Undergraduate Economic Review

Volume 4 | Issue 1 Article 14

2008

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Abstract
Discriminatory practices rooted in an ethno-caste system have dominated Nepal for centuries. This paper investigates the existence of such practices in Nepal's communal micro-hydro plants. A field research on the role of caste in influencing access to electricity was carried out in Ghandruk, Nepal. The research indicates that although the costs of establishing the micro-hydro plant is shared equally between user-groups, benefit sharing is highly uneven. This analysis demonstrates the need for development projects to be more aligned with socio-economic ground realities.

Undergraduate Economic Review

A Publication of Illinois Wesleyan University

Vol. IV-2007-2008

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(With Specific Reference to Ghandruk)

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[1] This project was made possible in part by a grant from the Rivers Institute at Hanover College.

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Discriminatory practices rooted in an ethno-caste system have dominated Nepal for centuries. This paper investigates the existence of such practices in Nepal's communal micro-hydro plants. A field research on the role of caste in influencing access to electricity was carried out in Ghandruk, Nepal. The research indicates that although the costs of establishing the micro-hydro plant is shared equally between user-groups, benefit sharing is highly uneven. This analysis demonstrates the need for development projects to be more aligned with socio-economic ground realities.

I. INTRODUCTION

1.1 Energy Resources in Nepal

No significant deposits of fossil fuel are available in Nepal. Hence, it relies heavily on traditional energy sources. The most dominant energy resource in the country is biomass. Forest resources are under increasing threat due to the excessive dependence on fuel wood, fodder, timber, and other forest products. It is estimated that about 44,000 hectares of forest area is degraded and deforested every year, while only about 4,000 hectares are reforested (CRTN, 2005). In the meanwhile, the mountainous landscape and high surface runoff found across the country means that it has great potential for hydropower generation. It is estimated that there is potential for 83,000 MW (Mega-Watts), of which about half is economically exploitable (Warnock, 1989). Large-scale hydroelectric installations have been constructed to tap this potential. According to the Nepal Electrification Authority, the total installed hydroelectricity generation capacity was 586 MW in 2002. By the same year, this power had been made available to 878,100 consumers through 1,982 Km (Kilometers) of transmission and distribution lines (CRTN, 2005).

Unfortunately, all the electricity distributed is largely consumed in urban centers and lowland areas. Due to the rugged and unstable topography of the country, the national grid that produces more than 95% of the total hydroelectricity generated is unlikely to connect itself to the rural parts of the country in the near future. One of the responses to this problem has been the development of local micro-hydro plants that electrify rural communities in remote and inaccessible areas of Nepal. A brief definition of a micro-hydro is that it produces 5-100 kW (Kilo-Watts) of electricity to satisfy needs on a village level. According to Fullford, Mosley, and Gill (2000), electrification through Micro Hydro for rural communities is a boon as it has 'proved very successful as a tool to help (them) develop their economic position and improve their life-style' without getting connected to the grid.

In the past, a combination of public sector credit through the Agricultural Development Bank of Nepal, private sector initiative, and technical and financial assistance through various agencies has enabled communities in remote areas of Nepal to own and use electricity through micro hydro plants. One important point to be noted is that a lot of these plants are owned and operated communally. Smith (1994) identifies communal involvement as one of the 'key factors for the success of village hydro-Electric programmes' as he explains that 'when a (communal) contribution, in terms of cash and/or labor is required, the villages will carefully consider whether the hydro-electric scheme is worth the investment'. Based on the experience of the Aga Khan Rural Support Programme who has installed 15 schemes in Northern Pakistan, he states that the schemes with an element of community involvement are the ones that are most reliable and fully utilized (Smith, 1994). Commenting on rural electrification through micro-hydro in Nepal, Fullford, Mosley, and Gill (2000) emphasize the role and importance of communal involvement by stating,

> 'The installation of a hydroelectric generation system often involves a whole community so that the community needs to be mobilized. This

involves setting up management systems, so that people can be held responsible for running the system. Usually a hydroelectric scheme is subsidized from outside, but the local people contribute labor for the civil works that need to be done'.

1.2 Caste and Ethnicity in Nepal

Discriminatory practices based on an ethno-caste hierarchy latently exist across Nepal today. The feudalists of Nepal that ruled the country for the past two and half centuries interlinked the legal system with the Hindu caste system. Consequently, the Nepalese society is highly stratified along the lines of caste and ethnicity with priestly *Brahmans* at the top, the *Kshatriya* (kings and warriors) just beneath them, and the *Dalits*, who are designated as 'impure', and 'untouchable' or *acchut* at the bottom (GSEA, 2005).

The lack of laws regarding caste-based discrimination is not an issue as such practices were officially abolished in 1963. In fact, Nepal's new constitution of 1990 describes Nepal as 'multi-ethnic, multi-lingual and democratic'. Furthermore, it declares that all citizens are 'equal irrespective of religion, race, gender, caste, tribe, or ideology'. Unfortunately, the enforcement of these laws is lax. In addition, discriminatory provisions still exist, such as the protection of 'traditional practices', which has been used to bar *Dalits* from temples and to permit continued caste discrimination. Consequently, caste-based discrimination, while diluted, remains today.

The caste hierarchy of Nepal plays a strong role in determining who does and does not gain access to political and economic power and resources. Information on the incidence of poverty by caste in Nepal demonstrates how the caste system influences the ability of different groups in gaining power and resources. According to it, the *Dalits* that are at the bottom of the hierarchy had the highest incidence of poverty in both 1995 and 2003. Similarly, the *Brahman* and *Chettri* that are on top had one of the lowest incidences of poverty for both years (GSEA, 2005).

1.3 Objectives of the Study

Having briefly discussed the role of caste in gaining access to power and resources in Nepal, this study seeks to examine the role of caste in determining a household's access to electricity and the ways in which caste can determine access to electricity in rural Nepal.

2. METHODOLOGY

2.1 Site Selection

In 2005, it was believed that 1,100 micro hydro plants existed in Nepal (CRTN, 2005). Consequently, in order to assess the existence, causes and implications of caste-based exclusion of micro hydro in rural Nepal, this study focused only on the 'Ghandruk Micro Hydro Plant'. Specifically, the study focused on the status of the *Dalits* living in the village in regards to their access to electricity generated from the plant. The plant is located in ward number five of Ghandruk Village Development Committee in Kaski district of Western Nepal. The nearest road to the plant is at about 6 hours walking distance at a place called Nayapul which is 43 km from Pokhara (Khennas S., & Barnett, A., 2000). The project started in November 1990 and was completed in 1992. It generates 50kW of electricity. The total project cost is USD 59,916[2].

The Ghandruk Micro Hydro Plant is considered to be one of the oldest and most successful communal Micro Hydro in Nepal. The local people provided labor worth USD 3,504 during the initial stage of building the plant. Apart from that, the Canadian fund provided USD 13,743, ACAP (Annapurna Conservation Area Project) provided USD 9,162 and the Agriculture Development Bank of Nepal provided a loan of USD 13,743 of which the Nepal government subsidized half. Most of the equipment needed for the

[2] All conversions from Nepalese Rupees to US Dollars in this paper are approximated and based on the exchange rates of July 19, 2007 as announced by the Nepal Rashitriya Bank.

project was designed and installed by Development and Consulting Service, a Nepali Non Government Organization. A British-based charity, ITDG (Intermediate Technology Development Group), now known as Practical Actions, which has a long experience in micro-hydro, provided technical support. The plant is managed by the communal Ghandruk electrification management committee.

In 2001, the village had a total population of 4,448 or 1,013 households. The village has a heterogeneous population with *Gurungs* being predominant. They constitute 62 percent of the total population, followed by *Dalits* (22 percent), *Magars* (six percent), *Brahmin*s (five percent) and *Chettris* (five percent) (Interdisciplinary Consultants, 2001). Only, six wards in the village, however, are electrified from the plant: wards 3, 4, 5, 6, 7, and 8.

As described previously, the *Dalits* are the poorest and most excluded caste group in rural Nepal today. Consequently, in this study, the Ghandruk Micro Hydro Plant and the *Dalits* were taken as representatives for communal Micro Hydro and excluded groups in rural Nepal.

2.2 Questionnaire Development

The questionnaire was developed based on the objectives of the study. Thus, its first goal was to retrieve data on factors that might help determine if caste influences a household's access to electricity from the Ghandruk Micro Hydro Plant. These factors were: the number of members per household, level of educational attainment of household heads, annual income per household, and the distance of a household from the micro hydro plant.

To assess how belonging to an excluded group might limit one from accessing electricity, questions related to the following issues were developed: financial condition, the initial distribution process, and the evolution of the use of electricity of respective households.

Finally, in order to assess the possible implications of caste-based exclusion to micro hydro plant and Nepal, questions regarding how the locals perceived the 'existent' unequal distribution of electricity in the village were developed. Since the village had recently undergone an insurgency, the political environment in the village was suspected to be volatile. Hence, direct questions regarding inequality and discrimination were not developed.

2.3 Data Collection

41 households were interviewed during the course of the research. For the field interviews, the sample was to be stratified along the lines of age, caste, gender, location, lodge ownership, and distribution of electricity in order to make it representative of the population of the electrified community in the village. No efforts were made towards including households from the none-electrified community in the remaining three wards. In addition, only the households that contributed labor when the plant was established in 1991 were interviewed.

Before starting field work, a focus group discussion and a pilot test were carried out in the village. The focus group comprised of five locals. The pilot test was conducted with a local *Dalit.* During the fieldwork, relevant documents were also collected of which the most important ones were: the current subscription list, the latest survey of additional demand for electricity in the village, and the costs and revenues balance sheet of the micro hydro plant for the past three years.

Apart from local villagers, experts on micro hydro were also interviewed in Kathmandu, Pokhara, and Ghandruk respectively. In Kathmandu, interviews were conducted with the executive officer for NTNC (National Trust for Nature Conservation) and the Team Leader for Practical Action, Nepal. In Pokhara, interviews were conducted with the current director of ACAP and a micro hydro specialist at ACAP. In Ghandruk, interviews were conducted with one of the two operators of the Ghandruk Micro Hydro, a member of the local electricity management committee, the chairman of the local electricity management committee and the manager of the Ghandruk micro hydro plant.

3. ANALYSIS

3.1 Descriptive Statistics

3.1.1 Data Collected

In this section, quantitative data collected during field work, which are the most pertinent, are discussed. As seen in Table 1 below, the average WATTS, or amount of electricity individual households subscribed to at the time of the field research, is 235 Watts. MEMBER is the number of members in each household. As suggested by the table, the size of an average household in the village is three. Similarly, the average INCOME, total annual income of households converted in US Dollars, is USD 745. EDUCATION is the years spent in school by the head of the interviewed household. The total years spent in school by an average household head in the village is three years. Finally, DISTANCE, is the total time in minutes it takes for an individual to walk from their house to the plant. Compared to other options, i.e. measuring the distance in meters, this approach was chosen because most villagers talked about distance in terms of minutes (on foot) and not meters. In addition, this was also more convenient for data collection.

Table 1:

Summary Statistics for Variables

	WATTS	MEMBERS	INCOME	EDUCATION	DISTANCE
Mean	235	3	745	3	14
Median	100	3	550	0	15
Maximum	1400	6	3668	10	25
Minimum	25	1	0	0	5
Std. Dev	310	2	936	4	5

In the electrified community of the village, the micro hydro provides electricity to a combination of 284 *Gurung*, *Dalit*, and other castes. Out of the 284, 216 (78 percent) are *Gurung*, 53 (19 percent) are *Dalits*, and nine (three percent) are of other caste. At the start, the tariff was set at a flat rate of USD .0076 per watt for ordinary households and of USD.0115 per watt for lodges. Later, beginning April 14, 2007, the village electrification management committee revised its policies and tariffs were set at a flat rate of USD.0122 per watt for ordinary households and at USD.0158 per watt for everyone using electricity for commercial purposes. Households are fitted with low cost circuit breakers. Power is automatically cut off when consumers use more than the wattage allocated.

The average monthly revenue generated by the plant calculated for the past two and a half year based on the original tariff policy charging USD .0076 per watt for ordinary households and USD.0115 per watt for lodges is USD 436. Average monthly revenue generated by the plant for the past three months after it imposed its revised tariff policy charging a flat rate of USD.0122 per watt for ordinary households and at USD.0158 per watt for everyone using electricity for commercial purposes is USD 578. As seen in Table 2 below, the average monthly revenue and cost of the plant for the past 32 months has been approximately USD 457 and USD 284.

Table 2:

Descriptive Statistics for Monthly Revenues and Costs of the Plant (2004-2007)

	Revenue (USD)	**Cost (USD)**
Mean	457	284
Median	440	293
Standard Deviation	60	95
Minimum	403	161
Maximum	667	482
Count (Months)	32	32

Source: Field Study, 2007

In 2006, the electrification management committee decided to replace many of its old equipment in the plant, i.e. nozzles, LC Board, runner, etc. It cost them about USD 8,398. In addition, in 2007, the committee decided to buy new police switches worth

USD 2,443. According to residents, these are the only major operation and maintenance costs incurred for the plant ever since it established in 1991. Currently, the committee has around USD 2,290 in a bank called the *Dwitiya Sanstha* (Secondary Institution) in Pokhara, Nepal. Several parts will require changing in the immediate future, i.e. the generator that might not work for more than an additional 5 years. If replaced, it will cost the villagers about USD 7,635.

The plant is managed by the Ghandruk Electrification Management Committee. Initially, the plan was for the committee to consist of eleven executive members: six nominated from each of the wards where the scheme provides service, three nominated from *Ghandruk Yuwa Samuha* (Ghandruk Youth Club), one nominated from among the ACAP officials, and the Ghandruk VDC chairperson as an ex-officio member. However, after the Maoist insurgency, no 'official' electricity management committee exists in Ghandruk as all the original and elected committee members have been chased out by the rebels. The committee has appointed three staff – one manager and two operators – to manage and operate the system. Each receives approximately USD 61 as a monthly salary.

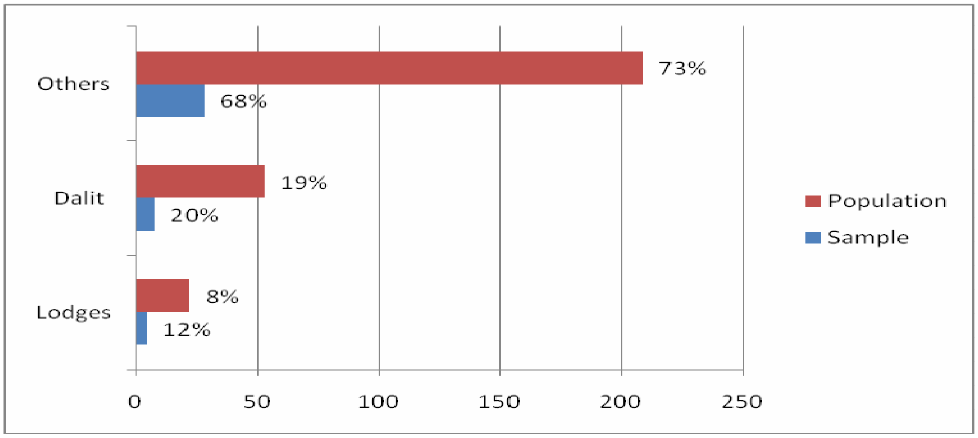
3.1.2 Stratified Sample

As previously mentioned, an effort was made towards making the sample representative of the population based on age, caste, gender, location, lodge ownership, and distribution of electricity. Consequently, the variation in the samples collected suggests that some success has been achieved in doing so.

As seen in figure 1, the population of the electrified community is constituted by 22 lodges, 53 *Dalit* households, and 209 other households. In the meanwhile, the sample is constituted by five lodges, nine *Dalit* households, and 27 others. Consequently, the percentage of lodges (12%) and *Dalit* households (20%) in the sample is very close to the percentage of lodges (8%) and *Dalit* households (19%) in the population of the electrified community.

Figure 1:

Comparing the representation of *Dalits* and Lodges in the Sample and Population

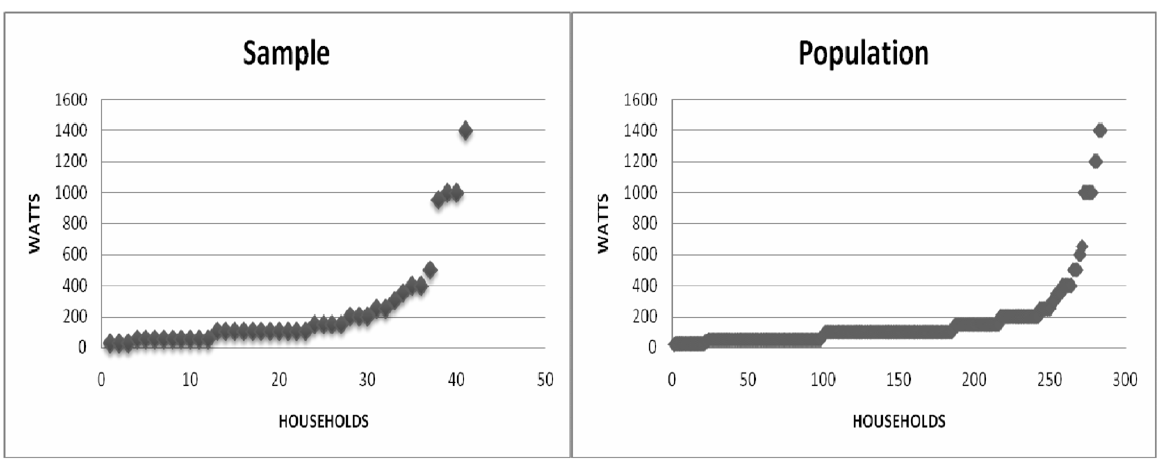


Source: Field Survey, 2007

Similarly, as seen in figure 2, success has also been achieved in making the distribution of electricity in the sample representative of that in the population. In figure 5, the x and y axes represent the households and the Watts of electricity they are subscribed to. The households in both the sample and population in the figure have been arranged in ascending order (based on Watts subscribed) from left to right. As can be seen, the curves of distribution of electricity for both the sample and population are almost identical.

Figure 2:

Comparing the Distribution of Electricity in the Sample and Population



Source: Field Survey, 2007

An effort was also made towards making the sample representative of the wards and women in the village. In regards the wards, success was achieved as out of the 41 households, 14, 10, 5, 1, 5, and 6 were from wards 3, 4, 5, 6, 7, and 8 respectively. In addition, 10 out of the 41 interviewees were women. Interviewing more women was difficult considering that household heads in Ghandruk were predominantly male. Finally, some success was gained in including as much elder people in the sample. The logic behind trying to do so was that they were most likely to know about the MHP since its installation in 1991. The mean age for the 41 interviewees was 57 years, with the oldest interviewee being 83 years old and the youngest being 27 years old (See Table 3 below).

Table 3:

Descriptive Statistics for AGE in the sample

AGE	
Mean	57
Median	59
Minimum	27
Maximum	83
Count	41

Source: Field Survey, 2007

3.2 Distribution

3.2.1 Regression Analysis

In order to investigate if caste plays a role in determining a household's access to electricity, a cross-section regression analysis in OLS (Ordinary Least Squares) was run based on data collected from 41 households in Ghandruk. The regression model used in order to do so is as follows,

$$WATTS = \beta_0 + \beta_1 \text{MEMBERS} + \beta_2 EDUCATION + \beta_3 LODGE + \beta_4 INCOME + \beta_5 CASTE + B_6 DISTANCE$$

Descriptions of the variables used in the model can be seen in Table 4 below,

Table 4:

Describing the Variables

VARIABLES	DESCRIPTION
WATTS	Subscribed Electricity per household
INCOME	Annual income per households (in USD)
LODGE	Dummy Variable: Lodges - 1 and Others - 0
EDUCATION	Years spent in school per household head
MEMBERS	No. of members per household
DISTANCE	Minutes taken to walk to the MHP
CASTE	Dummy Variable: Dalits-1 and Others – 0

The first independent variable is *MEMBERS.* Since, the more members, the higher demand for electricity in a household and vice versa, it is hypothesized that *MEMBERS* should positively correlate with *WATTS*. The second independent variable in the model is *EDUCATION*. Since one would expect that with more education, a household would be aware of the benefits of electricity and want more electricity, it is hypothesized to have a positive relation with *WATTS*. The third independent variable used in the model is *LODGE*. Since the lodge owners are the local elites, it is hypothesized that lodges will have access to more electricity compared to ordinary households. The fourth variable used is *INCOME*. Since, a higher income means that a household is capable of paying for more electricity compared to others; it is expected it to have a positive relation with *WATTS*. The fifth variable in the model is *CASTE*. Since, the *Dalit* are a marginalized group, they are expected to have access to significantly less *WATTS* compared to other castes. Finally, the last independent variable is *DISTANCE*. The further a household is from the plant, the more expensive it is to provide electricity to it and vice versa. Hence, it is expected to have a negative relationship with *WATT*S.

Table 5:

Cross-Section Growth Regressions

Dependent Variable: WATTS

Method: Ordinary Least Squares

Included observation: 41

VARIABLES	COEFFICIENT	T-STAT	PROB.
MEMBERS	19.22	1.06	0.29
	(18.1)		
INCOME	0.06**	2.17	0.03
	(0.03)		
LODGE	696.73***	8.11	0
	(85.81)		
EDUCATION	-2.08	-0.27	0.7
	(7.43)		
CASTE	-121.49*	-1.76	0.08
	(68.87)		
DISTANCE	-2.93	-0.51	0.60
	(5.65)		
OBSERVATIONS	41		
R-SQUARED	0.81		
ADJUSTED R-SQUARED	0.78		
OBS*R-SQUARED	19.32		

As can be seen in the OLS estimations of the regression in Table 5, the significant variables are *INCOME*, *WEALTH*, and *CASTE*. All other variables correlate insignificantly to *WATTS*. The coefficient for *INCOM*E is .06. This means that a USD 1 increase in annual income is associated with an increase of subscribed *WATTS* of .06. The coefficient for *LODGE* is 696.73. This means that an average *LODGE* has access to significantly more Watts than an ordinary household. Finally, the coefficient for *CASTE* is -121.49. This indicates that, a *Dalit* household in Ghandruk compared to households belonging to other caste groups subscribes significantly less electricity. Clearly, the regression analysis indicates that caste-based exclusion from access to electricity does exist in Ghandruk.

In order to see if there was a problem with imperfect multicollinearity, A the correlation matrix between the independent variables was constructed and investigated to make sure none of them had very high correlations (see Table 6 below). In addition, comparing the observed R-Squared with critical values in the chi-square table, the null that there is heteroskedascticity in the model can be rejected.

Table 6:
Correlation Matrix for Independent Variables

	INCOME	LODGE	EDUCATION	MEMBERS	DISTANCE	CASTE
INCOME	1	0.52	0.13	-0.07	-0.01	-0.32
LODGE	0.52	1	-0.01	-0.06	0.25	-0.18
EDUCATION	0.13	-0.01	1	0.44	-0.401	-0.13
MEMBERS	-0.07	-0.06	0.44	1	-0.11	0.36
DISTANCE	-0.01	0.25	-0.4	-0.11	1	0.11
CASTE	-0.32	-0.18	-0.13	0.36	0.11	1

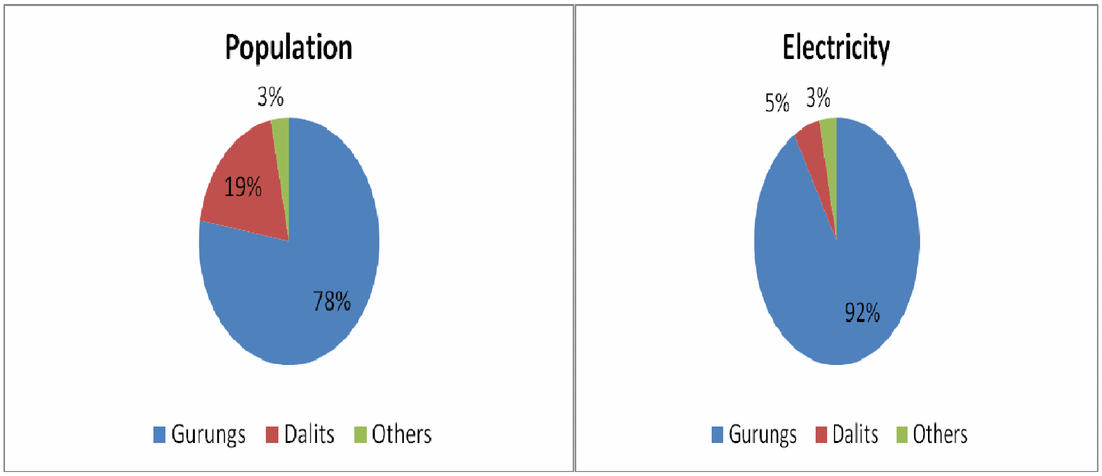
3.2.2 Further Evidence

As we see in Figure 3 below, out of the 283 electrified households, 216 belong to the *Gurung*, 53 belong to the *Dalits*, and nine belong to other caste groups. Consequently, the *Gurung* households that make 78% of the population have access to 42,745 Watts or 92% of electricity while the *Dalits* that make for 19% of the population have access to

2,410 Watts or 5% of electricity. The others that make for 3% of the population have access to 1,575 Watts or 3% of the electricity.

Figure 3:

Distribution of Population and Electricity across Caste-Groups



Source: Field Survey, 2007

In addition, while a household belonging to a *Gurung* or 'other' caste group, on average, have access to 198 and 175 Watts respectively, a *Dalit* household, on average has access to 46 Watts of electricity (for more details see Table 7 below).

Table 7:

Descriptive Statistics: Access to Electricity of Different Ethnic Groups

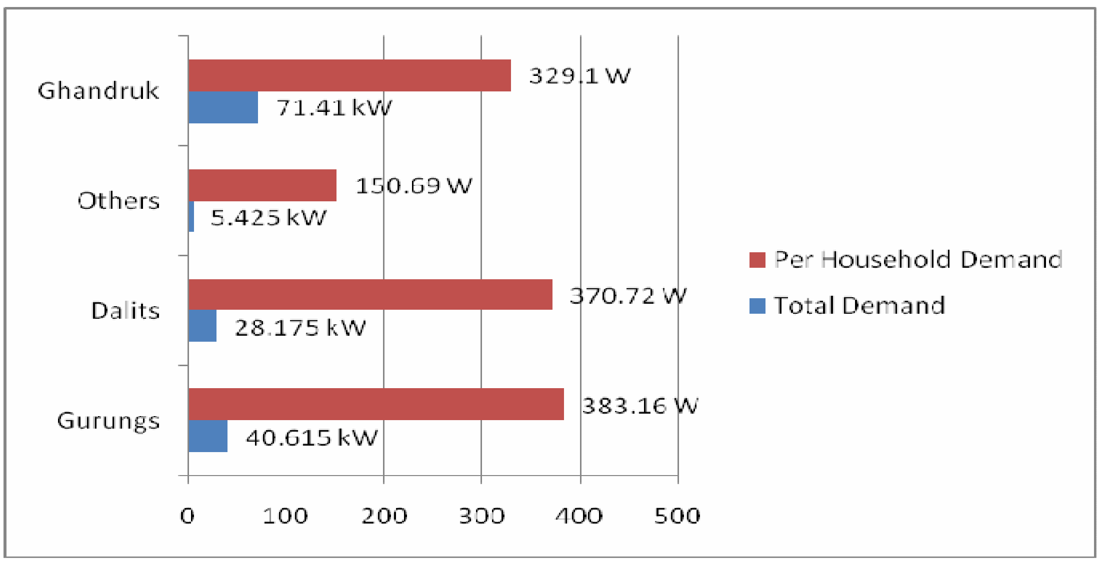
	GURUNG	***DALITS***	**OTHERS**
Mean	198	46	175
Minimum	25	20	25
Maximum	1400	100	350
Sum	42745	2410	1575
Count	216	53	9

Source: Field Survey, 2007

Given the fact that the labor contributions from the village were equally distributed between the households, the argument goes that benefit sharing should be equal too and the *Dalits* that make for 19% of the population should gain access to 19% of the electricity generated. One way in which the inherent inequality in distribution could be justified is if the *Dalits* were not to demand for additional electricity. However, this is not the case as we see in Figure 4. The total addition demand of the *Dalits* for electricity is 28.175 kW at an average of 370.36 Watts per household, almost as much as per household demand of the *Gurung* households which is 383.16 Watts. Similarly, per household demand of the *Dalits* is more than that of those belonging to other castes (150.69 Watts) and the village itself (329.10 Watts).

Figure 4:

Additional Electricity Demanded in 2007



Source: Field Survey, 2007

3.3 Determinants of Exclusion

3.3.1 Financial Status

In the regression analysis, it was observed that both *LODGE* and *INCOME* were significantly related to *WATTS*. Lodge owners are the local elites in the village. As suggested by figure 1, the *Dalits* are the poorest caste-group in Nepal. In addition, they have the lowest annual income in the electrified community of the village at USD 138 per year per household compared to USD 2,084 and USD 687 per year per household for lodge owners and others (households that are neither *Dalits* nor lodges). These calculations are based on data collected from the sample of 41 households. Clearly, financial status does play a large role in determining who does and who does not gain access to electricity. Consequently, the poverty of the *Dalits* can be put down as one of the reasons why they have access to negligible amount of electricity. Nevertheless, looking at the large demand for additional electricity made by the *Dalits* (28.175 kW) and the extremely low tariff rates at which electricity is available in Ghandruk, there seem to be other factors too that might have contributed to the unequal distribution.

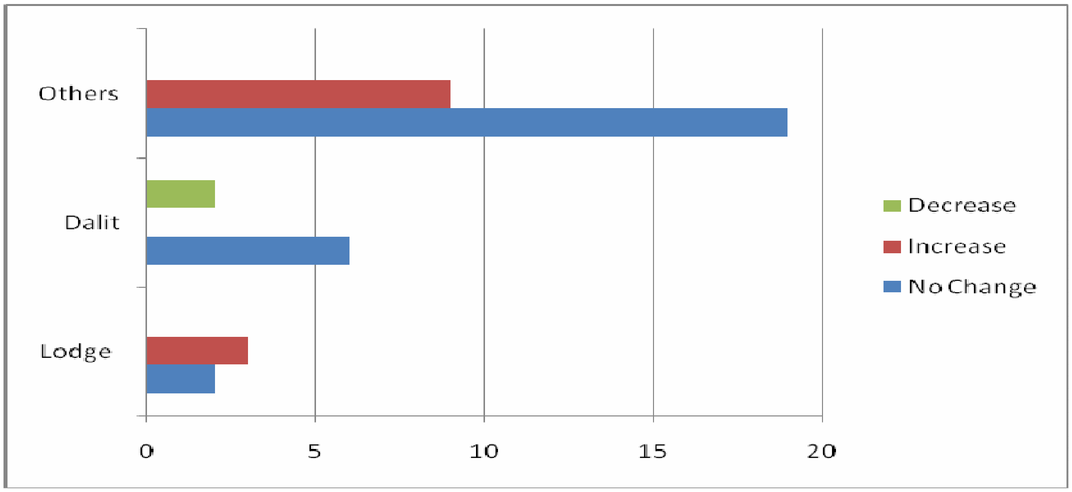
3.3.2 Social Status

The distribution pattern that was set in 1991 (Phase I and II), is not set in stone. Throughout the past 15 years or so, local households have been trading their electricity with one another with out any interference of the local electrification management committee. In the electrified community of Ghandruk, households are free to buy and sell electricity from one another. Consequently, it is possible for a household that had a certain Watts of electricity in 1991 to have more electricity today. It can buy or even rent electricity from a neighbor or relative. Similarly, new households established in the village after the distribution of electricity in 1991 can have access to electricity through the same process. The interviewed experts made it clear that all the electricity generated from the plant is distributed and the electrification management committee can no longer provide additional electricity to anyone. Nevertheless, due to trading of electricity among villagers, the distribution pattern is always changing.

As seen in figure 5 below, out of the five lodges that were included in the sample, two stated that their subscribed wattage had remained the same while three expressed that they had increased their subscribed wattage over the years. Similarly, out of the eight *Dalit* households, six had experienced no change while the subscribed wattage of two had actually decreased. Finally, for the group that fell in neither category, 19 had experienced no change while nine had increased their access to electricity.

Figure 5:

Changes in Access to Electricity



Source: Field Survey, 2007

Similarly, in 1999, 16 lodges had subscribed to a total of 17 kW of electricity at a rate of 1.06 kW per lodge. At that time, the lodges had subscribed to 33% of the total electricity generated from the MHP (Thumim, 1999). In 2007, however, 22 lodges are subscribed to a total of 18.25 kW of electricity at a rate of 829.4 Watts per lodge. Today, the lodges have subscribed to 38% of the total electricity generated from the plant. In a sense, the access to electricity of lodge owners over the years has increased by approximately 15%.

Clearly, the scenario presented does not look good for an excluded group like the *Dalits*. When locals in a community like Ghandruk constantly trade electricity with one another, marginalized groups like the *Dalit* have the most difficulty in acquiring more electricity due to their social status. Apart from financial incentives, locals selling or renting electricity are bound to have a social incentive to do business with a household that belongs to one's own caste group or one that can be considered an equal. Hence, social status is another fact that affects distribution.

3.3.3 Lack of Awareness

Finally, one another factor apart from wealth, and status that explains the highly uneven distribution of electricity in Ghandruk is the way in which electricity distribution took place in 1991. The distribution of electricity in 1991 took place in two phases. In the first phase, the management committee went to households and asked them how much electricity they wanted. Consequently, at the time, there was a demand of only 33.775 kW. This was problematic to the committee and the villagers as selling only 33.775 kW would not generate the needed revenue. Consequently, the committee and villagers together persuaded the lodge-owners to purchase the surplus electricity.

Table 8 below compares the distribution of electricity in 1991 after the first phase when only 33.775 kW were distributed with the current subscription of electricity in Ghandruk. The standard deviation and mean for 1991 are 180.58 and 141.31 respectively. The coefficient of variation for 1991 is thus 1.28. This implies that distribution of electricity after the first phase itself was highly uneven. However, the standard deviation and mean for 2007 are 239.52 and 171.05 respectively. This means that the coefficient of variation for 2007 is 1.4. Clearly, the data indicates that the coercing of lodges to subscribe to more electricity in the second phase of distribution increased the uneven distribution of electricity in Ghandruk at the cost of the *Dalits* who contributed equally.

Table 8:

Comparing Distribution in 1991 and 2007

	1991	**2007**
Mean	141	171
Standard Deviation	180	239
Minimum	25	20
Maximum	1000	1400
Count	239	284

Source: Calculations based on current subscription list and data from Kapali, 1997

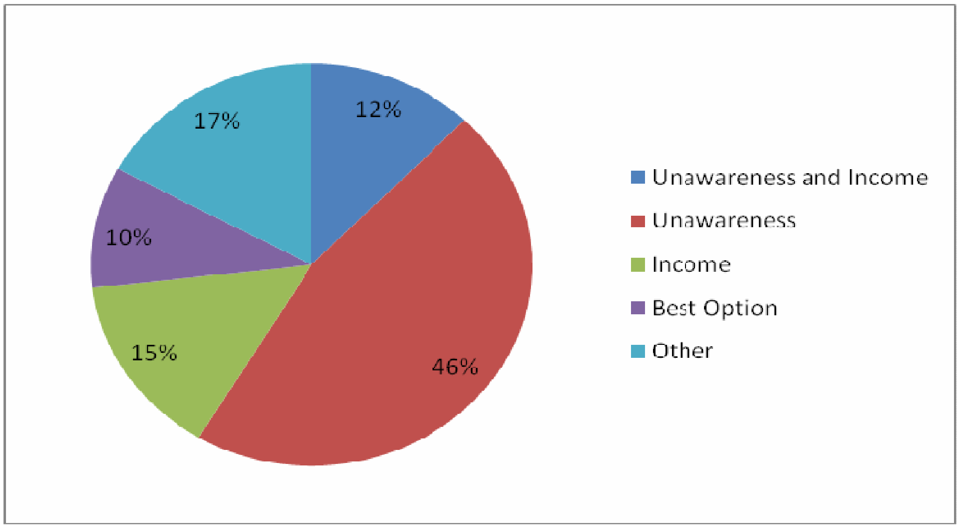
Interestingly, unlike in 1991, when there was a demand for only 33.775 kW, today demand for electricity in the village has increased substantially as the latest survey shows that the total demand for additional electricity in the six wards is 71.415 kW (see figure 7).

According to basic economic principles, something must have changed tremendously for this surge in demand. The change could have been in the population of the villages, the income of the villagers, prices of related goods, expectations of villagers, or the taste and preferences of the villagers. Many in the village believe that the population of the village, instead of increasing, has decreased over the years as many people are emigrating abroad and to the cities in search for better opportunities. Similarly, the income of the villagers could not have been a factor either as there does not seem to be any sort of economic boom in the village with the recent Maoist insurgency that lasted for more than ten years. Consequently, the reason why demand for electricity has increased over the years is because people have now become aware of the widespread uses and benefits of electricity that they were not during the implementation stage of the project.

When the villagers where asked why they demanded for so little electricity in 1991, 46% of the interviewees replied that they did so due to unawareness of the widespread uses of electricity. In addition, 12 % of the respondents pointed out a mixture of unawareness and income constraints as being the reason. Similarly, 10% of the respondents stated that the wattage they subscribed to was their best option, 15% stated that they had financial constraints and 17% of the respondents cited other reasons. Consequently, when the experts were asked if the locals might have demanded for more electricity in the first phase had they been better educated about the benefits of electricity during the implementation stage, all of them agreed. Clearly, the distribution of electricity would have been more equitable had things been different right from the start.

Figure 6:

Reasons for Limited Demand in 1991



Source: Field Survey, 2007

Unfortunately, the people that suffered most from this policy error were the poor and excluded groups (i.e. *Dalits*) that were least likely to have known about the widespread benefits and uses of electricity. During the interviews, many locals expressed that back in 1991 the only electrical appliances they properly knew of were light bulbs: most didn't know how electricity could be useful, apart from lighting a bulb on the inside and outside of the house. In addition, it appears that one of the other deterrents for the locals was the fear that electricity is something dangerous: electricity can cause short circuits and shock people to death.

4. DISCUSSION

Donor funded micro hydro projects requiring communal involvement (equal cost sharing among community members) have come a long way, yet the unequal sharing of benefit based on an age old discriminatory caste system is unjust. Apart from being unfair, such practices threat the long run stability of micro hydro plants by brewing animosity amongst the subalterns. During the field study in Ghandruk, it was found that talks of an equal redistribution of electricity had been frequently brought up in local meetings over the past 15 years. Similarly, many of the *Dalits* that were interviewed expressed that they felt exploited and mistreated by the powerful and the system. Consequently, whilst successfully bringing electricity and the benefits of modernization to a few local elites, the micro hydro plant has bred immense animosity in the village between the haves and the have not's. If the 'past' Maoist insurgency and the ongoing upsurge in the plains of Nepal is anything to go by, one can see how the caste-based exclusion of the *Dalits* could mean problem for both the micro hydro plant and the village. In addition, ensuring more inclusiveness across development projects like communal micro hydro plants is also in the interest of the nation as a whole.

Developmentalism, since its birth in the mid 20th century with the establishment of the World Bank and the International Monetary Fund has viewed poverty as a purely technological problem having nothing to do with messy social sciences such as economics, politics, and anthropology. The establishment of the Ghandruk micro hydro plant was an effort in the same direction. From the research findings, we see that the donor funded development agencies working in Ghandruk were, for the large part, focused only on the technicalities of establishing a micro hydro plant and were to a large extent, out of touch with the socio-economic ground realities of the village. Consequently, the effort proved counterproductive as the micro hydro plant, instead of bringing wealth and prosperity, exacerbated existent socio-ethnic fragmentation within the village. If the 'past' Maoist insurgency and the ongoing upsurge in the plains of Nepal is anything to go by, one can see how the current situation in Ghandruk, partly created by development agencies, can contribute towards further dividing the country. Thus, the key lesson learned from the analysis is as follows: if donor funded development agencies truly intend to help the poor; they should, prior to starting development projects anywhere, gain an adequate understanding of socio-economic ground realities and plan their projects accordingly. The negative consequence of what happens when this is not done is evidenced by the case of the Ghandruk micro hydro plant.

5. CONCLUSION

The development of communal micro hydro power is extremely important for the development of Nepal. In the rugged and unstable regions of rural Nepal where a majority of the people still burn fuel wood and kerosene for cooking and lighting, electrification through micro hydro is the only way out. Nonetheless, if the long run stability of such micro hydro plants is to be ensured, policy makers and planners should tackle caste-based exclusion in Nepal's communal micro hydro plants with the seriousness it deserves. The three main factors that limit the access of excluded groups from access to electricity are their financial status, social status, and lack of awareness. Policy makers should be well aware of these factors and plan accordingly when installing a new micro hydro plant anywhere. Financially supporting lower caste poorer groups by charging them less compared to others might be an option in dealing with the financial barriers that arise. Similarly, creating mechanisms to ensure that the 'lower' social status of excluded groups does not prevent them from asking for and getting the amount of electricity they deserve is crucial. Finally, it is very important that wherever a communal micro hydro project goes, villagers are first and foremost educated adequately of the benefits and uses of electricity.

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