-hydro is an indigenous foundation of energy for which the possible occur in the almost the Himalayan Region countries which includes Afghanistan, Bhutan, China, Myanmar, Nepal and Pakistan. MHP is commonly express as regionalized small scale Water power plant less than 100 KW. In the context of power generation up to 100 KW, MHP have gained massive acceptance in developing countries during the last for decades (Koirala, 2011). MHP can provide electricity facilities through micro-hydro generation is a cost effective and law impact for power generation that effects a possible result for rural electrification in Nepal (Parish, 2002).

Nepal is a geographical diversified and natural buttes country. From the top of Himalayas have about 6000 rivers and rivulets heaving total length more than 45000 km (Sharma & Awal, 2013) with hug potentiality of hydropower generation. Being a small country but rich in hydropower resources Nepal bragged its first hydropower plant in a way back in 1911 considering the geographical situation in Nepal. Nepal has 83000 MW is estimated and 43000 MW of economically as well as technically feasible hydropower potential (Shrestha, 2018). Nepal's electricity generation is controlled by hydropower through the complete Centerior of energy use of a country. The electricity is a tiny segment almost 43.9 percent total population of Nepal still deprived of electricity (Uprety, 2017).

In Nepal Pharping micro-hydro of (500 KW) was the first hydro plant well-known system back in 1911 (NEA, 2015). But after a long time of the first hydroelectricity project Nepal had not construct other projects. After 23 years long time two hydro plants namely Sundarijal 900 KW and Panauti 2.4 MW come into operation the demand of electricity increased mainly on wards from 60s bigger hydro-power increased almost 20 times (Ghemere, 2012).

After the political changes in 1990, the government of Nepal formulates the new hydropower policy 2001 and to promote the private sector investment in the area of hydropower development which aims to expand the electrification with in the country and export (www. Welcomenepal.com).Nepal's ten five year plan (2002 to 2007) aims to extend the verifications within country and export to India for mutual benefits (NPC, 2010).

Taplejung District is remote one and there are so many natural resources as well as Betties of Nepal. There are a plenty of water resources from different revisers and rivulets way from Himalayan reason to hilly reason, which has potentials of hydroelectricity power generation. This districts is lies in the province no one of the country. The economy of this district is depending on the agriculture production in which water resources play vital role. The main sources of electricity supply depend of this district with micro-hydroelectricity project (AEPC, 2009). Taplejung is one of the different types of district in Nepal, which is not connected the national grid electricity and there is no any facility of hydroelectricity power up to 2041 BS(NEA, 1984). Nepal Electricity Authority (NEA) installed a micro-hydroelectricity project Sobuwa Khola Micro-Hydropower (125 KW) in 2041 BS. After then there are twelve micro-hydroelectricity projects are construct as well as they generated and supply the electricity power of the local people without connected in national grid of the NEA (NEA, 1991). The main objective of this research article is to analyze the livelihood impacts of the micro-hydro-electricity projects on the rural people of the surrounding area. The main sources of electricity supply depend of this district with micro-hydroelectricity project. They fulfilled the local electricity power supply of different area of this district.

2. Research Methodology

A number of steps were followed to accomplish the present study.

2.1. Research Design

This paper aims to analyze the livelihood impact on the respondents with the help of some determinant variables: impact of electricity, impact in education, saving money, saving time and other economic activities. This research is used an explorative, descriptive and analytical framework to evaluate the livelihood impact of micro-hydroelectricity project for the surrounding rural people. Primary data was used in this research as a source of information. Semi-structural questionnaires were used at time of the survey for the primary data collection. Both qualitative and quantitative methods were used for data analysis.

2.2. Sampling design

This study analyzes the livelihood impacts of rural people of the Taplejung district from the micro-hydroelectricity projects. There are 12 micro-hydroelectricity projects which supply the electricity power of the rural people. Among them Luangwa Kholo Micro-hydroelectricity Project (100 KW) cash point area was selected as sample area of this research.

2.3. Sample Size Selection

The Luangwa Kholo micro-hydroelectricity project has 100 KW electricity generation capacities which provided electricity power for 535 households of the Taplejung district, which are the cash-point as well as affected households of the project. The 535 household are the universes of this research, among them 10 percent households were selected as a sample size of the population from the propulsive sampling method. Survey was held in October 1st to 10th 2019 among the selected sample population. The information was taken with the help of field survey in sample area were

inputs the using Statistical Package for Social Scientists (SPSS) Software and analysed by the used of the descriptive statics.

2.4. Data Presentation and Analysis

Analysis of the livelihood impact in the surrounding area people of the project, different economic indicators of the sample area people were measured. Some important indicators are as, electricity used for light and cooking, wage rate, price of agro and meat product and housing, drinking water and sanitation condition before and after hydropower project.

Energy Consumptions for Lighting Purposes

The electricity and kerosene are the main consumption source for lighting purpose in the project affected area. To measure the livelihood of the surrounding people electricity consumption for the lighting purpose is one of the important indicators. The following table compared the use of electricity for the lighting purpose before and after the MHPs.

Table: 1. Energy Consumption for Lighting Purposes

S. No.	Sources of Energy	Before Project (%)	After Project (%)	Percentage Change
01	Electricity	05	100	+95
02	Kerosene	95	00	-
	Total	100	100	

Source: Field Survey, 2019

Table 1 show that after the project, electricity user households has increased by 95 percent from 5 percent. Now, 100 percent households have been using electricity for lighting purpose which is one of the positive impacts of the project on the local livelihood. Electricity helped to change their life styles and daily works, e.g. it helped to study for children and easy to others household work in the evening. In the views of local people, electricity helped to conserve the forest, control soil erosion process that aggravates the flood and land slide hazard.

Expenditure Decrease from Electricity

Before construction of the MHPs sample area of this research had not been electrification. People of this reason used Tuki for the lighting at the night time. After MHPs had been operated, they start to use the electricity for light, the expenditure of the surrounding communities decrease or not. To examine this situation, researcher included the cost related question in the survey to compare the cost of the light in surrounding communities' people information had been collected. The information related to expenditure from light had been mentioned the following table, according to the information provided by the respondent.

Table: 2 Saving the Expenditure

Information	Frequency	Percent
Yes	37	67
No	18	33
Total	55	100.0

Source: Field Survey, 2019

Table 2 shows that situation of the surrounding community people of MHPs whether rural people save their expenditure to replace the Tuki by the electricity for the used the lighting system to their daily life. From the total respondents 67 percent agree their expenditure saved by the used of electricity for lighting system and 33 percent of respondents disagree their expenditure saved by the used of electricity. The respondents who had own trade/business after construction MHP these respondent consumption pattern of electricity had increase and they had not save money. Other those respondents who had not any trade/business before and after the MHP these respondent consumption pattern of electricity had very low, so they saved the money after electrification. From the opinion of the respondents surrounding communities of MHPs expenditure had been saved due to the electricity used for the lighting purpose.

Learning Time of the Children

In this portion of the reach analysis explored that the effect in learning time of the children in sample area due to the MHPs, which help to analysis the livelihood impact of the sample area peoples from the micro-hydro project. By help of the respondent provided information whether the project had helped to the sample area people's children learning time increase. From the information provided by the respondents shows that, 100 percent had agreed that the project have increased the learning time of the children's on the sample are, which help to education system of the community (Field Survey, 2019).

School Education Improved from MHPs

Education is related to livelihood impacts of society. In this portion of the result discussion had analysis school education improvement of the surrounding community children due to the MHPs. The information related to school education improvement provided from the respondent through the questioner survey. From the total respondent 100 percent had agreed that the school education improved of that surrounding community people due to the MHPs, which had positive impacts of livelihood for the sample areas population (Field Survey, 2019).

Impact on Sanitation

Sanitation is one of the important livelihood indicators of the people in the sample area. From the survey, it is found that people who use modern types of toilet are aware about sanitation problem and their living standards are better. The use of modern types of toilet is increasing in the study population as shown in the table:

Table: 3. Toilet Use of Study Population

S. No.	Types of Toilet	Before Project (%)	After Project (%)	Change (%)
01	Pakki/Modern	15	85	+70
02	Kacchi (Deepwhole cover)	40	80	+40
03	Opened	45	10	-35
	Total	100		

Source: Field Survey, 2019

The table 3 shows that people of the study area use three types of toilets. The number of households who use modern or Pakki (permanent) toilet is increased by 85 percent and the households who use Kachchi (temporary) toilet is also increased by 40 percent whereas the people who use opened toilet is decreased by 40 percent after the project. Project had conducted different awareness programs about sanitation and environment conservation at local levels. As a result, the toilet user households in overall have increased which leads to improve the livelihoods of the surrounding community of the project.

Price of Agro-Products

Main occupation of the local people in the project surrounding area people is agriculture. Therefore, the price of the agro-product is another important indicator to measure the livelihood impact of the project. The following table shows the compared status of the agro-price before and after the project.

Table: 4. Price of Agro Products in the Study Area

S. No.	Agro Products	Unit	Price (BP)	Price (AP)	Change
01	Rice (Mota)	Pathi	Rs. 65	Rs. 140	+ Rs. 75 (115%)
02	Maize	"	Rs. 50	Rs. 100	+Rs. 50 (100%)
03	Wheat	"	Rs. 65	Rs. 120	+ Rs. 55 (85%)
04	Kodo	"	Rs. 35	Rs. 80	+ Rs. 45 (128%)
05	Tori	"	Rs. 150	Rs. 250	+ Rs. 100 (67%)

Source: Field Survey, 2019

The table 4 shows that the main agro products of the study area are Rice, Maize, Wheat, Kodo and Tori. The table 4 makes clear that the price of every product has increased more than 67 percent after the project. The Project affects directly in the price of agro products. During and after the construction of the MHPs, the people have lost interest in agriculture as they got other alternative sources of income like office jobs, small business etc. Some people have changed their profession and become contractor from farmers after the project. Also people lost their cultivable land due to the project which also resulted in the price rise of agro products, which leads to improve the livelihood of the agro dependent households of the sample area.

Effect on Local Business

Other important occupations of the sample area people are small and household industries and local business. The condition of small and household industries is the important indicator to measure the livelihood impacts of the project. The following table has compared the small industries as well as local business situation of the sample area people before and after the MHPs.

Table: 5. Industrial Status of the Study Area

S. No.	Type of Industries	Before Project	After Project	Change
01	Water Mills (Ghattas)	12	06	-06
02	Rice Mills	01	04	+03
03	Bakery	01	03	+02
04	Furniture	02	04	+02
05	Tailoring	05	10	+05
06	Goldsmith	01	01	No change
07	Blacksmith	01	01	No change

Source: Field Survey, 2019

The table 5 shows that except Water Mills (Ghatta), the number of other industries (Rice Mill, Bakery, Furniture, Tailoring etc.) has increased in the project area after the project, six Ghattas out of twelve have been replaced by the Rice Mill on the study area after the MHPs. However, other industries like rice mills, bakery, furniture etc. have positive impact from the project, which has increased employment opportunity and self-employment. It helped to increase their income and had positive impact to the livelihood of the study area people.

Impact on Wage Rates

Wage rate of the sample area people is the other indicator to measure the livelihood of the people which affects the income and living standard of them. The following table compares the wage rate of the labour in before and after the MHPs.

Table: 6. Wage Rate in the Study Area

Categories	Before project	After project
Skilled labor	Rs. 600/day	Rs. 1200/day
Unskilled labor	Rs. 400/day	Rs. 800/day

Source: Field Survey, 2019

The table 6 shows that there is a heavy change in wage rate of skilled (like carpenter, mason) and unskilled labors after the construction of the MHPs. The wage of both categories of labor has increased by 100 percent in the study area. As there is shortage of male workforce in the villages, it is difficult to run farming fields. During the harvest and planting seasons, the labor force is in such a short supply that the wage almost triples. And as a result, a stretch of land areas lies barren and uncultivated in some parts of the study area.

Expenditure Saving by the Used of the Electricity

In this part of the study analysis, the saving situation is due to the MHP in the sample area people. After operation of the MHP, sample area people replace the Tuki by the electricity for the light in their daily work in the night time. To replace Tuki by the electricity they save some amount of expenditure from the light cost, which is analysis by the help of the following table.

Table: 7. Expenditure Saving due to the MHPs

Items	Number	Minimum	Maximum	Mean	Std. Deviation
Saving	68	0	200	119.15	43.939

Source: Calculation by Researcher Based on Field Survey, 2019

The table 7 shows the saving expenditure of surrounding communities people due to the electricity used for light. From the total respondent 100, only 68 respondents had saved their expenditure by using the electricity, because they had no any trade/business in that area. The expenditure saving maximum is Rs 200 and minimum saved is Rs 68 shows from the table. Like same average saving of the expenditure is Rs 119.15 which deviation shows in the maximum from the table.

Time Saving Due to the MHPs

Saving time is the other important economics phenomena of the society, because the rural people used that saving time in other productive sectors. Time saving in the sample area peoples of MHPs used the electricity power on their daily works. They used traditional method of agro processing for their consumption before construction the MHPs and after MHPs they used modern technology for agro processing for their consumption and may save the time from agro-processing. Hundred percent of the respondents in sample areas agrees that they save the time by using the electricity for agro processing to their daily consumption (Field Survey, 2019). That time they had used other productive work which had positive impact for the socio-economic development.

Employment Opportunity from the Projects

To provide the employment opportunity from the different MHPs for the sample area people very important likelihood impacts of the project. This research article tries to identify whether MHPs had directly provided the employment opportunity for the surrounding community people or not. The respondents provided information through the interview at the time of the questioner survey explains by the helps of following table:

Table: 8. Provide Employment

Information	Frequency	Percent
Yes	30	55
No	25	45
Total	100	100

Source: Field Survey, 2019

The table 8 shows the employment opportunities situation to provide directly by from the views of the respondents. The table shows that the 55 percent of respondents' opinion is that MHPs provides employment opportunity directly for the surrounding community people. According to the respondents, the researcher concluded that the MHPs provide

employment opportunity for the surrounding community people which have positive impacts on livelihoods of the sample area people.

3. Conclusion

The analysis gives a clear picture of the livelihood impacts of the MHPs in the sample area people. Different indicators like energy consumption, decrease expenditure, learning time of the children, school education, used of sanitation, price of agro-products, local business, wage rate, saving expenditure, time saving and employment opportunity. industries situation, wage rate, agro-product pricing, energy consumption for light and cooking, housing condition, drinking water and sanitation situation of sample area people had been used and compared before and after the MHPs to measure the livelihood impacts on the sample area people. To compare these variables as indicators to measure the livelihood impacts of the sample area people and community, the research article had been concluded that these entire variables had positive impacts from the MHPs. After the hydro-project used the electricity for light and energy has increased, local people housing condition had improved and sanitation facilities had improved. Similarly, agro-product price had increased, numbers of small and household industries had increase and wage rate of labor increased. Likewise, MHPs help to increase learning time of the children and school education improved and it decreases expenditure saving money and time in the sample area people. All of these positive impacts of the MHPs in the sample area, which have increased their income and living standards of the sample area people. It shows the positive impacts of local livelihood from the MHPs.

From the data analysis, it is concluded that the MHPs are important in the context of Taplegung district of Nepal. Such projects have been helpful directly and indirectly in improving the livelihood of the surrounding community people.

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