Access to Energy Revealing through Socio-economic Status Survey of the Local People for Rural Electrification in Nawalparasi

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Abstract

Rural electrification program seems to be crucial to improve living conditions and promote development. The main objective of this study was to identify the socio-economic status of the local people and also measure their perception on willingness to pay for hydroelectricity in two rural municipalities of Nawalparasi East district. The study has followed both qualitative and quantitative methods for socio-economic survey. Household questionnaire survey, Focus Group Discussion and Key Informant Interview techniques have been applied for primary data collection. In addition, secondary data has been compiled through published and unpublished documents from field as well as central level. Agriculture and livestock rising have been found the major sources of income in this area. Therefore, the non-farm source of income is very low. However, remittance from foreign job playing vital role as another source of income for the livelihood of the people. As being economically capable and socially aware with modern facilities and its implication on better and easier life support in future, the local peoples from the study area has been found encouraging. Whole area of the study site has not available electricity facility and their positive willingness to pay for hydroelectricity is the major finding and step forward for the future planning of regular and reliable power supply to uplift their socio-economic condition, reduce poverty and support on rural development activities.

Keywords: agriculture, socio-economic condition, techno-feasibility, hydroelectricity, rural development

Introduction

Nepal's water resources endowments are extraordinary. Its numerous rivers with high gradient and perennial nature are its bounteous gift for hydropower development. It endows approximately 6000 rivers with a total length of 45,000 kilometers. Hydropower potential in Nepal is supposed to be some 83,500 MW as per the studies carried out decades ago and out of these only 43000 MW are found to be economically viable. Till the date we have been able to harness only 1181 MW of hydro-power (621 MW from NEA and 560 from private sector) around

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the country (ADB, 2020). Yet only a fraction of the existing potential has been harnessed and only 86.44percent of the population has access to electricity (NEA, 2020). Hydropower plays vital role in the economic development of the nation. Poverty is a major obstacle for sustainable development of not only developing countries but also the entire world. One of the opportunities to cope with the multidimensional aspects of poverty is access to modern energy such as electricity (Kanagawa & Nakata, 2008).

Energy access is the situation where people can secure the modern energy at affordable prices (Spalding-Fecher, Winkler, & Mwakasonda, 2005). Access to modern energy like electricity will drastically improve the quality of life of those who do not have yet. There has also been increasing attention on poverty reduction through energy access improvement among international organizations in the energy field (World Bank, 2004). The International Energy Agency (IEA) estimates that 1.1 billion people do not have access to electricity, most of them living in rural areas in developing countries (IEA, 2017). Lacking reliable access to electricity is considered a limit on people's opportunities and quality of life. The role of energy as a key driver to sustainable development is now widely recognized by the global community, as evidenced by the fact that the Sustainable Development Goals (SDGs) include access to affordable, reliable, sustainable, and modern energy for all by 2030 as an explicit target.

Access to electricity can improve socio-economic conditions in developing countries through its influence on key components of poverty, namely health, education, income and environment (Kanagawa and Nakata, 2008). Electricity alone may not be able to create all the conditions for economic growth, but it is obviously essential for basic human needs and economic activity (IEA, 2017). Electrification schemes in rural remote areas can be seen as an innovation to replace traditional fuels and consequently people may struggle for it. It is the provision of electric lighting that leads to less eyestrain because of increased and consistent (no flickering) lumen output in the surrounding atmosphere. Eyestrain is commonly associated with the usage of kerosene lanterns (the common form of lighting in rural areas). An electric light can signify a higher and improved social status within the community that is one of the perceived benefits from electricity in rural villages (Matinga and Annegarn, 2013). Increased awareness from access to TV and radio; extended access to education (schools are able to extend opening hours into the evening as a result of electric lighting); and exposure to standards of living associated with different cultures (users may relate electricity consuming activities to urban or 'western' demographics), which may also arouse curiosity. Electricity may provide a sense of **security** through improved lighting and lower risk of fuel shortage. Ownership of development initiatives as a means to sustainable community development, true

participation ensures people take ownership and infrastructure is maintained and repaired locally, based on a sense of local ownership that includes community involvement, user training, and contributions in kind (material or labour). (Yadoo and Cruickshank, 2010).

Rural electrification program seems to be crucial to improve living conditions and promote development; however, there is also a need for evaluation of such programs' impacts to determine whether or not interventions are relevant and cost effective. Lack of access to energy in rural areas and more precisely to electricity is one of the major hurdles to economic development (Khandker, Barnes, & Samad, 2009, cited in Torero, 2015). Electricity use is interconnected through complex casual relations with multiple dimensions of socio-economic development, viz. income generating activities, market production and revenues, household economy, local health and population, education, and habits and social networks (Riva et al., 2018). Access to electricity is considered an essential element in the sustainable development of rural areas and an enabler for countries to achieve their Millennium Development Goals (Nanka-Bruce, 2010).

Rural electrification is a complicated issue because of user affordability, rural inaccessibility and remoteness, low population densities and dispersed households, low project profitability, fiscal deficit, scarcity of energy resources, population growth, lack of professionalism, and over-dependence on subsidies (Lahimer et al., 2012). Rural electrification is seen as a key mechanism to improve living standards; increase income through income generating activities and improve community services such as education and healthcare (Practical Action, 2013). Rural electrification in Nepal is very expensive due to the topographical conditions and at the same time the purchasing power of the consumers very low (NEA, 2020).

Provision of electricity has excellent potential to improve livelihoods and stimulate economic growth in the working areas of influence. Rural electrification schemes are important factors in supporting the goal of the Government's development Plans to decrease poverty incidence in respect of social and resettlement issues. Electromechanical Design Division (EMDD) of Engineering Services, Nepal Electricity Authority (NEA) has conducted a techno-feasibility study for rural electrification in two Rural Municipalities of Nawalparasi (East) District. The socio-economic study of these two Rural Municipalities was a part of techno-feasibility study works.

The main purpose of the study was to finalize provision of rural electrification by extending NEA's existing rural distribution system supplied from the national transmission grid to the two rural municipalities of Nawalparasi (East) district. The specific objectives were to identify the socio-economic status of the local people and also measure their perception on willingness to pay for hydroelectricity.

Conceptual Framework

Energy access in the form of electricity is considered an essential element and potential to improve living standards, livelihoods and stimulate economic growth, increase income through income generating activities and improve community services such as education, healthcare and environmental preservation. Hydropower is an environment friendly source of energy. Being the access to energy would improve health outcomes and reduced mortality through improved indoor air quality from changes in lighting source. Education benefits through higher earnings for children living in electrified households that have higher educational attainment. Income benefits from access to electricity through new opportunities of work, especially in nonfarm activities. It enhances to use savings time from household chore in productive activities and domestic benefits. It also increases productivity of agriculture, home business through higher revenues and lower environmental contamination.

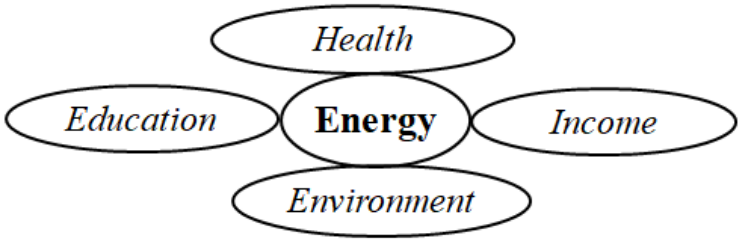

Figure 1: Conceptual framework of study

Approach and Methodology

The study has followed both qualitative and quantitative methods for socio-economic survey based on structure household questionnaires. A field survey has been conducted for the primary data collection. With reasonable sample size, HH survey has been carried out in study area. A Rapid Rural Appraisal (RRA) was envisioned to gather information concerning demography, economic activity, education, and health, commercial use of energy and availability and affordability of energy/fuel service. Figure 1 highlights study approach and methods. This process has been incorporated into each ward based on details consultations with stakeholders and local communities.

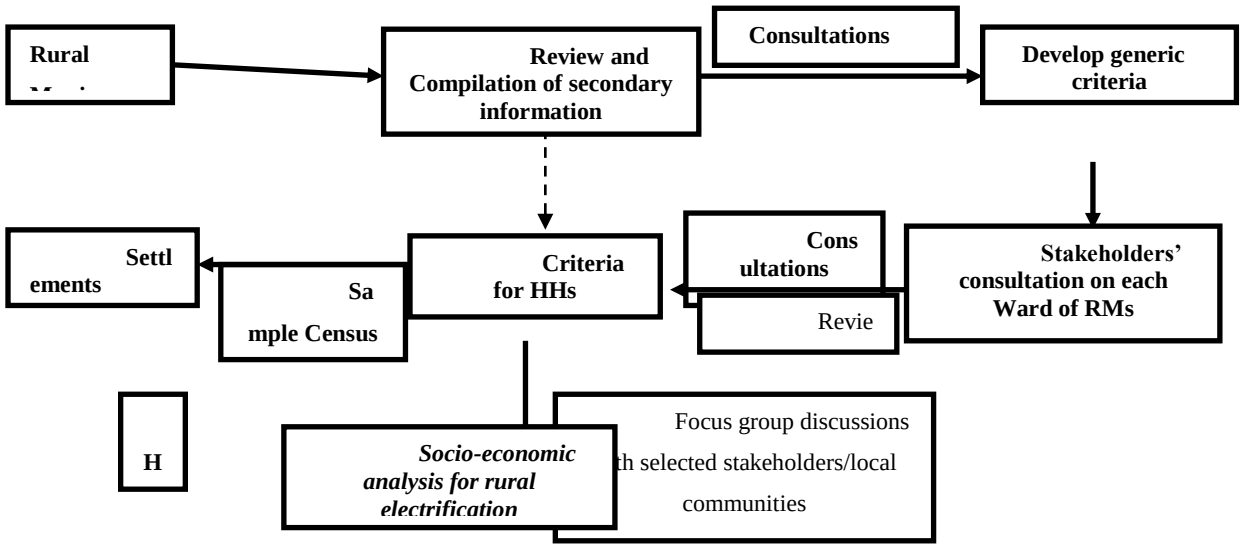

Figure 2: Schematic presentation of study methods

Sampling Design and Procedure

The sample survey has been designed at two levels, settlements and households. The settlement sample has been conducted to predict overall socio-economic status within different social groups, access on existing infrastructure facility, social impacts, ascertain the ability of stakeholders to benefit from the study whereas sampling of HHs has been carried out to understand their socio-economic condition and assess impact on poverty and ability/willingness to pay, identify vulnerable groups such as women headed households and ethnic minorities.

At least three settlements from each ward were selected after the consultation with stakeholders/local communities then household survey has been carried out among the randomly selected HHs in the ratio of 5:3:2(5 on highly vulnerable group, 3 on moderate and 2 on less vulnerable). Table 1 represents actual sample size and determined figure of settlements and HHs for field survey.

Table 1

Coverage Area by Spatial Units

Characteristics	Total	Covered	Percent
No. of wards	12	12	100
No. of settlements	145	36	25
No. of households	6485	325	5

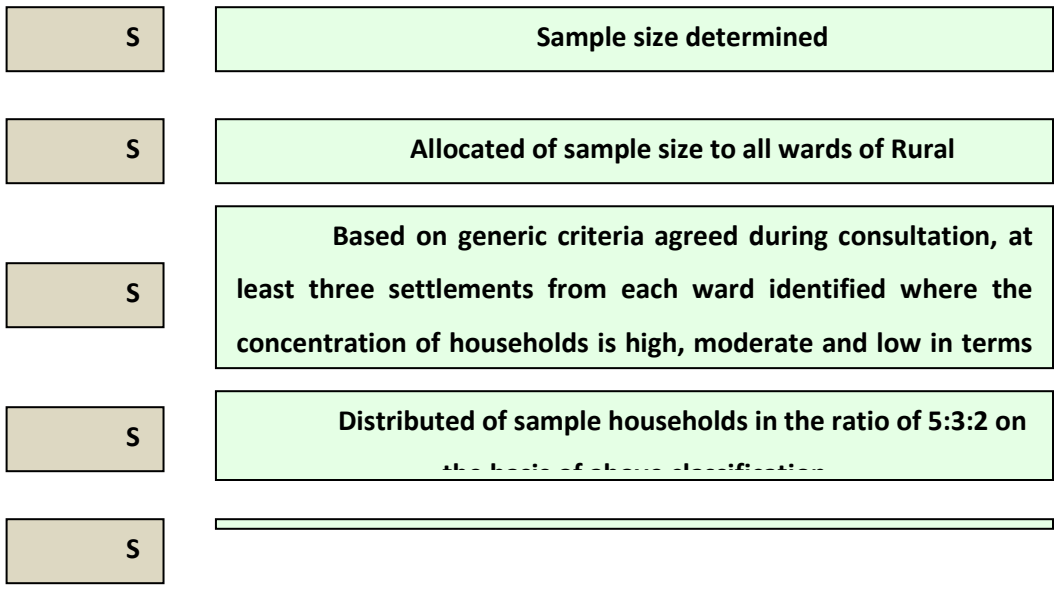

Figure 3: Sampling procedure for selection of households

Geographical Setting of the Study Area

Study area (part of Nawalparasi_East district) is extended from 27°38' to 27°52' North latitude and 84°02' to 84°21' East longitude geographically (Figure 4). Administratively, the study area consists of two Rural Municipalities (Bungdikali and Bulingtar). It has 239.54 sq km of surface area with the population of 34,856. Out of which 15,653 (44.9 percent) are male and 19,203(55.1 percent) are female, and the density of the population is 146 people per sq. km. which is less than comparison to the national figure (180). The literacy rate is 66.7 percent and the average household size is 5.4 (Table 2). The population below 15 years of age is 33.2 percent of the total population. On the basis of ILO criteria, the economically active population in the study area is 58.2 percent of the total population. The remaining 8.6 percent of the total population are above 60 years of age. The altitude ranges from 500 to 1936 meters above sea level. It is characterized by different climatic zones, sub tropical to warm temperate in Churia and Mid-hills. Where

temperature is recorded minimum of 5°ᶜ to maximum 37°ᶜ and annual average precipitation is 2145 mm.

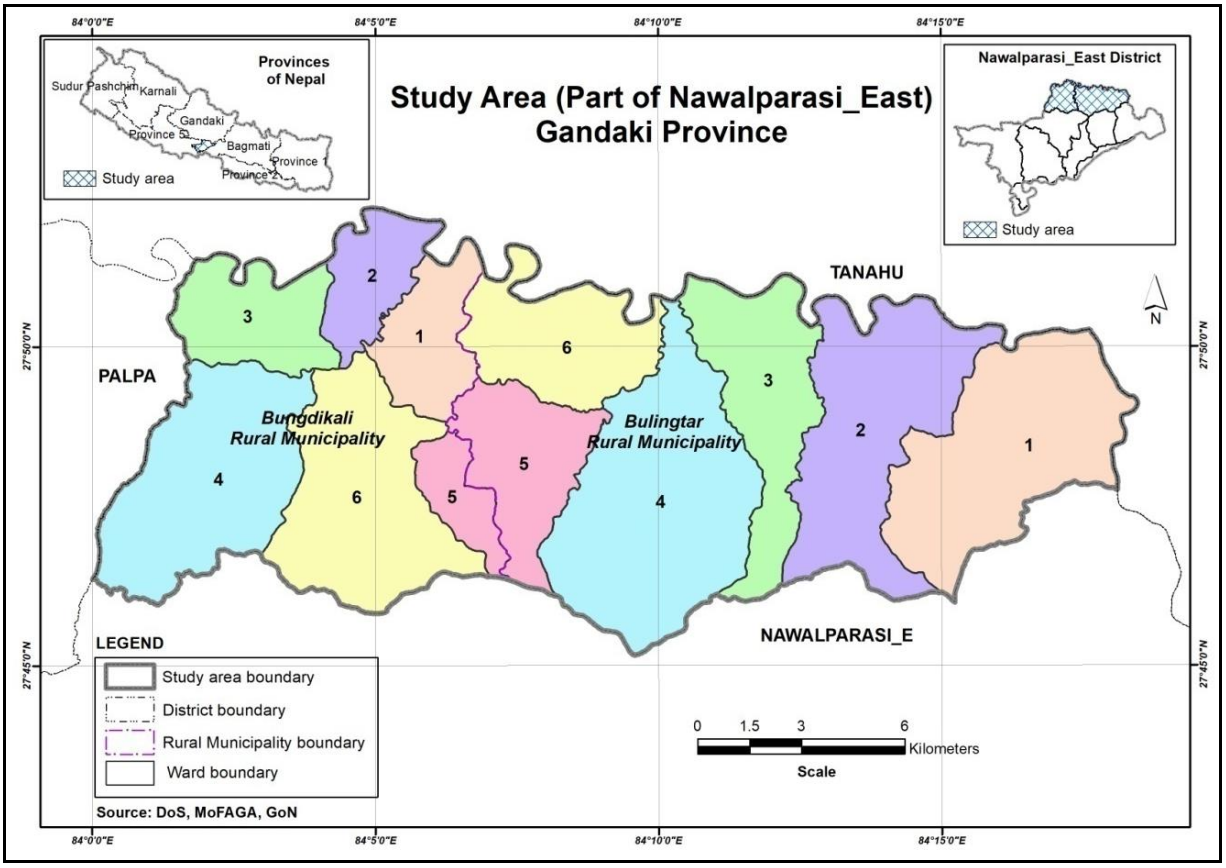

Figure 4: Location map of study area

Table 2

Distribution of Households and Population by Sex

SN	Local Units	HHs	Total Population	Male	Percent	Female	Percent	HH Size
1	Bugdikali RM	2,998	15,734	6,990	44.4	8,744	55.6	5.2
2	Bulingtar RM	3,487	19,122	8,663	45.3	10,459	54.7	5.5
	Total	6,485	34,856	15,653	44.9	19,203	55.1	5.4

Source: Field survey

RM = Rural Municipality

Social Composition of the Study Area

Ethnicity

The study area is a mixture of people of different origins, cultures, languages and ethnicities. The change in ethnic composition has been further accelerated by the arrival of outsiders into the area for various purposes such as business, agriculture and services. The study area is composed of many ethnic groups making up distinct communities according to altitude and climatic condition. Magars, Kami, Brahman (Hill) and Chhetries have settled mostly in the upper hills. In the study area, the majority of the people are of Magar caste (29.1percent) followed by Kami (6.2 percent) and then Hill-Brahmins (5.9 percent).

Religion and Language

In terms of religion, 87 percent population covered by Hinduism, which is dominant and followed by Buddhism (8 percent), Christian (3 percent) and others. Nepali (47.3 percent) is the main language widely spoken by all people for communication. Besides Nepali, the second most spoken language in the study area is Magar (35.0 percent) followed by Newari, Gurungs and others.

Disadvantaged Groups and Ownership of Women Under Property

Energy access improvement directly contributes to freeing up women and girls from time-consuming housework such as laundry, cleaning, etc. by utilization of electricity. In addition, through reduction of time-consuming chores and attainment of energy services, it has indirect contributions for women to have opportunity to attend schools or educational activities as well as take into a part in the labor market or establish small enterprises. As a result, gender equality and empowerment of women are promoted.

The largest disadvantaged groups within the population of the study area as defined by National Census, 2011 are Magar (29.1 percent), Gurung, Thakuri and so on whereas occupational caste groups/dalits groups such as Kami (Blacksmith), Damai (Tailor), and Sarki (Shoemaker) have also dominant role which occupied around 13 percent of total population. In another part, most of the women traditionally receive little or no education, and for traditional reasons do not generally seek employment and are confined to domestic chores. Responsibilities of women are primarily limited to take care of the household activities like cooking, washing, care of the children, sick person, as well as other daily survival needs for family members. In addition, women are actively

involved in agricultural labour. They are engaged in agricultural input and production as well as output management. However, the status of women in Magar, Gurung and Thakuri communities is comparatively better than that of other castes. There are about 7 percent of total households have female ownership under livestock, 6 percent households have female ownership under land and 0.6 percent has under house only.

Education

Educational attainment such as a literacy rate and enrolment in schools is one of the most fundamental elements of economic and social development. High illiterate rates have been the major obstacle of further progress in developing countries, preventing poor population from income-generating activities and attaining empowerment. It is presumed that advancement in the literacy rate is affected by five aspects: economic, educational, geographical, and social/cultural aspects as well as an aspect of electricity.

The national census 2011 reported that the literacy rate in the Nawalparasi (East) district is 71.7 percent for the population of six years of age and over. The male and female literacy rates are 76 percent and 59 percent respectively. However, the literacy rate in the study area is 66.7percent according to the census 2011, which is less than the district average. From the field survey, it reveals that the literacy rate is 60.1percent within study area which is comparatively lower than other areas.

Health and Sanitation

Using modern energy reduces exposure to hazardous pollutants. Avoiding drudgery such as collecting fuel wood improves health condition of, in particular, women and children. Access to electricity enables vaccination and medicine storage by a refrigerator.

Due to poor transportation facilities, lack of proper drainage system, etc., people of the study area facing severe health problems. Despite the existence of sufficient health institutions in the study area, there is lack of health services. The entire population depends upon the facilities available in the adjoining health centres from different location of the district. The health posts and the sub-health posts located at different places provide health care facility for the people of the district. The present sanitation facilities in the study area appear to be satisfactory. There is a pipe water system in most of the houses. Most of the pipe water facilities are provided from small rivers and

springs. Out of the total population, 85 percent use pipe water, 11 percent and 4 percent use dug-well and river water respectively. Open defecation along the river or in the open fields is also common practice (56 percent) in the study area. Only 44 percent of the households in the study area are equipped with toilet facilities.

Transportation and Communication

Transportation facilities are moderate in the study area. More or less, most of the wards have seasonal motor able road facilities. An earthen fair-weather road starts from Daldale, Pragatinagar and Bhedabari area of Nawalparasi (East), which are joining as a feeder road links with East-West highway. However, there are not reliable vehicles movement along the road network.

Communication facilities are better in the study area in comparison with other rural and hilly areas of the country. There are land line telecommunication facilities in the southern parts within study area. In addition, CDMA and other NTC Mobile systems are operating in most parts of study area. The Illaka post office is located in Bulingtar and additional post offices are located in each ward, which are very useful to communicate the local people with their relatives outside the village or abroad resides.

Economic Condition of the Study Area

Land Cover/ Land Use and Average Holding Size

Forest and cultivated land are the predominant form of land cover/land use in the study area. Other types of land cover/land use in the study area consist of open forest like grazing and shrub land, built up area, sandy and barren lands. Agricultural land is generally located along the river basin and its tributaries on relatively fewer steep slopes near the settlements. Forestland is primarily found on steep sloped hillsides.

Around 51 percent of total households within study area have occupied more than 10 ropani land for agricultural production in terms of size. Similarly, 36 percent have occupied 6-10 ropani, 11 percent have occupied 1-5 ropani of land and very few proportion of households (2 percent) have occupied small patches (below 1 ropani) of land for cultivation of crops.

Crop Production and Cropping Pattern

The major crops grown in the study area are maize, millet, wheat, paddy, barley, ghaiya, ginger, pulses, oilseeds, etc. Similarly green vegetables, fruits like orange, banana, pear etc. are also produced in the area. There are some new crops like coffee,

amriso, Junelo and bamboo leaf (tama) are also produced in this area. The cropping pattern varies from site to site depending upon altitude, land quality and availability of irrigation. More fertile and year-round irrigated lands are cultivated three times a year whereas non-irrigated lands are cultivated once a year. The selection of crops is based on the land quality and irrigation facilities available. The cash-crops of the study site constitute of ginger, fruits like orange, banana, pear and vegetables like pidalu, besar etc. The selection of crops to be cultivated in some area appears to be influenced by the dominance of ethnic group and local culture. For example, in the upland area, maize and millet are predominantly grown because the major ethnic groups like Magar, residing in the area have traditionally been using these grains for various purposes. In the absence of irrigation (Bari), the cropping pattern is mostly dominated by three cropping systems comprising of maize, millet and ginger.

Livestock

Livestock and agriculture are integral parts of the agrarian society. Households in the study area raise livestock both for cash income and farming purpose. Livestock raising activities are carried out by most of the households in this area irrespective of their caste, culture, climate or topography. However, the number and type of livestock vary across the village and ethnic groups. They also vary according to the topography and the climate. The major types of livestock raised in the area are goat, sheep, pig, cow, buffaloes and ducks. In addition, some of the households are also involved in poultry farming. Buffalo and cow are raised by most of the ethnic groups mainly for milk, ghee and manure. In addition, Magar community raise buffalo for meat. Similarly, goats and sheep are raised mainly for meat. Also, poultry are kept mainly for meat and eggs.

Income Source and Occupation

The major source of income in Nawalparasi (East) district is agriculture and animal farming. The economically active population of this area is 58 percent, out of which 81 percent are employed in agriculture and animal husbandry, and rest are in business and services. Therefore, the non-farm source of income is very few. However, remittance from foreign job playing vital role as another source of income for the livelihood of the people. The field survey revealed that agriculture is the main source of livelihood for the people. However, in recent years, many young people go to foreign

countries to work as labourers. As far as the study area and Nawalparasi (East) district is concerned, the level and structure of consumption are more or less similar to the rural settings of the country. Most of the expenditure is for the consumption of food items leaving little for education, health, energy and other non-food items.

Daily Wages Status

According to field survey, it is found that most of the area has not similarity in daily wages by sex. 59 percent of total male receive more than Rs. 400 wages whereas 64 percent of female receive less than Rs. 350 wages after serving the work in different sectors. But, there is equal rate for male and female in few wards as they reported during field survey.

Food Sufficiency Status

As being hilly region with moderate slope and rugged topography, life is very difficult in this area. Most of the people depend on agriculture and they have to survive from their own production. However, they have some alternate source of income to support their livelihood in some families within the study area. According to field survey, the local people indicate that 25.5 percent of total households have food deficiency for around 6 months. They can feed themselves only 6 months from their own land production and 40 percent family have food deficiency for around 3 months. So, these families have forced to be involved in other activities for their livelihood. It is found that, the economic condition of 71.5 percent among overall people and 59 percent among DAG people getting better in comparison between past 10 years and now.

Sources of Energy and Consumption

Energy

The study area has no electricity. The major source of energy for cooking is firewood whereas for lighting is kerosene. According to the field study, it reflects that 51 percent households still using kerosene and 39 percent households use solar for lighting. (Some households use kerosene and solar both as a source of energy for lighting). Apart from this, some parts of the Bulingtar RM are electrified through micro-hydro schemes utilizing small local rivers.

Monthly Consumption and Cost for Used Energy

Field survey reveals that the cost of kerosene is ranges from Rs.120 to Rs. 160 for per liter in different location within the study area. Around 46 percent of households consumed more than 3 liters of kerosene per month. Households are paying monthly Rs. 120 for getting energy from micro hydro instead of using one lamp/bulb.

Willingness to Pay for Hydroelectricity

Out of the total households, 66.8 percent of HHs claim to be willing to pay Rs. 1500 for meter connection where as 33.2 percent households are agreed to pay more than Rs. 1500. In another part, most of the households (71.7 percent of the total) are expecting and willing to pay in installment basis of Rs. 500/- for meter connection and about 10.5 percent are agreed to collect more amount of installment, which may exceed Rs. 500 to 1000 and rest 12.3 percent of households are suggested to pay in one time for total cost. Similarly, 50.2 percent of households claim to be willing to pay Rs. 100-150(in average Rs. 125) as a minimum monthly cost and 15.2 percent of households agreed to pay above Rs. 200 as a maximum monthly cost. However, 11.1 percent of households are suggested and agreed to pay based on their utilization unit and government targeted cost whatever it required.

Table 3

Willingness to Pay for Hydroelectricity by Wards

SN	Local bodies	WN	Sampled HHs	For meter connection(NRs.)		Willing to pay in Installment				Monthly Bill				
										Minimum			Maximum	
				< = 1500	> 1500	500	501-1000	> 1000	Not required	< 100	100-150	150-200	> 200	As used
1	Bungdikali RM	1	30	25	5	25	3	1	1	5	20	0	0	5
2		2	23	8	15	14	4	2	3	5	11	0	5	2
3		3	32	21	11	22	4	3	3	3	16	4	6	3
4		4	28	15	13	20	4	0	4	1	18	3	3	3
5		5	26	15	11	16	0	0	10	4	13	2	4	3
6		6	22	21	1	20	0	2	0	2	11	1	7	1
7	Bulingtar RM	1	25	15	10	22	2	1	0	5	9	4	5	2
8		2	30	20	10	19	4	3	4	3	15	6	3	3
9		3	28	22	6	16	6	3	2	4	17	3	3	1
10		4	24	20	4	20	0	0	4	3	10	2	5	4
11		5	27	14	13	18	3	1	5	4	9	6	3	5
12		6	30	19	11	21	4	2	3	2	14	4	6	4
Total			**325**	**217**	**108**	**233**	**34**	**18**	**40**	**41**	**163**	**35**	**50**	**36**
			Percent	**66.8**	**33.2**	**71.7**	**10.5**	**5.5**	**12.3**	**12.6**	**50.2**	**10.8**	**15.4**	**11.1**

Source: Field Survey

Findings and Conclusions

Rural electrification is considered to fulfill the requirement for development intervention through improved health and education. The success of rural electrification schemes may be influenced by social, cultural and economic values and their applicable characteristics. Rural electrification is the process of bringing electrical power to rural and remote areas. Electrification schemes in rural remote areas can be seen as a novelty to replace traditional fuels and consequently people may strive for it. It is important as the benefit from rural-electrification schemes goes beyond power output, and can lead to long-term positive development when designed properly.

Crop production and animal farming are found as the major sources of income in the study area. The economically active population of this area is 58.2 percent, out of which 81 percent are employed in agriculture and rest are in business and services. Therefore, the non-farm source of income is very few. However, remittance from foreign job playing vital role as another source of income for the livelihood of the people. The field survey revealed that agriculture is the main source of livelihood for the people. However, in recent years, many young people go to foreign countries to work as labourers. The literacy rate in the study area is 66.7 percent. The major source of energy for cooking is firewood whereas for lighting is kerosene. The study reflects that 51 percent households still using kerosene, 39 percent households use solar whereas only 9 percent households use electricity for lighting through micro-hydro schemes. Having economically capable and socially aware with modern facilities and its implication on life support for the planning in targeted study area. Most of the study area (91 percent) has not available electricity facility but their positive willingness to pay for hydroelectricity is the major finding and step forward for the future planning of regular and reliable power supply to uplift their livelihood, reduce poverty and support on rural development activities.

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