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RURAL FIELD STUDIES NEPAL

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Acronyms and Abbreviations

AHREP – Andhi Khola Hydro Electric and Rural Electrification Project

AKP – Andhi Khola Project: the broader rural development project, incorporating AHREP

AKWUA – Andhi Khola Water Users Association

B&W – Black and White

BPC – Butwal Power Company

CBS – Central Bureau of Statistics

CGI – Corrugated Galvanized Iron sheet

FSS – Food self sufficiency

HH - household

JD – Jagriti Devi VDC

JHEREP – Jhimruk Hydro Electric and Rural Electrification Project

JIDCO – Jhimruk Industrial Development Company

LPG – Liquefied Petroleum Gas

NEA - Nepal Electricity Authority

NPR – Currency: Nepali Rupees, April 2007 – approx. 73 NPR = 1 USD

PV – Photo Voltaic (Solar Panel)

PRA – Participatory Rapid Appraisal

RCC – Reinforced Concrete Construction

TB – Tulsi Bhanjyang VDC

TV - Television

VDC – Village Development Committee (administrative/political unit)

Local Terms:

Bhari: A load carried by people. Often used to measure wood consumption, and generally assumed at 40 kg, but widely variable.

Brahmins: Highest caste in Hindu caste hierarchy

Chettris: Higher caste in Hindu caste hierarchy

Dalits: Low castes in Hindu caste system. (generally poor artisans)

Khet: Lowland area useful for paddy cultivation

Magars: A group of people not belonging to Hindu caste hierarchy

Mana : Unit of volumetric measurement of grains, about 1/2 litre

Muri: Unit of volumetric measurement of grains, 160 mana

Newars : An ethnic group of people in rural areas generally considered involved in business

Pathi : Unit of volumetric measurement of grains (1 muri = 20 pathi; 1 pathi = 8 mana)

Ropani : Unit of area measurement (508 sq meter; 1 ha =19.5 ropani)

Introduction

This is a report based on field studies conducted in Nepal in 2007 to evaluate the impact of electricity and other related projects financed by Norway on the socio-economic conditions in the project area. The Andhi Khola Hydro Electric and Rural Electrification Project (AHREP) and Jhimruk Rural Electrification Project (JHEREP) were selected as the case studies. AHREP is the electrification project within the broader rural development project, Andhi Khola Project (AKP). While the latter was a longer term multi-sector project of United Mission to Nepal (UMN), and largely falls outside the scope of the present evaluation, the AHREP together with JHEREP (both financed by Norway) are the subjects of study and evaluation. In addition, Norway participated in financing another project in Andhi Khola of UMN, which was in the form of literacy classes for women, health and sanitation like toilet construction and entrepreneurial training. The household survey will include data that shows some of the effects of this broader project. In general, data collected represent a compound impact from interventions of the AKP, the AHREP, and other developments, such as increased out-migration and further division of land, split up among family members becoming adults and inheriting the land. Therefore, the question of attribution can only partly be answered.

A5.1 Andhi Khola Field Study

A5.1.1 Study design and method

The field study in Andi Khola followed various methods in order to verify the information. Both qualitative and quantitative information was collected. The study comprised two main methods: PRA (Participatory Rapid Appraisals) and a household survey. Under PRA, data collecting techniques included discussions with various stakeholders such as development offices at the district and local level, health offices, education offices, police posts, politicians, women's groups, local teachers, members of VDCs (administrative/political units), users of irrigation facilities and farmers' groups. The evaluation team also went for walks with local people, conducted time-line surveys with individual households, and detailed account of change at a few individual households were collected as illustrative case studies. A discussion with industrialists was also held and a few representative industries were also surveyed using a checklists, which had been prepared before going to the field.

For the household survey, about 4-5 % of households in two selected areas/VDCs were chosen as a sample. Two previous studies in the Andhi Khola had been conducted in 1981 and 1993, respectively, and both covered the VDCs of Jagatri Devi and Tulsi Bhanjyang. Due to the baseline data these earlier studies provide today, the same VDCs were selected also in the present study. There are in total 35 VDCs in the Andhi Khola area. Jagatri Devi (JD) and Tulsi Bhanjyang (TB) were initially selected (in 1981) because they constituted areas close to the location for the power station. The number of households in the two VDCs was 1,442 in 1981 and 1,881 in 1993. According to a household population census survey in 2001, the number of households had increased to 2,392, distributed on 1,551 households (population = 7,934; average household size=5.1 members) in JD and 841 (population = 4652; average household size = 5.5 members) in TB, respectively. Compared to 1993, this represents an annual growth of 3%. In 1981, a 10 % sample size had been selected, which implied a sample size of 145. This was a stratified sample to obtain spread in geographic location and caste line (all wards and castes were represented). Firstly, the sample size for the wards was determined on a proportionate basis and then all castes were represented on a proportionate basis and in a way so as to include all castes. The analysis was to a considerable extent focused on caste category. In 1993 survey, the same method was followed, but emphasis was more put on so called „wealth categories" (based on land holding and/or food self-sufficiency) than on caste. The 1993 survey covered 92% of the households who had been included in the 1981 survey which meant that 134 household from the 1981 survey were also included in 1993. This formed 7.2% of the household population in 1993.

In the present (2007) survey, 120 households were selected; 80 from JD and 40 from TB. Disregarding population growth since 2001, this implies that a 5 % sample size has been selected in each of the two

VDCs. If an annual growth of 3% is accounted for, the sample sizes constitute 4.5% in Jagatri Devi and 4.1% in Tulsi Bhanjyang, respectively.[1] The sample was limited due to constraints of time and resources, but together with the availability of base line studies and additional, qualitative data collected (described above), the study has produced sufficient data to be able to analyse the situation.

With regard to the overall electrification of Butwal Power Company (BPC) in Andhi Khola and the selected households in the survey, a clarification needs to be made. According to consumer data obtained from BPC[2], the electrification area includes 35 VDCs with a total of 176 wards. The number of domestic connections is 20,146 plus 256 other connections. This represents 98% of all households in the area considered electrified. None of the non-electrified households was included in the sample. The household sample of 120 therefore is only about 0.6% of the total. In terms of administrative units, the sample is drawn from 9% of the total number of electrified wards. The sample size is therefore not statistically valid for the whole population.

We tried to recover the households who had been interviewed in 1993, but were able to identify only 15 of them with full certainty. In addition to the main researchers, other people who had helped in conducting the previous surveys were engaged for the interviews. Of them, Netra Aryal was still working in BPC. He had not taken part in the 1981 survey, but in 1993, he assisted Kamal who had also done the survey in 1981. Netra could not remember which households had been included in 1993 because he had been regularly visiting the households as a meter reader and did not know if he had visited them in relation to the survey of 1993 or for other purposes. Also, a few households which he did remember had moved, apparently due to divisions of property, due to the opening of the road or for other reasons. In many cases, households were found to have moved to the area close to the road. The 15 households who Netra identified as having been surveyed in 1993 also confirmed their participation at the time. Other households included in the present study were not sure whether they had been interviewed also in 1993 because so many surveys have been undertaken in recent years.

The 1993 survey realized that caste as an indicator of wealth is not satisfactory because some of the higher caste households are as poor as lower caste households. Therefore, it moves away from caste to 'land holding' as an indicator with the assumption that land is still an important asset and that people would like to invest in it. But it also realizes the importance of the type of land people keep, and uses instead 'grain production per capita' as the indicator for the grouping of households as proxy to wealth status. This, in turn, is converted to 'food self sufficiency' (FSS) of households. Therefore the criteria for measuring wealth mentioned in the 1993 survey are: Rich (FSS always more than 12 months), Medium (FSS 6-12 months), Poor (2-6 months) and very poor (less than 2 months).

Today, however, land holding has become small for all and only a few can fulfil their food requirement based on their own production. Therefore, the importance of land holding has declined. Moreover, non-farm opportunities are more remunerative and people tend to move towards these to an increasing extent. Out-migration is one of the results. The Nepal Living Standard Survey II, conducted by the World Bank and CBS in 2003-04, came to the conclusion that those able to move on to non-farm activities, especially through migration, are able to escape from poverty. According to the WB report, this shift has helped reducing the poverty level from 42 % to 31 % during a period of eight years. The other contributing factor for the reduction in poverty was said to be a shift towards urban-based employment where wages are higher. The 1993 report mentions that people tended to migrate from the villages to Galyang, that is, the road side. Today, people appear to increasingly focus on urban activities and other non-farm activities. This leads to further migration of cash earning families either to urban areas or to the road side.

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[1] Given that there is 3% annual growth and that this is equally distributed, the number of households in the beginning of 2007 would be 1.797 households in Jagatri Devi and 974 in Jagatri Devi, thus 2.771 in total for the two VDCs. Here, we assume that the growth in households is identical in JD and TB, which might not be the case.

[2] Excel file Doc. No.: BPC/F/DIS/AHC/06/00

In sum, the evaluation team saw a need to revise the type of indicators that may be used for measuring and categorizing wealth among the population today. To obtain a realistic picture, and one that is in line with people's own perceptions of what wealth constitutes today, a 'wealth ranking' exercise was done to identify the different households and their level of wealth. The exercise, including the criteria for wealth that were elaborated, are described as follows:

Once in the field, we obtained lists of all the households (as listed in the name of household head, who in this area is normally a man) living in the villages[3], specified according to their location (in all the 16 wards of the two VDCs). It had been anticipated that these lists would be available from the VDC offices, but in the field, this turned out to be impossible. The offices of these VDCs had just opened one month before they were visited. The new political climate leading to the inclusion of the rebel party in the government had created an environment for the opening of the offices. However, they were left without any documents because these had been burned down during the conflict. As a result, a list of customers obtained from Butwal Power Company (BPC) was used for identifying the households. In a few locations, the list was prepared by the help of key informants.

Once the total list of household heads was prepared, we gave it to three people (key informants who were found to be aware of the general situation in the village). These were all men, each belonging to the Brahmin, Chettri and Magar caste respectively. These people were considered to have good familiarity of the village situation and of the households. As men are considered to have more knowledge of the situation outside the household, they were to be considered as key informants. We asked them to rank the wealth of each household by sitting together and reaching consensus based on their own perceptions of what is important in determining wealth. They were asked to divide people into four groups – rich, medium, poor and very poor. Later on, they were also asked what considerations they had made for the categorization. The criteria were based on a combination of people's level and type of income (temporary or permanent job in Nepal or abroad), nature of job in general, farming activities (irrigated khet (lowland), paddy land), business success and the households' range and types of assets. They considered that a *wealthy* household would have income to fulfil adequate food (good quality rice) consumption through out the year and have some extra income for sending children to boarding school and good college and have some adequate property (like land, house and other assets) for sustaining expenditure. According to a rough calculation, this would amount to some NPR 175,000 income for the family in a year (for a family of 7 members), i.e. USD 0.97/day, capita) and about 20 ropani good (khet) land and a good house. A *medium* household would be able to fulfil food requirements adequately and have income to send children to school and local college and have some assets (about 10-20 ropani land, and a medium type of house). In terms of income, this household would have about NPR 80,000 to 175,000 a year (for a family of 7 persons), i.e. a minimum of USD 0.45/day, capita. A *poor* household would have a hard time to feed the family adequately and will be able to send the children to only local government schools. It typically would have 5 to 10 ropani land, mainly dry land, and a small house. Its (for 7 members) income would be about NPR, 50,000 to 80,000 in a year, i.e. a minimum of USD 0.28/day, capita. A *very poor* household would have a very hard time to fulfil the food requirement of the family, and its members are malnourished because of inadequate food consumption. Even though children of this household sometimes attend local government school, they would have dropped out soon. It has a sort of hut for housing, and less than 5 ropani of dry land. Its annual income would be less than NPR 50,000 (for a family of 7 members), i.e. less than USD 0.28/day, capita[4].

[3] Villages are roughly equivalent to wards, but not always.

[4] Conversion done at NPR 70 per USD.

Table A5.1- 1: Characteristics of wealth ranks

Group	Income estimate (USD/day)	Land holding (ha) ni=non-irrigated irr=irrigated	Food self sufficiency	Dwelling, house type
Very poor	<0.28	<0.25, ni	Very low	Thatched hut, often single room
Poor	>0.28, <0.45	~0.35, ni	Low	Small house
Medium	> 0.45	<0.75, irr	Fully sufficient	Adequate house
Wealthy	~1,0	>1 ha, irr	Surplus	Good quality house, often multi-storey

Note: Incomes are estimated on a cash basis, own food consumption is not included. The same classification is applied in the Jhimruk study.

Even though categorization was done by the key informants, they had no influence on which households to be surveyed. It was done randomly after the categorization and with a view to represent diverse (caste) groups in the sample. A proportionate sample of households was taken from each wealth group. In addition, the selection implied that all 16 wards were represented to obtain geographical spread in the sample. While conducting the interview, it was emphasized that both household head (mostly male) and the spouse sit together for answering the questions. There were four interviewers for the survey and two of them were female having experience of the rural life. In the evening of the same day, each questionnaire was reviewed and if there were some inconsistencies and queries, repeat survey was also done.

In Andhi Khola, the preliminary discussions revealed that there is a significant difference in the use of electricity and its impact on enterprises in Galyang (road side) and in the non-Galyang area[5]. This was also a major finding in another study[6]. Considering this fact, it was thought important to allow for separate analyses of the 'semi-urban' (i.e., Galyang) and the rural areas, respectively. At the same time, it should be noted that the boundary between semi-urban and rural is not always clear. When deciding on how many households to pick from each type of area, a sample of more than 30 households was considered necessary in order to analyse the material. A relatively slightly larger sample size (6.5 %, that is, 35 households out of 543) was therefore selected in Galyang to facilitate this type of analysis. In the non-Galyang area, the number of households is 1.849, thus the rural sample of 85 represents 4.6% of the population in question. As a result, explicit poverty aspects tend to be under represented, as there are more poor in the sample representing a smaller share of the total population.

A5.1.2 The Project

Andhi Khola is located in southern part of Syangja district in central Nepal. It is located almost at the middle point (80 km) between the two major towns of Nepal; Pokhara and Butwal. The Syangja district is considered to have the highest population density per unit area (273 people/km2) and the highest level of out-migration in the country. The project area covers the area south of Andhi Khola (river) and north of Kali Gandaki (big river). These two rivers are separated by a ridge. Siddhartha Highway cuts through the ridge at Galyang Bhanjyang, the main bazaar in the area (earlier labelled road side). The Andhi Khola Project (AKP) which was implemented here from 1982-1996 was an 'integrated rural project' consisting of a hydro-electric plant, a rural electrification programme, irrigation, reforestation and erosion control, and development of agricultural and employment opportunities in the area. The main intervention under study (AHREP, financed by Norway) formed a substantial part of the AKP and covered the construction of the hydro-plant, rural electrification and

[5] This represented mainly the ward 8 of JD VDC and part of ward 8 of TB VDC. The data was obtained from the rough estimates from the respective VDC offices.

[6] Dale L. Nafziger, A Synopsis of domestic-sector impacts at the Andhi Khola project, Kathmandu 1994

the irrigation scheme. The irrigation scheme was developed with the participation of people. The hydro-plant was in operation since 1992 and from 1994 electricity has been supplied to the area. The notions „before the project“ and „after the project“ to be used in the evaluation thus refer, respectively, to the years 1993/1994 (before electricity became available) and 2007 (13 years after electricity's introduction in the area).

In addition to AHREP, as mentioned, Norway has co-financed another intervention in Andhi Khola in the form of literacy classes for women, health and sanitation like toilet construction and entrepreneurial training (under AKP, Norway was one among several donors, but the project was mainly financed by the UMN).

Taking the two mentioned VDCs as a subject of study in this evaluation implies that we include households who have been affected by the Norwegian financed projects. In the following, we label the Norwegian interventions under study as „the project“ for reasons of language. The results of AHREP will receive most attention, but the project on literacy, health, sanitation and entrepreneurial training will also be taken into account, as it provided services that in combination with electricity and irrigation have become considerably improved. As noticed in the introduction to this Annex, other interventions and developments have also had effect in the area, thus the question of attribution is challenging. The analysis is nevertheless done in a way so as to highlight the impact of the two specific interventions under study.

[Note: Data for 1981 and 1993 are from the respective base line studies. Data for 2007 have been collected within the present study. 1994 represents the year of electrification, and, as mentioned, 1993/1994 was used as the year(s) of reference when people were asked to state the situation before the 'project', as they recall it. This method, of asking people about their situation in the past, has obvious weaknesses as people's claims cannot be confirmed by observation. There are many factors that may influence people's statements; for example, their memory is selective and they may have a concern for underlining the project's success vis a vis the interviewer (or vice versa). Nevertheless, when results are used carefully, and given that the questions were addressed to a substantial number of respondents, they have value, both in terms of indicating actual changes as well as in terms of grasping how people qualitatively perceive the changes in question (during the successive parts of the interviews). We thus base the findings on a mix of quantitative and qualitative data. When possible, results were also verified by triangulation, such as evaluating people's responses in relation to data obtained from other sources. 2006 is the year when the project was completed.].

The sample survey shows that the average family size is increasing, and it has grown by 13 % during a period of 25 years – from 1981 to 2007 (Table A5.1- 2). In 1981, the proportion of the female population was slightly higher (than that of men), but it declined in 1993 and in 2007. The number of children below 5 years (per family) has also been declining. The number of children from 5-15 years increased from 1981 to 1993, but had declined in 2007. The numbers of adults have increased in all these periods.

Most households in the study area expressed that they have been the traditional residents in the project area. Only 9 households (7.5 per cent) expressed that they had moved to the study area during the years after electrification. When asked to state the situation before the project, they referred to their way of living wherever the household had been located at that time. This approximation as to describing past conditions in the area under study is not reflected in the data and analysis to be presented and thus constitutes a limitation that has been unavoidable due to time constrains. In return, we consider the inclusion of these households to provide the study with valuable information. Access to 'power' was considered as a prime reason for movement to the project area. The other reason which came up as a main reason included marriage. Two households also said they had moved to the project area because of other, direct benefits from the project. These households were from the neighbouring villages, which had also been affected by the project in a wider context. They were not treated differently than other traditional residents in the study area, and their situation before the project was also taken into account.

The project area consists of both hill slopes and valleys, but a major part of the area is the hill slope. Socially, this area is a mixed area consisting of Brahmins, Chettris, Magars, Newars and Dalits (the low caste in the Hindu caste hierarchy which earlier used to perform specified tasks like tailoring,

leather work, iron-smiting, cleaning). Dalits are usually the poor and social disadvantaged groups of people and they were (still are) considered untouchable by higher castes. Magars is a non-Hindu group and is one of the 59 indigenous peoples or 'janajatis' in the country.

There were three main types of services provided by the project. Hydro-power plant construction, rural electrification, and irrigation. Electrification from the hydro power plant supplies more than 20.000 consumers, while irrigation provides about 300 lit/sec water in winter months and 688 lit/sec in monsoon season, which helps to irrigate 300 ha of farm land. A water users association called Andhi Khola Water Users Association (AKWUA) has been set up, which was also instrumental in the construction of irrigation channels. Those involved in the construction obtained shares in water rights and they now get water based on those shares[7]. Some surplus land (about 300 ropani or 15 ha) was also pooled together from the large land holders after paying nominal price (NPR 1.600 – 1.800), which was then sold to poor people at about the same price and as loan without interest but to be paid in 10 years.

A5.1.3 Family status of respondents

Table A5.1- 2: Demographic features in Andhi Khola (n=120).

	1981 (n=145)	1993 (n=134)	2007 (n=120)
Family Size (members)	6.90	7.30	7.81
Female members	3.50	3.60	3.84
Male members	3.40	3.70	3.92
Children 5-15 yr	1.69	1.90	1.78
Children Below 5 yr	1.1	0.91	0.79
Total Adult members	4.11	4.49	5.28

A5.1.3.1 Caste Composition:

In Andhi Khola, Brahmins (45.83 %), Magar (29.2 %), Newar (13.3 %) and Dalits (8.33 %) were the major groups of people in the sample in 2007. The caste composition of the sample households as described above corresponds to the total caste composition of the VDCs studied as obtained from the VDC sources.

Table Table A5.1- 3 shows that the caste composition in the Andhi Khola has been relatively stable over the years, although, with respect to Brahmins and Magars there has been a slight decrease since 1993. Conversely, the proportion of Newars has increased and Chettris (4 households) appear to have established themselves in the area for the first time.

[7] There are about 25.000 shares in total. A share would get a wet season maximum of 0.027 l/sec water., and about half of this in the dry season. A person could get at the most 4 shares and a family could get at the most 28 shares.

Table A5.1- 3: Caste composition in the Andhi Khola

	1981		1993		2007	
	HH count	%	HH count	%	HH count	%
Brahmin	71	49	67	50	55	46
Chettri	-	-	-	-	4	3
Dalit	10	7	10	7	10	8
Magar	49	34	48	36	35	29
Newar	15	10	9	7	16	13
Total	145	100	134	100	120	100

A5.1.3.2 Variation in wealth among households:

Given that the perceived relevant indicators for measuring wealth have shifted from food production/self sufficiency (1993) to a mix of indicators in 2007, it is not possible to conclude with certainty that poverty (lack of wealth) is on the decline in absolute terms. However, there are several indications that the project together with other developments have contributed to reducing poverty in the area (see below). What may be concluded from the present survey is that differences in affluence are perceived to be less in 2007 compared to the picture provided by earlier studies (although distinct indicators were used at different points in time, as mentioned, and this constitutes a condition for the analysis to follow). We acknowledge the important role played by the three key informants in defining criteria for wealth and identifying all households according to the four wealth categories. Nevertheless, as informed citizens with insight in the situation of each household, their ranking is considered particularly valuable. For example, given that people's level of assets is an indication of wealth, a sign of the relevance of their categories will appear below when we present changes in house building techniques. Here those defined as „rich" are found to possess houses of better quality than what poorer groups keep (see above in the methodology for how households were categorized by key informants). In addition to the assets people possess, the criteria are based on people's access to land, level of food consumption and income, ability to send children to school and other factors, as mentioned.

An alternative to the chosen approach would have been to select one single variable to measure wealth in each family, but this could easily have excluded other relevant criteria. A third (and ideal) option, would have been to first locally develop a range of criteria and then measure all these in every household. This, however, would have required far more resources than what has been available in the present study.

Table A5.1- 4 shows that in the years between 1981 and 1993, the differences in people's level of wealth increased. In this period, the percentage of poor and middle class households declined, but those of very poor and rich increased. Economic disparity was generally growing. However, in 2007, the proportion of poor and very poor households is perceived to be far less (37%) compared to 58% in1993. The groups considered as rich and middle class now constitute more than 60% of households (as compared to 42% in 1993). It is reason to believe that these signs of reduced poverty are linked to the projects in question. As will be discussed later, irrigation, electricity, combined with other opportunities like employment in the project, the establishment of new enterprises, trade and migration, and improved water supply and health services (including their positive effect on people's time use) seem to have provided households with the ability to improve their material living conditions. Access to electricity affects several of these changes. The increased accessibility and availability of transport and educational facilities also affects the development in a positive direction.

Table A5.1- 4: Distribution (%) of households in Andhi Khola according to wealth rank

	1981 (n=145)	1993 (n=134)	2007 (n=120)	HH population in the list for wealth ranking prepared in 2007 (n=2400)
Rich	9.7	14.2	30.0	29.0
Medium	36.5	27.6	33.3	34.0
Poor	41.8	39.5	31.7	32.0
Very Poor	11.9	18.6	5.0	5.0

Note: The wealth categories used in 1993 were applied also on the 1981 data and were defined as follows: Rich: More than 100 pathi/capita/annum (always more than 12 months grain supply from own land). Middle: 40-100 pathi/capita/annum (6-12 months grain supply). Poor: 13-14 pathi/capita/annum (2-6 months grain supply). Poorest: 0-13 pathi/capita/annum (less than 2 months grain supply). Criteria for wealth categories in 2007, and the reasons and possible implications of changing the criteria, have been accounted for. See methodology for how key informants defined wealth categories in 2007, which reflect not only land, but also other income sources, ability to send children to schools, house quality, and sustainability of income.

The question is who benefited most. An attempt has been made to analyze this according to caste status. There is a general claim in Nepali literature that Brahmins and Chettris benefit most from development projects. Also in the 1993 report, it was claimed that these groups get more benefits from the project.

Table A5.1- 5: Distribution of wealth rank (% households) according to caste status in Andhi Khola

	Brahmins/Chettri	Magars	Newars	Dalits
1981				
Rich (n=14)	19	0	0	0
Middle (n=53)	48	27	22	20
Poor (n=61	27	60	67	30
Very Poor (n=17)	6	13	11	50
1993				
Rich (n=19)	25	4	0	0
Middle (n=37)	31	29	22	0
Poor (n=53)	31	44	78	40
Very Poor (n=25)	12	23	0	60
2007				
Rich (n=36)	32	15	35	8
Middle (n=40)	36	25	53	27
Poor (n=38)	24	23	12	65
Very Poor (n=6)	2	13	0	8

Table A5.1- 5 shows that a larger proportion of Brahmin/Chettri and Newars are wealthier than Magars or Dalits. But from 1993 to 2007, the benefits have also been directed to Dalits and Magars, despite the fact that they still form the majority of those belonging to poor and very poor class. In this Table, Chettri group is lumped together with Brahmins to make it comparable with 1981 and 1993. In these surveys, Chettri group was not represented and Newar group was under represented.

A5.1.3.3 Physical assets owned

The physical assets studied include houses and other common assets that people add as their income increases. The housing quality as studied here by house walls and roof types clearly indicates that people's living conditions have improved after the time of the project (1993/94). Several factors strengthen the validity of the data collected as to how people described the situation in the past: The concrete nature of such changes (easy to remember), their public visibility (other people may confirm/question people's responses) and the significance of houses as people perceive it (the quality of houses is important to people themselves, thus changes are likely to be remembered), are all factors that strengthen the validity of data collected also as to the situation before. (The same applies for reports of people's other possessions in the past, to be given below.) Table A5.1- 6 shows that for walls, brick and RCC have replaced mud and stone to a considerable extent. The proportion of walls made by mud and stone has decreased by 20%. In the roofs, many more households now use zinc (CGI) sheet and RCC slab. About 40% of households said they have changed from thatched roofs to

these other roof types after the project. CGI and RCC slab (and tile/slate) are more expensive to purchase than thatched roofs made of tree leaves, but they are considered to last for longer and be of better quality. These changes in housing techniques are considered as improvements in people's living standard and as linked to the project and other developments (see below).

Table A5.1- 6: Distribution of households (%) according to house wall and roof types in Andhi Khola

	House-wall					Roof-type				
	Brick	Mud and stone	RCC	W/board	Other	Tile/slate	CGI sheet	Thatch	RCC slab	Other
Before (n=120)	9	87	1	1	2	4	35	56	3	2
After (n=120)	22	67	10	0	1	3	54	17	26	0

Table A5.1- 7: Households (%) according to house features and wealth rank in Andhi Khola

	House-wall					Roof-type				
	Brick	Mud & stone	RCC	**B**oard	Other	Tile/ slate	CGI	Thatch	RCC slab	Other
Before										
Rich (n=36)	19	77	4	0	0	4	50	31	12	4
Medium (n=40)	7	89	0	2	0	7	39	50	45	0
Poor (n=38)	4	96	0	0	0	4	21	75	0	0
Very poor (n=6)	9	82	0	9	0	0	27	75	0	0
After										
Rich (n=36)	42	44	14	0	0	3	45	3	50	0
Medium (n=40)	15	75	7	3	0	5	73	5	18	0
Poor (n=38)	11	76	11	0	3	4	21	75	0	0
Very poor (n=6)	9	82	0	0	0	0	27	73	0	0

Table A5.1- 7 shows that wall and roof types are not only correlated to the 'before and after' situation, thus the coming of the project, but also to people's 'wealth status'. This is not surprising, given that their level and types of assets were among the criteria from which the wealth ranking was made. The information is nevertheless useful. The general shift after the project from mud and stone wall to brick and RCC wall is not evenly distributed, as expected. Proportionately more rich households (as defined today by the study's criteria) have shifted to RCC roof and CGI sheet than groups today defined as less affluent. Among the „rich", 33% have abandoned the mud and stone walls (although 44% among them still keep this) and only 3% today have thatched roof. The material changes in question have certainly required a substantial income. The most important factor here is that the wealthier have earned money on farming due to irrigation and increased production (see below). They also sell food-grains, vegetables and milk, and have other types of income. The increased income has been partly transferred to house construction. The case studies clearly show this. The employment opportunities within the project and outside in the bazaar area have also benefited a few of them. There is also a tendency to out-migrate and earn remittances. The case study show this, and it is also likely that remittance income has been diverted to house improvement. This is so because the improved food security (caused by increased production) have provided less demand for people to use remittances for

nutrition purposes. It is also worth noting that also among the less affluent groups today, there have been some changes in building techniques down to the group defined as „poor“. But for the „very poor“, there has not been much change. .

Ownership to other assets has also increased after the project. Electrical appliances will be treated below. In Table A5.1- 8 we see that 15 % of all households today keep a motorbike, whereas only 2% say they did so before the project. There have also been increases in people's acquisitions of water storage tanks, private cars, buses and trucks. These shifts have mainly taken place in the semi-urban area, but motorbikes are becoming increasingly in use also in rural areas.

Table A5.1- 8: Distribution (%) of ownership to transport vehicles and water storage tanks

Other Assets	Before the project			After (2007)		
	Semi-urban (n=35)	Rural (n=85)	Total (n=120)	Semi-urban (n=35)	Rural (n=85)	Total (n=120)
Bicycle	6	0	2	11	2	5
Motorbike	6	0	2	29	9	15
Power Tiller	0	0	0	3	0	1
Private Car	3	-	1	11	0	3
Truck/bus	3	1	2	11	1	4
Water storage tank	9	1	3	37	5	14

Two major changes before and after the project are important: The increase in motor cycle ownership and water storage tank. This change is more marked in semi-urban area as compared to rural area. The increase in vehicle is caused by increase in business and industries for which availability of electricity is also important. The increase in production and income due to irrigation is also translated into purchase of motorcycle. The urban houses in the bazaar area require a water tank, and thus their number has increased. Here, electricity is used for providing pump pressure to fill roof-top tanks (done by the town's water utility). Before the project in question, there were no electrified water pumps.

A5.1.3.4 Social assets

A major form of social assets in this region has been the kinship obligations and community co-operation; in short, people's informal networks. There are traditional as well as newly formed organizations of people for mutual co-operation. The project appears to have created some of these new organizations and thus increased people's social assets, which also have and educational and economical impact. For example, when the AKP started adult education for women, women's groups were formed. The classes were held in the evening. Now there are women groups in most of the communities. They organize regular meetings and do social works. Some of them were also reported to organize saving and credit groups. Other groups established in relation to the project include irrigation groups, such as the Andhi Khola Water Users Association (AKWUA) and its sub-committees. There are farmers groups as well. They were also seen to organize saving and credit functions. There are also organizations of electricity users. This is especially so in Andhi Khola, where individual households pay electricity bill directly to the user groups, which pay the lump sum electricity bill to BPC. Community forestry groups are other organizations that are playing significant roles in social interactions.

A5.1.3.5 Water and sanitation

In 1981, there was no piped water in the two VDCs in question (see Table A5.1- 9). In 1993, 37 % households had access to piped water. Since then, the supply of drinking water has continued to improve. In rural areas, various water schemes have provided the majority of households with piped, gravity fed drinking water. In the semi-urban area (through the municipality's water supply), electricity is used for running water pumps that supply a large proportion of the population with drinking water. In 2007, 70 % households (overall) had access to piped water.

This general improvement in access to drinking water is mainly caused by other parts of the AKP than the Norway supported AHREP under evaluation. However, the availability and use of electricity for water pumps in the semi-urban area has clearly contributed to improving the distribution of water. The improvement in this realm can thus partly be attributed to the project under evaluation. Our findings here support the claim that successful development of public services depends on efforts related to several types of infrastructure and not only one.

The following data point to some of the other effects of the AKP: In 1981, no households had a toilet. In 1993, 77 % households had their own toilet (generally a water seal latrine) and in 2007, 87 % households had a toilet. Based on what respondents recalled, 4 % said they used to have a bathroom (toilet within the house) at the time before the electrification project. 46 % said they used to have a latrine. Today, 36 % have bathroom and 51 % have latrine.

In sum, positive changes have taken place in terms of access to drinking water and sanitary facilities. The Norwegian intervention under evaluation has contributed to people's improved access to drinking water in the semi-urban area. However, without other interventions focusing specifically on providing water infrastructure (also partly supported by Norway), this would not have been the case. It is clear that in combination, electricity and other efforts bring important improvements.

Table A5.1- 9: Access to drinking water and sanitation facility (% households)

	1981 (n=145)	1993 (n=134)	2007 (n=120)
Piped water	0	37	70
Reliable water	0	36	70
Toilet	0	77	87

The sources of drinking water before the project were: water storage tank (3 %), spring/river/lake (50 %), dug well (23 %), tube well (3 %), public fountain (25%), and private tap (6 %). After the project, the same figures were, respectively, 14 %, 29 %, 21 %, 2 %, 44 %, and 26 %. Here, the households with access to public fountains and/or private taps in 2007 represent the 70 % who have access to piped water (see above). Households were not found to use individual pumps for drinking water. Only one household (of 120) was reported to use a manual pump before the project and now no one reported to do so.

The increased use (11% points) of storage tanks was also noted in Table A5.1- 8 and implies that the owners become less dependent on public supply and variations thereof. We also see that there has been a reduction (from 50% to 29%, that is, about 20% points) in the number of people relying on spring/river/lake water and a dramatic increase in the use of public fountains (from 25% to 44%) and private taps (from 6% to 26%). This shift in water supply means that the quality of water has improved. In contrast to the river/lake water, water from pipes, fountains and taps deliver water from protected sources. The evaluation has not conducted physical tests (neither did the 1981 and 1993 surveys), but there is reason to conclude that both the access and quality of water has been improved through the project. It was commonly reported that problems of diarrhoea, dysentery and intestinal worms were extremely high in the past. This problem has been reduced now. This supports the claim that drinking water quality has improved. As noted above, this can for the semi-urban area partly be contributed to the arrival of electricity. We also see that what people perceive as 'reliable' water supply correlates with the occurrence of piped technology.

Table A5.1- 10: Time to collect drinking water (% households)
(Numbers do not add up exactly to 100 because of the rounding of fractions)

	Less than 5 min	**5-30 minutes**	**0.5 to 1 hour**	**1 hour +**
Before the project (n=120)	36	27	33	3
After the project (n=120)	61	23	12	3

According to the way respondents in 2007 recalled the situation, the time used to collect water has been drastically reduced. For example, before the project, only about one third of households had

been able to collect water within 5 minutes distance, but now in 2007 61 % households could do that. Bringing water sources close to home through water supply schemes of the AKP is the major reason for this reduction in the distance. Furthermore, to reiterate the point, electrified water pumps condition this positive development in semi-urban areas.

It is also reported that after the project, men increasingly participate in water collection. This could be explained by the closer distance to the sources, but it could also be a sign of increased awareness on matters related to the traditional gender division of work, which put a great burden on women. A slight contribution to this change in the water collection pattern may be attributed to AKP (where Norway was one of several contributors) as it helped in raising the awareness about the sharing of work by males and females through adult literacy classes.

A5.1.4 Findings and conclusions (wealth, assets and water)

- Generally, people's level of affluence or standard of living appears to have increased after the coming of the project. This is indicated, firstly, in the relatively high proportion of households perceived as „rich" and „middle class" by key informants (compared to wealth ranks of a different order made for 1981 and 1993). The concept of poverty (or wealth) must here be considered as a relative quantity, reflected in the fact that the key informants perceptions provided the standards of what constitutes an acceptable level of affluence and what objects a household „should" contain (cf. processes where objects over time become „normal). Nevertheless, and secondly, the data on people's housing materials, the vehicles they possess and not least, their access to water of better quality, provide further support for the argument that there has been a rise in affluence in absolute terms (measured according to how they recall the situation in the past). The fact that many people have improved the quality of their dwellings and some have acquired motorbikes and water storage tanks, reflect that they have greater access to money than before. Here, irrigation, electricity and outside employment opportunities have contributed significantly in making (many, but not all) households able to improve their finances. Because of increased food self-sufficiency (see later) due to more production resulted from irrigation, some cash incomes earned from jobs associated with electricity and remittances are increasingly converted to household assets – house quality and other assets.
- Compared to the wealth ranking in the past, where only a few households were regarded rich and relatively many were poor, the ranking in 2007 (Table A5.1- 4) showed that 95% of the population are equally distributed on the three categories „rich" „middle" and „poor", While the category „very poor" decreased dramatically. This reflects an increasing degree of equity being the case; more people have access to goods and services. The benefits have also been distributed to Dalits and Janajatis like Magars. In the past, it was commonly held that only Brahmins and Chettris took the benefits of interventions. Even though these groups are still wealthier in the area in question, the conscious efforts in the project to include Dalits and Magars seem to have had positive effects.
- The project has facilitated the creation and functioning of new social organizations, which continue to yield relevance and provide people with social assets (networks, education, and monetary advantages). Signs of greater awareness as to gender equality are shown in that (some) men today contribute to collecting water.
- Piped water (public fountain and private tap) today constitutes the main source of drinking water; 70 % of the population now have access. The proportion of households having toilets increased significantly in the period under review. This trend started before the accomplishment of the project under evaluation, but has since grown in intensity, mainly due to interventions directed especially at this task, but in the semi-urban area also conditioned by the arrival of electricity. Access to proper drinking water is a fundamental development goal, and one to which the project AKP (AHREP included) in this area has contributed to fulfilling. Improved access to water and sanitation has also benefited the poorest.

A5.1.5 Livelihood

In contrast to the general decline in Nepal in people's involvement in farming, this has not been the case in Andhi Khola. The main explanation for this can be attributed to the provision of irrigation by the project. In Andhi Khola, as people in 2007 report the developments, involvement in farming has remained the same (66 % households before and after the project).

There has not been much change in the tenancy pattern. There were no sole 'tenant' cultivators before and after the project. Owners cultivating some land on share basis were 3 % households before the project which increased to 5 % in 2007. The rest farm their own land.

There has also been a slight change in the size of land people keep in the irrigated area. On average, each household reported to have kept 12.5 ropani (0.62 ha) of land before the project. But in 2007, this has been reduced to 10.6 ropani (0.53 ha). The decline is obviously due to the increase in the number of households, leading to division of property including the land.

Before the project, the main source of irrigation was the traditional gravity canals. Now the main source of irrigation is the new canal system with water supplied from the headrace tunnel. On the other hand, it is only one VDC out of a total of 35 in the project area that benefits from this directly.

The project seems to have brought some business opportunities for the local people. About 23 % felt that business had somewhat increased because of the project and 6.7 % felt that it increased significantly. Only 2 households (0.4 %) felt that business had declined because of the project. The rest felt there was no change.

There has not been a major change in the type of businesses, but their number has increased after the project. This could also be due to demographic change requiring more businesses to cater the needs of the people.

Electricity had been a major factor when respondents had made decisions to undertake business. Of the 48 households in the sample engaged in business in Andhi Khola, 19 (40%) felt that electricity had been a major factor. Tailoring, restaurants and grocery were the major business ventures before the project. There was also one video or film shop, which used to run by a generator. After the project, the major change was a significant increase in the number of groceries. Rice mills were also added. These businesses have not been able to generate much employment. They were mostly of 'subsistence type' of business indicating only family members were employed. On average, a business unit does not seem to give a full employment to a person.

In 2007, about 75 % households were not able to produce sufficient food for subsistence. In 1981, 70 % households had not been able to produce sufficient food. There is no comparable data for 1993. In 1981 and 1993, the total food grain production in the two VDCs was measured. Based on the assumed minimum required per person per year (60 pathi food grain or 180 kg), it was estimated that 88 % of total food required was met locally in 1981 and 83 % in 1993. This means that 10.5 months of people's food requirement in 1981 and 10 months in 1993 would have been met locally. Considering that the population has almost doubled since 1981 (household population in 1981 was 1.442, in 1991 1.881, and in 2007 2.771 the grain production per capita would have been half by now and this means households would be able to meet only 5.2 months' food requirement locally. In 2007, on average, food requirement for 7 months was produced. Here it should also bee considered that the 1981 and 1993 studies were based on the assumption that 60 pathi food grain (i.e., 180 kg) was considered as the requirement for a person in a year. But now minimum of 200 kg is regarded as basic requirement for the grain only and there are other requirements for food. Considering this fact, there has been some improvement in food self-sufficiency of the households. This is mainly so because of the expansion of irrigation facilities in an area of 300 ha which facilitated production of 3 crops per year in some areas and 2 crops in most of the areas.

In sum, compared to the total production of grain in 1981 and given that the population has nearly doubled in the period, one could have expected households in 2007 to be able to meet only 5.2 months' food requirements per year through locally produced food. The situation is that 7 month's requirements are being produced locally. This increased productivity can clearly be attributed to the project in question (irrigation facilities) and has had a positive effect on people's food security and in turn their ability to spend a larger share of their money on other purposes than sustaining a living than

would have been the case without the project. We consider the increased efficiency in food production as a significant and positive effect of the intervention under evaluation.

Table A5.1- 11: Distribution of households (%) deriving income from different sources
(Changes in livelihood sources of the households; the data represent members of the whole household, i.e., not only household head). This implies more than 120 income earners in the 120 households. However, how many in each household has not been recorded.

	Business Home	Outside	Agriculture + livestock	Gov. pension	Remittances	Permanent employment	Wage employment
Before	12	3	66	10	10	10	7
After	27	11	66	11	33	16	11

Some changes in income sources are seen from Table A5.1- 11. The main change is found in the increase in off farm opportunities – business, employment and labour migration (resulting in remittances). It is interesting to note that the share of households involved in agriculture and livestock has not declined in Andhi Khola, which is mainly because of irrigation.

Four men in the sample had jobs within the project; one had a permanent job within the project and 3 had wage employment directly from the project. In 1993, 9 men in the sample were working in AKP or in UMN's Jhimruk Project, 3 of them in professional capacity. Over the years until 1993, 28 people in the sample were employed by AKP including 2 women who worked as domestic help.

A significant change took place with regard to households deriving income from remittances: The number of households has increased from 10% before the project to 33% after the project. This change is clearly not project related, as the project has not displaced people. It is seen as a general trend in Nepal over the past 10 years due to civil disturbances.

Given the increase in money generating activities and, at the same time, the stable share of people involved in agriculture, we may conclude that people tend to diversify their livelihood strategies more than before. Included in this picture is the marked trend towards business activities (which increased from 15 to 38% among all household members). As mentioned, 40% of those engaged in business in 2007 said they regarded electricity as having been a major factor when taking on such activities. These explanations together with the observed increased occurrence of businesses in the area (although mainly organised as family enterprises) implies that access to electricity has contributed to increased economic activity.

Note: Given the over-representation in the sample of households by the road (that is, the semi-urban area, see Methodology), and the observation that businesses tend to be established in busy areas where transport is good and where many people move about, the calculated percentage (38%) of people involved in business is likely to be unequally distributed in semi-urban and rural areas, respectively. However, this does not contradict the argument that electricity is one of the important conditions for people to start up various businesses. Furthermore, given that the same respondents were asked to state the situation before and today, we do not face the problem that the sample in the past had a different distribution on semi-urban and rural areas compared to today. Thus we can also conclude with certainty that the occurrence of people involved in business has increased in the period.

A5.1.5.1 Major findings and conclusions on livelihood

- Mainly because of new irrigation, involvement in farming has remained the same, despite the growth in the number of households and the general decline in other places.
- There has been a relative improvement in food self sufficiency after the project due to more efficient farming techniques (irrigation), as compared to what the situation would be without the project. Otherwise, this area would have been likely to witness mass out-migration (permanent) of the population.
- According to 40% of the people who have established businesses or otherwise become involved in such activities, electricity has been a major condition. Taken together with the actual rise in businesses after the project (particularly in the semi-urban area), one may conclude that electricity

has provided business opportunities to some groups and spurred increased economic activity and improved the availability of various services.

- There has not been a major change in the type of business and mostly family members were employed.
- Irrigation, combined with other opportunities like employment in the project, and enterprises, trade and particularly migration, seems to have made the households able to move up on the economic ladder. However, it is clear that the most pronounced impact on economic growth is from remittances from abroad.

A5.1.6 Energy situation

A5.1.6.1 Energy Use

Consumption of firewood (kg/household/year – one bundle was assumed to be 40 kg) was 4.240 in 1981 and 7.040 in 1993. In 2007, households reported an annual, average use of 6.337 kilogram's. This indicates a 10 % reduction in the use of firewood from 1993 to 2007. There has not been any significant change in collection time, even though there is slight increase (from 8.3 % to 11 %) in the number of households reporting that a bundle of firewood can be collected within an hour.

People were asked to state their monthly use of various energy sources today and how they remember this to have been before the project. The results are shown in Table A5.1- 12. Firewood has been and remains important. The average in 2007 of 528 kg per household per month corresponds to the 6.337 kg annual consumption mentioned. When asked to recall what the quantity of firewood collected had been before the project, respondents stated 687 kilos per month in average. This constitutes 8.244 kg per year, which is a somewhat higher figure than the average of 7.040 kg that emerged in the 1993 survey. Thus people in 2007 recalled to have decreased their firewood consumption by 23% after the project, whereas the reduction appears less (10%) if the 1993 data are chosen as reference. This points to the necessity to treat data emerging from people's memory with caution. Memories of quantities (and time use) are likely to be more difficult to establish than for example the adoption of new types of items. In addition, the sample from the semi-urban area (where the reduction has been dramatic, see below) was proportionally slightly higher than that of rural areas. Nevertheless, these factors accounted for, there is no question as to the important saving of firewood for cooking and boiling purposes, mostly in semi-urban area, after the arrival of electricity (and gas, see below). However, see the note below, on the difficulty embedded in converting local terms for „loads" into kilogram's. This uncertainty exists for the data in the present study as well as for the base lines that exist. Indeed, another study of electricity use in the early days[8], came to the conclusion that even though the study had been in depth, there was reason to conclude that fuel wood consumption data could not be relied on. Hence, based on unreliable data available and evidence from earlier studies, the present report will have to refrain from putting a number on decreased or increased fire wood use. What can be said is that alternative energy sources to fire wood, including electricity are used more in urban than in rural areas. Thus, if a saving in fire wood is achieved, it is most likely to happen in the semi-urban areas, as will be shown.

All other forms of energy consumption are higher in the semi-urban area compared to rural areas, also after the project. The exception is charcoal where consumption has been stable in semi-urban but slightly increasing in rural areas. But then, charcoal is completely unimportant quantity-wise. The use of kerosene is going down for both groups, as its main use was for lighting, now almost completely taken over by electricity..

Expenses on energy consumption (purchase/collection) per household is almost the double in the semi-urban area in absolute terms, but there is not much difference in terms of percentage of income, because households in the semi-urban area has higher income. In absolute terms, such energy expenses have increased significantly after the project (it nearly doubled in the semi-urban area). But

[8] Dale L. Nafziger, ibid

in terms of percentage of income, energy expenses increased only by 1 % in average. About 10 % of the households' income (both semi-urban and rural) are used to cover energy consumption.

Table A5.1- 12: Average monthly energy consumption and expenses and its sources

Energy source	Before			After		
	Semi-urban (n=35)	Rural (n=85)	All (n=120)	Semi-urban (n=35)	Rural (n=85)	All (120)
Fuel wood in Kg (before situation based on 1993 baseline)	545	605	587	388	585	528
Charcoal in Kg	0.29	0.26	0.27	0.29	0.38	0.35
Kerosene in Litre	4.6	2.6	3.2	1.6	0.5	0.8
Dry cell Batteries Number	2.0	1.3	1.5	0.8	0.9	0.9
Other batteries(cost for recharging NPR)	0.06	0.05	0.05	0.17	0.08	0.3
Candles Number	0.83	0.05	0.28	5.3	3.48	4.02
Electricity Units (kWh)	0	0	0	62	15	29
Gas LPG (NPR)	29.4	0.0	8.5	417	128	213
Cost of energy NPR/month	739	417	508	1.342	702	882
% income spent on energy	11	8	9	11	10	10

Note: Analysis of erroneous consumption data for fuel wood provides the following explanation. People do not generally know the quantity used in kg. People mostly collect or else buy fire wood in the unit „bundle" (bhari), and the standard weight per bhari of 40 kg has been used to convert to kg. However, there is actually no such standard for a non-commercial commodity such as collected fire wood. A strong woman will invariably make her work more efficient by carrying bigger bundles, while a young girl will carry less, but collect more bundles. It is both women and girls who collect most of the fire wood, while commercial bundles sold in the bazaar are more often carried by men. It is for the same reason that fuel wood weight consumption data given in the baseline studies are not considered reliable.

The wood consumption data thought to be doubtful were cross-checked with literature,[9] and it was found that for Nepal, a family of seven would typically use 350 kg of fuel wood per month. The conclusion is that fuel wood consumption data from the study should not be used. In stead, the concept of the household energy balance is used in the following, to determine the extent of possible fuel wood substitution with electricity or other energy sources.

The basic assumption is that overall energy use for cooking remains the same, or in fact increases somewhat because of increasing family size that was noted. Therefore, any saving in one form of energy for cooking will have to be replaced with another form of energy, and the candidates for this are LPG and electricity. Consumption figures for these may be considered reliable because LPG cylinders are of standard weight, and electricity consumption is under control from the utility, as shown later. Taking consumption quantities for LPG and electricity as determined in the survey and from BPC consumer statistics, it becomes clear that reported reduction in firewood cannot be replaced with a combination of LPG and electricity. In rural areas, from about 30 kWh of electricity per month consumed, almost none is available for cooking, it is all needed for lighting. In the semi-urban area, if 50 kWh per month is assumed used for cooking, this will only replace about 20 kg of firewood. The cost of LPG is about NPR 5.70/kWh in Galyang. The amount spent on gas in the semi-urban area will

[9] Regional Wood energy Development Programme in Asia - http://www.rwedp.org/index.html

buy about 73 kWh of energy, and this can replace about 30 kg of firewood, while in rural areas, it will buy less than the quantity needed to replace 10 kg of wood.

From this perspective, it can be estimated that in the semi-urban area of Galyang about 4% of all cooking is done with electricity. In rural areas, the use of electricity for cooking is practically non-existent, while about 2% of all cooking is done with LPG, and an unknown share with biogas.

Therefore, if a household in the semi-urban area has used 545 kg of fuel wood per month before the project, and given the recorded use of LPG and electricity, it would today still need about 500 kg of fuelwood per month, as it can save no more than 50 kg of fuel wood with the quantities of LPG and electricity used.

If a household in rural areas has used 605 kg of fuel wood (which is doubtful) in 1993, before electrification, it would still need almost 600 kg today, because with the quantity of LPG and electricity used, it can substitute not more than 10 kg of fuel wood. But then, the general trend in cooking energy use may be rather on the increase because of increasing family size (7%).

A further uncertainty relates to the stated consumption figures for electricity, due to the fact that more than half of the subscribers have an un-metered connection. It has been found in the study of Nafziger, cited earlier, that consumers of this type frequently err in estimating their consumption by as much as 100%. This will be looked into in a later paragraph.

A5.1.6.2 Use of different sources of energy for different purposes

Before the project, fuel wood had been the main energy source used for cooking and boiling water, according to respondents in 2007. About 97 % households had always used fuel wood, and 3 % used it occasionally. After the project, 74 % always use it, 13 % use it occasionally, and 13 % never use wood for cooking or boiling water. The other main source of cooking energy is gas. Before the project 97 % did not use it at all, and 3 always used gas. But after the project, 16 % always use gas, 15 % use it occasionally, and 70 % do not use it at all. Regarding electricity, nobody used it before. After the project, 10 % always use electricity for rice cooking with the use of rice cooker, 9 % use it occasionally, and 82 % do not use electricity for cooking at all. There has also been a reduction in kerosene use for cooking and boiling. The use of gas and electricity for cooking and boiling water is concentrated mainly in the semi-urban area.

Table A5.1- 13 % household energy sources for different purposes in Andhi Khola

	Before					After				
	Never	Some-times	Fre-quently	Very fre-quently	always	Never	Some-times	Fre-quently	Very fre-quently	always
Cooking/boiling water										
Fuel wood	1	1	1	-	97	13	5	4	4	74
Electricity	100	-	-	-	-	82	5	3	1	10
Gas	97	-	-	-	3	70	3	4	8	16
Kerosene	85	5	3	1	6	87	8	2	1	3
Lighting										
Electricity	100	-	-	-	-		1	1	-	98
Candles	88	7	-	-	5	41	52	4	1	2
Kerosene	2	3	2	-	93	75	20	2	1	2

Sample size n = 120, total % may exceed 100 due to rounding

Space heating and heating of bath water is normally not done. It was done only sometimes and mainly by firewood. After the project, there seems to be a slight change towards gas and a still smaller trend towards electricity for space and bath water heating. These changes are not significant.

For lighting, kerosene (followed by PV and candles) was the main source of energy before the project as people recall it Table A5.1- 13. But by far kerosene was mainly used for this. But after the project, 98 % households always used electricity for lighting.

From interviews with government officials and employees at the district and community level it was found that all office lighting is done using electricity, but some offices are only open during daylight hours. The consumer subscription of offices, schools, health and police posts is at the domestic tariff. Electricity has become the main energy source for administrative offices, as lighting is the main energy application. Preparation of tea and perhaps small snacks requires a small quantity of energy in comparison. The energy source used depends on fund availability. As long as budgets last, an electric hot plate is the preferred method of making tea, while gas is also used, and when money is scarce it is usually fire wood.

Candles are used for lighting and its use has increased after the project. Before the project only 12 % households used it, but now 69% households use it. Candles are used for emergency purposes when there is a power cut. In the past, there would be a stock of kerosene for lighting and so candles were not used.

Dry cell batteries are used for radios and cassette players. Before the project, about 40 % households used batteries for both radio and /or torches. Now, about 25 % households still use batteries for radio (radios are kept; either purchased or borrowed, see below, by 57%), but only 2.9 % use them for cassette player (kept by 41%). There is very little use of vehicle batteries.

A5.1.7 Conclusions on the rural energy situation

- In the semi-urban area, the arrival of electricity has caused a shift in the way many households cook food and boil water. Overall (rural and semi-urban), 10 % households always use electricity for cooking (82% never do), and 16 % always use gas after the project. Gas was also in use before the project, when 3 % used it. There has been a reduction in the use of kerosene for cooking purposes after the project. Electricity and LPG in Galyang (semi-urban area) and bio-gas in the rural area are the main sources of energy where fuel wood is replaced. Use of electricity is commonly for rice cooking in the Galyang area. These changes represent a considerable shift towards new cooking technologies and energy sources that is worth noting. Before the project, 97% among all households always used fuel wood whereas 74% always do today. As a result, in terms of the quantity of fuel wood consumed, there has probably been a reduction, particularly in semi-urban area. However, it is not possible to quantify the saving reliably on the basis of the collected data. On the basis of household energy balance calculations, it can be estimated that in the semi-urban area of Galyang about 4% of all cooking is done with electricity. In rural areas, the use of electricity for cooking is practically non-existent, while about 2% of all cooking is done with LPG, and an unknown share with biogas.
- The consumption of kerosene (primarily used for lighting) has declined significantly by about 80 %, from an average of 3.6 litres/month to 0.7 lit/month on average. The reduction is about by a factor of 5 which is significant, even given the limitations involved in data reliability. In this area, with nearly 100% electricity connection rate, electric light has replaced the former kerosene lamp.
- The use of dry cell batteries has been reduced significantly, due to the use of radio and cassette player connected to mains electricity.
- The main energy source in government and other public offices is electricity used for lighting.
- Consumption of candles increased, which is due to its use as a backup in the event of power (electricity) failure, because many households do not keep kerosene on stock any more. The average household uses about candles per month, which is estimated to give emergency light for 6 to 8 hours per household and month. This would indicate an electricity supply availability of around 99% under normal circumstances, meaning less than 100 non-supply hours per year.
- The monetary cost (and thus use) of energy is higher in the semi-urban area as compared to rural areas in absolute terms, but in relative terms (% of income) there is not much difference. Households spend about 10% of their income on energy consumption, and this was also the case in the past as people recall it. It is noted that expenses data for energy collected are not corrected for inflation, and if this is done, the present cost of energy needs to be divided roughly by 2, resulting in lower expenses for energy today than in 1994. This is difficult to believe, because there is a trend to use more energy as the living standard goes up, and the perception is in general that energy cost

are going up in absolute terms. It is more likely that recall data from before electrification were consistently overstated. Nevertheless, collected information indicates that there is a high degree of stability in the relative share of energy cost as compared to household income.

- Space heating and heating bath water is not done generally, and if done, it was mainly by firewood. After the project, there seems to be a slight change towards gas and electricity for heating, but it is mainly in semi-urban areas, and it is not a significant change.

A5.1.8 Features of Electrification

All the households surveyed are connected to electricity, while in the project as a whole, BPC data indicate that 98% of households are connected. Most households interviewed for this study had become connected to electricity in the period between 1996 and 2000. The process seems to have begun in 1993 and in recent years there is also a steady increase in the connection rate.

A5.1.8.1 Types of subscription:

The surveyed households had three types of subscription: social tariff, domestic tariff and industrial tariff (see Table A5.1- 14). 53 % of the households surveyed were having social tariff, 43 % had domestic tariff and 3 % had industrial tariff. Social tariff was more common in rural area and domestic tariff in semi-urban area. Industrial tariff was more common in semi-urban area. For the whole project area, BPC data indicate shares of 52 % (10.689 subscribers) social tariff (non-metered), 46 % (9.458 subscribers) domestic tariff, and 2 % (256 subscribers) industrial tariff. Thus the sample has a modest under representation of households on domestic tariff, and a corresponding, slight overweight of social (small consumers) but also of industrial tariffs. The differences here (sample vs. total population) are not considered to be important to the analysis.

Table A5.1- 14: Types of subscription in Andhi Khola (sample households).

		Social Tariff	Domestic Tariff	Industrial Tariff	Total
Overall	Households	64	52	4	120
	%	53.4	43.3	3.3	100
Semi Urban	Households	10	23	2	35
	%	28.6	66.3	5.7	29.2
Rural	Households	54	29	2	85
	%	64	34	2	100

Non-metered connections of small size cut-outs are common in rural areas Table A5.1- 15. There are three types of cut-outs: 50 W, 100 W and 250 W. Among electrified households in the sample, 64 (53%) have such smaller size capacities installed which implies a non-metered connection (8 % are 50 W, 21 % 100 W and 24 % 250 W). 63% (54) of rural households and 29% (10) of semi-urban have a non-metered connection. Two households were found to have shared electricity with their neighbours. When reported this to BPC, staff expressed surprise. It means that they did not have meters.

Table A5.1- 15: Households having non-metered electricity connection (social tariff)

Location		Non metered (cut-out) (n=64)			
		50Watt	100Watt	250Watt	Total
Overall	Households	10	25	29	64
	% of non-metered households	15.6	39.1	45.3	100.0
Semi Urban	Households	2	5	3	10
	% of non-metered households	20	50	30	100.0
Rural	Households	8	20	26	54
	% of non-metered households	14.8	37	48.2	100.0

54 households (45%) have metered connection. Among the metered connections, there are three types: 400 W, 500 W and 1000 W. Only 1 household (of 120) had 400 W meter, and this was found in the

rural area. 33 households (61 % of metered connections) had 500 W and 16 (30 % of metered connections) had 1000 W (Table A5.1- 16). Not surprisingly, given the noted higher levels of businesses activities and electricity consumption in the semi-urban area, this is where we find a higher proportion of the larger capacities installed. In the semi-urban area, 40% of the households (14 out of 35) have 500W, 29% (10 out of 35) have 1000W and 6% (2 out of 35) have the industrial tariff (more than 100W). The corresponding figures for the rural area are 1% (400W), 22% (500W), 7% (1000W) and 2% (more than 1000W).

Table A5.1- 16: Households having metered electricity connection in Andhi Khola

AHREP		Metered (n=54)				
		400W	500W	1000W	Industrial tariff (more than 1000 W)	Overall
Overall	Households	1	33	16	4	54
	% of metered households	2.0	61.0	29.6	7.4	100.0
Semi Urban	Households	0	14	10	2	26
	%	0	53.8	38.5	7.7	100.0
Rural	Households	1	19	6	2	28
	%	3.6	67.9	21.4	7.1	100.0

As noted, due to their higher use of electricity, electricity related expenses per household are higher in semi-urban area. Table A5.1- 17 shows that the number of bulbs per household is almost the double in the semi-urban area as compared to rural area. The monthly bill is also almost double. The figures refer to data (averages) collected in the household survey and their validity is commented on below.

Table A5.1- 17: Some characteristics of electricity connection in AHREP.

Projects	**Semi-urban**	**Rural**	**Overall**
Average connection charge (NPR) per household	888	824	843
Average wiring charge/household (NPR)	3685	3174	3320
Number Lights-Bulbs/household	13.6	7.94	9.59
Average charge for the last month (NPR) per household	384	187	243
Monthly consumption (kWh, from Table A5.1-12)	62	15	29

Note: the values in the shadowed cells should be treated with caution. The table is based on verbal information obtained in the household survey. It indicates that the small consumers, in urban areas, who are generally poorer, pay double the price for electricity. This is a surprising finding which deserves scrutiny, as BPC claims to specifically address access for the poor at reasonable cost. It is therefore necessary to look at the actual situation, not only on the basis of survey results, but on the basis of BPC's tariff structure, and how it actually affects consumers in semi-urban and rural areas in the sample. Two different tariff regimes need to be considered, un-metered (Table A5.1- 18) and metered consumption (Table A5.1- 19).

Table A5.1- 18: BPC tariff structure for cut-out (non-metered) consumers

Subscribed Demand (watts)	**Monthly Charge (NPR/month)**	**BPC average kWh/month**	**Charge per kWh (NPR)**
25	19	12.5	1.50
50	39	14.5	2.70
100	66	23	2.90
250	116	51	2.25
400	179	66	1.80

The charges shown are flat rate per month. It indicates that the smallest category of 25W bears the lowest unit cost, it being explicitly pro-poor. The two largest supply categories are at an advantage, which is not pro-poor, but reflects the fact that BPC's overhead is equally applied across all categories, except the lowest. The assumed consumption figures, even though researched by BPC repeatedly over time, may introduce some error, but by and large assumptions are plausible. It is noted that in the Andhi Khola household sample there are no subscribers of the lowest category, while overall, 0.5% of all connections are of 25W subscription. There is a tendency for consumers to switch to higher capacity subscription.

Table A5.1- 19: BPC tariff structure for metered consumers

Subscribed Demand (watts)	Monthly Charge (NPR/month)	Energy charge (NPR/kWh)	Excess Energy Charge* (NPR/kWh)
Domestic Consumer			
500	89	1.75	5.2
600	107	1.75	5.2
700	125	1.75	5.2
800	142	1.75	5.2
900	160	1.75	5.2
1,000	178	1.75	5.2
Industrial Consumers**			
< 5 kVA	75	1.70	
5.1 – 15	90	1.70	
>15	100	1.70	

* Excess Energy rate is charge for consumption above the subscribed demand.

** the tariff is also differentiated for „peak consumers", not shown

The excess energy charge can be disregarded here. It has been introduced for peak load management, and customers will avoid peak consumption above the subscription value as much as possible. Normal monthly charges have two components: a cost per kWh, and a lump sum per month.

From the various tariffs applied, and the structure of subscriptions follows the characteristics of averages of consumption and charges to the customers shown in Table A5.1- 20.

Table A5.1- 20: Consumption and tariff pattern according to BPC data in Andhi Khola

Subscription category	% of all consumers	average monthly charge (NPR)	average monthly consumption (kWh)	average charge NPR per kWh
cut-out (25 to 400W)	52.4%	83	34	2.44
cut-out (25 to 100W)	22.3%	59	21	2.81
meter, domestic	46.3%	198	62	3.19
meter, industrial	1.3%	634	320	1.98

Accepting BPC's estimate of non-metered consumption, and given the composition of subscriptions in the rural areas in the sample, results in average monthly consumption of 34 kWh per customer in the overall cut-out category, considered as social tariff. The average spending per household is NPR 83 per month, which applies for 52.4% of all customers, and means that unit cost are NPR 2.44 per kWh.. This applies for 63.5% of all consumers in the rural sample, and for 28.5% of the semi-urban consumers.

Differentiating the small consumers, which are considered the poorer section of the category, shows that this section is 22.3% of all consumers, paying NPR 59 on average, and which consume 21 kWh per month. This means that this section actually pays NPR 2.81 per unit.

46.3% of all consumers subscribe to the metered domestic tariff, consuming 62 KWh/month, at a cost of just under NPR 200. The unit charge is therefore NPR 3.19. Only 1.3% of all consumers are in the „industrial" category, consuming 320 kWh/month on average, at a cost of NPR 634. This results in NPR 1.98 per unit.

About a third of households in AHREP paid the bill directly to BPC and two-thirds paid to users groups, which eventually paid the money to BPC in lump sum. The use of users groups avoided the need for every household to go to BPC office. A collector from users groups visit door to door for the collection of the bill, and it can keep 10 % of the amount to be paid to the BPC. This 10 % was used for social purpose including the paying of salary of the bill collector. 92.5 % households paid the electricity bill monthly and 5 % paid in advance (pre-paid).

Conclusion: Overall, more than 50% of all consumers benefit from a social tariff, which is about 24% lower than for the average metered domestic consumer. However, due to lower consumption and the flat rates applied for the smaller subscribers (25 to 100W), these consumers (22.3% of all), pay a higher unit price, which is only about 12% lower than the effective cost for metered consumers. This reflects the fact that BPC's overhead charge applied is the same for these subscribers, despite their lower consumption. Industrial consumers, on the other hand, benefit from the lowest tariff, 38% lower than for domestic consumers. Despite this favourable tariff, the share of industrial consumption is only 1.5% of the total.

It is also concluded that the stated electricity charges and consumption data in tables 11 and 16 are not reliable and are therefore not used in analysis. This indicates that a survey weakness is found in collecting such data, not only for electricity, but in general related to energy consumption, as found earlier when scrutinising wood fuel data..

A5.1.8.2 Use of household appliances

After the arrival of electricity, people keep (borrowed or purchased) TVs and Cassette players to an increasing extent. There has been a rapid increase in the use of TV, especially colour TV in semi-urban area, which may be a cause for the reduction in the number of radios there. Compared to rural areas, the use of appliances seems much higher in the semi-urban area. This is true for almost all appliances (Table A5.1- 21 on the next page). Use of fan, electric heater, refrigerator and computer is also significantly higher in semi-urban area than in rural areas. These appliances would not have been in use without electricity. The group „Any other", highly relevant in semi-urban areas after the coming of electricity, includes hair dryer, electric kettle, mobile phone, electric mixer, and water pump.

Table A5.1- 21: Households (%) using different appliances in Andhi Khola
(Bo – Borrowed, Pu – Purchased; Semi-urban (n=35), Rural (n=85), and All (n=120)

Appliances used	Before						After					
	Semi-urban		Rural		All		Semi-urban		Rural		All	
	Bo	Pu	Bo	Pu	Bo	Pu	Bo	Pu	Bo	Pu	Bo	Pu
Radio	6	40	5	26	5	30	9	34	21	42	17	40
Cassette/DVD	3	6	-	7	1	7	6	29	18	26	14	27
TV	-	3	1	3	1	3	14	68	24	30	22	42
E. Flat iron	-	-	-	1	-	1	9	40	1	7	3	17
E. Fan	-	-	1	3	1	3	14	49	18	13	17	23
Water heater	-	-	-	-	-	-	3	9	-	-	1	3
Refrigerator	-	-	-	-	-	-	9	26	4	4	5	10
Computer	-	-	-	-	-	-	-	9	-	1		3
Any Other	-	-	-	-	-	-	-	50	-	1	1	18

A5.1.8.3 Impact of electricity on household working hours, education and health:

With the availability of electricity, people have started to watch TV. Those families that watched TV, on average, watched it for 1.7 hrs per day. The amount of time listening to the radio has dramatically increased in rural areas (a decline is found in semi-urban areas), making also the average time (for those listening radio) increase (from 0.67 hrs to 1.62 hrs). Another noticeable change has been the

considerable increase in time of study after the dark for children (0.4 to 1.3 hrs). To a very modest extent, this also holds for women (0.1 to 0.2 hours) and even the men (0.0.5 to 0.2 hours). On the other hand, there has not been significant increase in the hours spent in productive work after the dark. Comparing semi-urban and rural areas today (Table A5.1- 22), it seems that in semi-urban areas, more time (almost double) is spent on TV as compared to rural area. On the other hand, studying and other kinds of work at night time are reported activities in both semi-urban and rural area after the coming of the electricity.

About 80 % of the respondents expressed that electricity has played or has helped in improving the educational standard at the household level. Similarly, 64 % respondents claimed that education has improved after having electricity at the community level. In 1993, only 15 of the 134 respondents or 11 % had reported that the project had helped in improving their own (family) education and 10 % had said that that education at the community level had improved. At that time only a few households had electricity. The respondents saying so were mainly from rich and middle class families.

Table A5.1- 22: Duration (hrs) of various tasks done at night after having electricity in Andhi Khola

Tasks	Before			After		
	Semi Urban	Rural	Total	Semi Urban	Rural	Total
Watching TV in hrs	0.00	0.00	0.00	2.28	1.50	1.70
Listening Radio in Hrs	1.13	0.50	0.70	0.82	1.9	1.60
How many hrs. family spend for the following activities after dark?						
Children studying hrs.	0.43	0.38	0.39	1.29	1.27	1.27
Women studying / reading hrs.	0.11	0.08	0.09	0.17	0.24	0.22
Men studying / reading in hrs.	0.06	0.05	0.05	0.11	0.27	0.23
Productive work by children in hrs	0.00	0.02	0.02	0.00	0.01	0.01
Productive work by Women in hrs	0.00	0.02	0.02	0.03	0.02	0.03
Productive work by Men in hrs	0.00	0.00	0.00	0.06	0.14	0.12
Some other works	0.00	0.00	0.00	0.74	0.68	0.70
Reading/conversation/showing/explaining something in hrs.	0.03	0.01	0.02	0.40	0.13	0.2

The female literacy rate is higher in areas having electricity. Similarly, availability of electricity has been instrumental to the new service of having computer classes in school. Availability of electricity seems to benefit girls more. This has been the general perception in the villages. Girls, who generally are given more work load as compared to boys in the day time, now can study in the night. It may also be because of this factor that enrolment of girls in schools and college in Galyang is said to have increased. Another probable and important contributing factor to girls' increased enrolment rate is the decline in water collection time, and, to a more limited effect so far, participation of men also in the collection of water.

The response to the impact of electricity on human health was similar to that of education. About 94 % respondents reported that it has helped in improving the health at the household level and 58 % reported that it has helped in improving the health at the community level. In 1993, only 6 (4 %) households had expressed that the project helped in improving medical facilities, and 35 % had expressed that sanitation and drinking water had improved. There were others in 2007 who said that general social awareness, income and housing had improved. The increased security was also highlighter; firstly because of electricity and lights on public places and secondly because of efficiency in police security in electrified areas. Electricity is also considered as being helpful in the movement of girls and women within the village after dark.

The PRA survey also reveals that availability of electricity has had positive impact on health condition. Now district health offices can keep vaccines with low costs. In the past, they used to run refrigerators or cold rooms with kerosene, and this was costly. Emergency services in the night are

better now. The private clinics and government hospitals now have kept various equipment and facilities like x-ray and lab test. Therefore, minor problems are solved within the district or in market centres (like Galyang in Syangja) where these services are available. Even at the household level, as seen, sanitation has improved after having electricity. Improved sanitation and coverage of drinking water is a significant effect of electricity's arrival, which implies that people's health conditions have improved.

The household questionnaire survey reveals that there has not been significant increase in the hours spent in productive work after the dark. Because of lack of potentialities for industrialization, there has not been significant increase in non-farm activities providing employment to people. But there is some increase in family-based enterprises after having the electricity.

There also seems a concern with parents that with the availability of electricity, the tendency to watch TV and listening to radio has increased among the children. While the use of these devises is not bad in itself, parents seem worried that it is using their study time. After having electricity, there has been rapid increase in the use of TV, especially colour TV, particularly in the semi-urban area.

A5.1.9 Conclusions on electrification

- Social tariff followed by domestic tariff are common, while industrial tariff subscriptions are marginal. Domestic tariff is common in semi-urban area. BPC seems in favour of metered connection now. As the earlier emphasis in AKP was social development and poorer-friendly, cut-out system (social tariff) was easily accessible.
- The total number of consumers in the Andhi Khola area is 20,556 (2006), from which a population[10] of approximately 160,000 benefits directly through electricity use at home.
- Very roughly speaking, the wealthier half of the population pay an electricity unit price of about 30% more than the poorer half. However, due to prevailing consumption and subscription patterns, almost half of this latter group pay more per unit of energy. i.e. about by 15%, compared to the overall social tariff group. Overall, the cost of electricity is below NPR 3 per kWh, i.e. less than USD 0.05/kWh.
- Use of electricity (for bulbs, industry or appliances) is correlated with household location. In semi-urban locations, the number of bulbs/household is about three times of the rural area number. Similarly, the consumption, and hence the cost in electricity (dues) are also about three times higher in the semi-urban area compared to rural areas.
- Only 1.3% are industrial consumers with an average consumption of 320 kWh/m, and an average monthly bill of NPR 630. Hence, the preferential charge per unit is just below NPR 2 per kWh.
- Overall, in the present situation, the entire tariff structure turns out to be moderately pro-poor, but consumption growth is likely to erode this bias.
- Users' group concept for electricity dues collection as practiced in Andhi Khola is considered useful and it also helps in building social and community assets.
- Regarding the use of appliances, TV has increased significantly after the project. In rural areas, the number of radios (and the amount of time people listen) has increased, but declined in semi-urban area. The use of other appliances is common only in semi-urban areas.
- People perceive that the impacts of electricity on education including the use of computers and particularly girls' education, health and security have been positive. Without electricity, the present level of improvement in education, female literacy rate and health services would not have been possible. The possibility to spend time in new ways, such as when saving time spent on collecting water, going to the nearest health service for proper treatment or children rehearsing in the evening,

[10] Calculated on the basis of average family size of 7.8 (survey data)

is one of electricity's most important and positive effects. Changes are small still, but the general trend is positive.

A5.2 Jhimruk Field Study

The project is located in Pyuthan district in western Nepal. It is mainly a hydropower project, which was completed in 1995/96 producing 12 MW of electricity. A part of the electricity is supplied to the national gird and a part is supplied to villages directly by the project. At present, it supplies electricity to 9 VDCs of the district. The water of the Jhimruk Khola (river) is diverted through a tunnel to a power station and then discharged to Madi river. Jhimruk Khola is considered by people to be valuable in terms of irrigation, and its diversion to hydropower meant that people in the down stream have faced problems in cultivating rice in the dry season (April-July period). In other seasons, there is no shortage of water. Even though the project stops for a month during the dry season and does not restrict the flow of water, there is still a shortage of water for irrigation in the downstream region (until another river mixes with Jhimruk about 13 km downstream). About 150 ha of land is now deprived of irrigation water for a dry season crop. Considering that the average yield would be 2.1 metric tonnes/ha, total production loss of the paddy would be 315 metric tonnes. A project called JIDCO helps in facilitating the development of irrigation facilities and in providing skills for enterprises. Maoist bombing of the hydro-power plant rendered it non-operational for some time.

The settlements in Jhimruk area are mainly located in the river bed, and the most affluent locations are the villages located along the Jhimruk river and Madi river (above the power plant). Irrigation by the river and fertile river bed is good two crops of paddy and another crop of either maize or wheat. Socially, this area is mixed consisting of both Hindu groups (Brahmins, Chettris, and Dalits) and non-Hindu groups (usually Magars).

The methodological approach in Jhimruk is basically the same as that described for Andhi Khola. Three main groups were included in the sample. There are two groups within the ‘electrified’ group (affected by the project) – one which has got electricity without losing the water for irrigation and another getting electricity and other benefits but losing the water for irrigation. The third group studied are non-electrified. In total, a sample size of 120 households was taken to make it comparable with findings from Andhi Khola. 80 households were studied among the electrified group (covering two subgroups and surveying 40 households each) and 40 in the non-electrified group. The study was conducted in three locations, all of rural character, as there are no semi-urban areas, to represent these groups:

1. One location included the villages lying in the downstream of the dam. These villages have electricity and other opportunities from the project but have been adversely affected by the diversion of water of Jhimruk river for the production of electricity. The villages included Ramdi, Tigra Chhap and Dhuwang. 40 households representing four wealth categories were surveyed here.
2. Another location included Tiram and Nayagaon VDCs, which has electricity and other facilities but are not adversely affected by diversion of water. 40 households were surveyed here.
3. The ‘non-electrified’ village (not affected by the project) included Hansapur and Dhungagadi. In this area, solar panels (PV) had been distributed by the government, but they were not working properly. No other differences (other than electrification) between these non-electrified villages and those in the ‘intervention area’ were reported. Therefore, we took them as ‘non-intervention areas, otherwise similar to intervention areas’. This is relevant for our comparative purposes.

A5.2.1 Family status of respondents

The family size is only 6.8 members and it has decreased in both electrified and non-electrified areas (Table A5.2- 1). But this decline is more drastic in non-electrified area. This could be related to health condition, i.e., higher children mortality in non-electrified because of lack of sanitation and water related to availability of electricity. This could be the possibility because children below 5 years are more now in electrified area. But this is not the case in the non-electrified area.

Table A5.2- 1: Demographic features in Jhimruk

		Electrified (n=80)	Non-electrified (n=40)	Total (n=120)
Family Size (members)	Before	6.69	6.93	6.77
	After	6.33	6.05	6.23
Female members	Before	3.26	3.45	3.32
	After	3.11	3.10	3.11
Male members	Before	3.41	3.48	3.43
	After	3.20	3.18	3.19
Children 5-15 yr	Before	1.39	1.83	1.53
	After	1.64	1.35	1.54
Children Below 5 yr	Before	0.64	0.90	0.73
	After	0.69	0.83	0.73
Total Adult members	Before	4.54	4.03	4.37
	After	3.81	3.35	3.66

A5.2.1.1 Caste Composition:

Caste composition consists of Brahmins (25 %), Chettri (18 %), Dalits (10 %), Magars (36 %) and others (11 %). In electrified area and non-electrified area, the proportion of Brahmins and Chettris was almost equal. Dalits are more numerous in electrified area than in non-electrified area and Magars are more in number in non-electrified area. Given that Magars are also poor, and some of them are very poor like Dalits, it was assumed that wealth-wise it would be balanced. As Dalits are mainly associated with Brahmins and Chettris (as they are Hindus), Dalits are more in number in Brahmin-Chettri settlements (see Table 3 also).

A5.2.1.2 Wealth rank of the households and changes:

There is no perceptible change in the wealth rank status of households before and after the project (Table A5.2- 2). It seems that electrified area is slightly better in terms of reduction in proportion of households under very poor and poor category after the project. In non-electrified area, there is no perceptible change. Even though there is loss of water, other enterprises like poultry production, vegetable production and the like, which are associated with electricity, have helped in balancing the income loss in the electrified area.

Table A5.2- 2: Distribution (%) households according to wealth rank in Jhimruk

	Before the project (1995)				Now (2007)			
	Rich	Medium	Poor	Very Poor	Rich	Medium	Poor	Very Poor
Electrified (n=80)	19	40	29	12	19	44	26	11
Non-electrified (n=40)	15	40	30	15	15	43	28	15
All (n=120)	18	40	29	13	18	44	27	12

Wealth status by caste (Table A5.2- 3) reveals that there is also marginal change, among other major caste/ethnic groups, but decline in the position of Dalits. Most of the Dalits are located in the electrified area, but have not connected to electricity because of their weak financial position.

Table A5.2- 3: Distribution (%) of caste/ethnic groups according to wealth rank in Jhimruk

	Before the project (1995)				Now (2007)			
	Rich	Medium	Poor	Very Poor	Rich	Medium	Poor	Very Poor
Brahmin (n=30)	23	60	10	7	23	63	7	7
Chettri (n=22)	32	32	32	5	32	36	27	5
Dalits (n=14)	8	25	42	25	0	33	50	17
Magar (n=43)	9	35	37	18	12	37	33	19

Note: Other caste group's number (11 households in 6 different groups) is small, and thus not used for this disaggregation.

A5.2.1.3 Physical assets owned:

House quality (based on type of wall and roof) seems to have very slightly increased in electrified area as compared to that in non-electrified area (tables A5.2-4 & 5). The change is towards brick and RCC house and decline in mud and stone houses. Some slight has also taken place in terms of roofing materials. In electrified area, proportionately more households have opted for RCC and CGI sheet. The change is marginal. One would question as when there has been decline in production, how things are slightly better now? There is electricity now and it has partly helped in improving the quality of houses, because it has helped in increasing income of at least a few, e.g. those having poultry farm and those having the food processing mills (like grain mills). Transportation facility has been good and it has facilitated marketing of products like poultry and availability of construction of building materials. It is noteworthy that downstream people had demanded a road as compensation for the use of water by hydro-power.

The survey data show that there has not been significant change in the ownership of house by gender. A slight increase in the ownership of house is seen after the project. Only 5 % respondents expressed that their house is owned by a woman before the project, but 6.3 % said so after the project.

After the project, there seems to have been some change in the electrified area. For example, there were a few households reporting that they had added poultry house, a hotel, increased the rooms in the house, built a new house and did house maintenance. But this was not reported in non-electrified area.

Table A5.2- 4: Households (%) having different house walls in Jhimruk

Location	Before				After			
	Brick	Mud and stone	RCC	Others	Brick	Mud and stone	RCC	Others
Electrified (n=80)	3	92	3	3	9	75	10	6
Non-electrified (n=40)	3	95	0	3	3	90	3	5
Total (n=120)	3	93	2	3	7	80	8	6

Table A5.2- 5: Households (%) having different roof types in the project sites in Jhimruk.

	Before				After			
	Tile	CGI	Thatch	RCC	Tile	CGI	Thatch	RCC
Electrified (n=80)	11	33	53	3	15	50	18	15
Non-electrified (n=40)	13	43	43	3	13	57	27	3
Total (n=120)	12	36	49	3	14	54	24	9

The data in Table A5.2- 6shows that wealth is also linked to house quality. It seems that proportionately wealthier households have brick walls, RCC walls, and CGI sheet and RCC slab roofs.

Table A5.2- 6: Households (%) house walls and roof types by wealth category in Jhimruk

	House-wall					Roof-type				
	Brick	Mud and stone	RCC	Board	Others	Tile/slate	CGI	Thatch	RCC slab	Others
Before										
Rich (n=21)	5	86	5	0	5	5	67	19	5	5
Medium (n=48)	2	96	2	0	0	13	40	46	2	0
Poor (n=35)	3	94	0	0	3	14	31	54	0	0
Very poor (n=16)	-	94	0	0	6	13	0	88	0	0
After										
Rich (n=21)	19	62	14	0	5	5	62	5	29	0
Medium (n=52)	6	79	8	0	8	17	60	12	12	0
Poor (n=32)	3	91	0	0	6	16	50	35	0	0
Very poor (n=15)	-	87	0	0	3	13	33	53	0	0

There has been some increase in the ownership of other assets, but this change was very marginal. The ownership of these assets in itself is marginal (see Table A5.2- 7).

Table A5.2- 7: Ownership of other assets in Jhimruk (% households)

Other Assets	Before the project			After (2007)		
	Electrified (n=80)	Non-electrified (n=40)	Total (n=120)	Electrified (n=80)	Non-electrified (n=40)	Total (n=120)
Bicycle	9	7	8	12	-	7
Motorbike	-	5	2	6	-	4
Power Tiller	-	-	-	-	-	-
Private Car	1	-	1	1	-	1
Truck/bus	-	2	1	1	-	1
Water storage tank	-	-	-	1	-	1

A5.2.1.4 Social assets

A major form of social asset has been the kinship obligations and community co-operation. There are traditional as well as newly formed organizations of people for mutual co-operation. Project seems to create some of these new organizations and thus increase social assets of the people. For example, there are groups like 'lift irrigation' groups, 'women's groups', farmers groups, co-operative groups and the like.

Most households in the study area expressed that they have been the traditional residents in the project area. Only 14 households (12 %) expressed that they moved to the project area. Access to 'power' was considered as a prime reason for movement to the project area.

A5.2.2 Water and sanitation

A5.2.2.1 Sources of drinking water

Sources of drinking water seems similar in both electrified and non-electrified areas in terms of access to public fountain before the project. The use of spring/river in electrified area was high in the past which is because of its location. After the project, a major change is increased access to public fountain which in both, the electrified and the non-electrified area (Table A5.2- 8).

Table A5.2- 8: Sources of drinking water (% households) in Jhimruk
Electrified (n=80), Non-electrified (n=40), Total (n=120)

Sources	Before the project			After the project		
	Electrified	Non-electrified	Total	Electrified	Non-electrified	Total
Water storage tank	-	-	-	3	-	2
Spring/ river/ lake	64	30	53	63	37	54
Dug Well	2	-	1	3	0	2
Tube well	3	-	2	4	-	3
Public fountain	30	34	31	74	70	73
Private tap	5	10	7	9	10	9

Table A5.2- 9: Time to collect the drinking water (% households) in Jhimruk
Electrified (n=80), Non-electrified (n=40), Total (n=120)

Sources	Before the project		After the project	
	Electrified	Non-electrified	Electrified	Non-electrified
Less than 5 min	35	30	67	48
5-30 minutes	49	52	48	50
30 min to 1 hour	14	18	5	3
More than 1 hour	3	1	-	-

Time to collect water has been considerably reduced (Table A5.2- 9). This is more significant in electrified area than in non-electrified area, even though access to public fountain is more or less similar. The lesser time required in electrified area has also resulted from water available from pumps, and easy access to river and spring water. A significant part of water collection is still done by women. Selective male out-migration could also be one of the reasons, but the tendency of girls fetching water seems higher than that of the boys. It is reported that now (after the project), participation of both 'male' in water collection has grown. This could also be a matter of general awareness. Information on the quality of water was not collected. But provision of water from public fountain means that water quality might have improved.

A5.2.2.2 Toilet

Before the project, about 68 % households did not a have toilet. After the project, about half the households do not have toilet. There is slight increase in access to toilet. The increase in this access is more rapid in electrified area than in non-electrified area (Table A5.2- 10).

Table A5.2- 10: Households (%) having access to toilet in Jhimruk
Electrified (n=80), Non-electrified (n=40), Total (n=120).

Sources	Before the project		After the project	
	Electrified	Non-electrified	Electrified	Non-electrified
Bathroom	1	10	10	10
Latrine	23	30	40	33
Do have neither	76	58	50	47

A5.2.2.3 Findings and conclusions:

- There seems to be a marginal improvement in wealth status in electrified area after the project, but non-electrified area seems more or less in the same status (as before the project). Some income generating activities (like poultry, mills, employment and trade associated with road access provided by the project) have helped to compensate the production loss in the electrified area.
- Access to drinking water seems to have increased because of availability of more public fountains after the project. This is more or less the same in both electrified and non-electrified area. The reduction in water collection time is more pronounced in electrified area, which could also be linked to its location near the river and springs. Moreover there are water pumps available in electrified areas.
- Access to toilet has also improved slightly, but still about 50 % do not use any type of toilet. The access has increased significantly in electrified area as compared to non-electrified area.

A5.2.3 Livelihood

Livelihood in the project areas is characterized by a diversity of activities, but farming has still been the central. Households not able to fulfil food security through their own production also depend on a number of other opportunities mainly migration to India and to the cities. Farming has still been of subsistence nature, even though cash crop farming (like vegetables) has been started by some and this is mainly because of extension activities done by JIDCO. Poultry production was seen to increase after the electricity, which was basically meant to cater the local market.

A large number of households were engaged in farming. Before the project, 80 % households were involved in farming. But in 2007, 75 % were involved in farming. Therefore, there is a general decline in involvement in agriculture. The decline in involvement in electrified area is not rapid, but it is rapid in non-electrified area. The availability of water pumps for irrigation and project activities related to encouraging farming and availability of market because of project staff and supply to district headquarters could be the reasons for not declining involvement in farming in electrified area. But there is some significant reduction in farming in non-electrified area. Because of lack of opportunities within the village, people have gone to India and outside for work.

There has been some reduction in land holding in both electrified and non-electrified area. This is because of population growth. There is no significant sale or buying of land experienced by respondents.

There is a loss of one crop (II crop rice called Chaite rice or April rice) in down stream area. On average, households surveyed in the downstream area (40 households) revealed that there has been 8 % reduction in the crop production per household. Of these households, only 9 households (22 %) reported that they have experienced the loss in production. Considering only these affected people, the production loss would be about 35 %, i.e. one-third of the production.

Before the project, the main source of irrigation was the gravity canals, which were made traditionally. A few households also stated that they had used to pump. 14 households in surveyed reported that they have used (lift) pumps.

The project seems to bring some business opportunities for the local people. About 18 % respondents in the electrified area expressed that it has been helpful (14 % said some what and 4 % a lot) for them. In non-electrified area, 1 % said that it helped a lot and 1 % said that it caused reducing the opportunities (Table A5.2- 11).

Table A5.2- 11: Changes in business after the project in Jhimruk (% of households)

	No change	Increased somewhat	Increased a lot	Decreased
Electrified area (n=80)	81	14	4	1
Non-electrified area (n=40)	98	-	1	1

The somewhat increase in businesses has not been able to generate much employment. They were mostly of 'subsistence type' of business indicating only family members were employed. Only 3 persons were found to be employed on a salary basis.

Food security from own production seems to decline generally in both electrified and non-electrified area. The food production was sufficient for 5.72 months before the project, but it seems to have declined to 4.24 months after the project. This is a decline by 1.5 months food self-sufficiency. The decline is similar in both electrified and non-electrified area. In the electrified area, decline is due to increase in population pressure and partly due to decline in production owing to diversion of irrigation area. In non-electrified area, the decline is both due to population pressure and decline in attention to farming as people move out for other employment. This out-migration tendency is high in non-electrified area.

Table A5.2- 12: Households (%) deriving income from different sources in Jhimruk
(Changes in livelihood sources of the households)

Sources of income	Before the project		After the project	
	Electrified (n=80)	Non-electrified (n=40)	Electrified (N=80)	Non-electrified (N=40)
Business	7	8	40	25
Home business	10	9	25	25
Outside business	4	7	8	15
Agriculture and livestock	86	68	86	52
Gov. subsidy/pension	17	30	16	27
Remittances	14	20	30	27
Permanent employment	20	5	22	8
Wage employment	19	22	25	5

There has been some changes in the sources of income (Table A5.2- 12). There is an increase in the percentage of households deriving income from business and remittances. The households deriving income from agriculture have declined more significantly in non-electrified area, more probably because of their out-migration for work and for business.

Five households obtained jobs after the project and it was directly through the project. One of them is woman. They all (comprising 6 % of households) are from the electrified area. No one from the non-electrified area got employment after the project.

A5.2.3.1 Major findings and conclusions:

- There is a general decline in involvement in agriculture. This mainly so in the non-electrified area, where households are more attentive to outside business and migration.
- There has been increase in business opportunities within the area (home business) in electrified area as compared to non-electrified area. Electricity is seen as a factor for increasing business and enterprises. Hence, electricity is one of the reasons for rapid increase in households having a business income in electrified area.
- Loss of production due to diversion of water is about 8 % in the down stream area, on average. Only 22 % households within that area were directly affected by this diversion, and their production loss equals about one-third of their production.
- A project benefit, in terms of employment, is also concentrated in the electrified area.

A5.2.4 Energy situation

A5.2.4.1 Energy Use

The households were found to use a variety of energy sources, which is shown in Table A5.2- 13. At present (2007), an electrified household was found to consume roughly 490 kg, and a non-electrified household 505 kg of fuel wood. However, reliability of these data is doubtful, as discussed earlier in the Andhi Khola study. Consumption of charcoal and candle is extremely small. Only one or two households were found to use it. Solar energy was common in non-electrified area where it has been promoted by the government. Dry cell batteries were also commonly used. The average consumption per month was about 1.6 batteries. Electricity consumption per month per household was 38 KWh.

Table A5.2- 13: Household monthly consumption of energy and its sources in Jhimruk

Energy Source	Before		After	
	Electrified[11] (n=80)	Non-electrified (n=40)	Electrified (n=80)	Non-electrified (40)
Fuel wood in Kg	520	550	490	505
Charcoal in Kg	0.3	0.1	0.3	0
Kerosene in Litre	4.0	4.0	0.7	2.8
Solar Energy Maintenance cost (NPR)	0.1	18.0	0.4	18.0
Dry cell Batteries Number	2.7	3.4	1.3	3.0
Other batteries(cost for recharging (NPR)	0.1	1.9	0.1	1.6
Candles Number	0.3	0.3	2.4	0.5
Electricity Units (kWh)	-	-	37.6	-
Gas LPG (NPR)	-	-	27	17
Cost of fuel/energy per month NPR	233	245	551	624
% of income spent on energy	3.8	3.6	6.6	7.0

[11] Households were not electrified at that time, but it is those that were later connected.

Considering inflation, which has not been accounted for in the above table, the increase in cost of energy is modest in absolute terms, but marked as a share of total income, which appears to have about doubled. General inflation in the period before/after amounts to an accumulated 49%, but the cost of electricity has remained stable, since there was no change of tariff. This appears to have an impact on non-electrified areas, where the cost increase for energy is shown to be higher.

Some changes after the project are:

- Slight reduction (6.6%) in consumption of fuel wood. This is mainly because of the use of improved cooking stoves as promoted in the villages, and more probably by reduction in family size. This reduction has taken place in both electrified and non-electrified areas.
- There is also reduction in consumption of kerosene. It has taken place in both electrified and non-electrified area. But this is more drastic in electrified area. The use of electricity is the reason for this. In non-electrified area, use of PV light might have helped in reducing the use of kerosene.
- Consumption of dry batteries has also been reduced, but this is more so in electrified area.
- Use of charcoal and gas is insignificant – both before and after the project.

A5.2.4.2 Use of different sources of energy for different purposes

Tables A5.2.-14 &15 show the households (in %) using different sources of energy for different purposes before and after the project and in electrified and non-electrified area. It has to be taken into account that non-electrified area had some access to solar energy even before the project. The analysis of the Tables reveals the following conclusions:

- Fuel wood is still he main energy for cooking. 100% of the households stated to always use it. Boiling water and also (sometimes for heating and heating the bath water. There has been very marginal increase in the use of kerosene for cooking and boiling water. Therefore, the marginal reduction in the use of fuel wood has come mainly from reduction in family size and use of improved cooking stoves in some households. Hence, the data shown, resulting in a reduction of fuel wood of 5 to 10% appears plausible.
- Electricity has been used in electrified area for lighting now, replacing the kerosene, and some gas also appears to be used for lighting. But still 11% households in electrified area expressed that they do not at all use it, because they are not connected to it.
- Tendency to use electricity has been seen in business sector. About 12 % households in electrified area said that use electricity for business. These are the shops using the refrigerator, mills, and poultry farms, where electricity is used. Therefore, electricity can be considered as precursor for whatever marginal growth has taken place in business and industry.

Table A5.2- 14: Household (%) energy sources before the project in Jhimruk
(Nev – Never, ST – Sometimes; F – Frequently, V Fr – Very Frequently, Alw – Always)

	Electrified area – before the project (n=80)					Non-electrified area – before the project (n=40)				
	Nev	ST	Fr	V Fr	Alw.	Nev	ST	Fr	V Fr	Alw.
Cooking/boiling water										
Fuel wood	-	-	-	-	100	-	-	-	-	100
Charcoal	100	-	-	-	-	100	-	-	-	-
Electricity	100	-	-	-	-	100	-	-	-	-
Gas	100	-	-	-	-	-	-	-	-	-
Kerosene	97	1	1	1	-	95	2	3	-	-
Heating /bath washing water										
Fuel wood	76	22	2	-	-	88	12	-	-	-
Charcoal	100	0	-	-	-	100.0	-	-	-	-
Electricity	100.0	-	-	-	-	100	-	-	-	-
Gas	100	-	-	-	-	100	-	-	-	-
Kerosene	100	-	-	-	-	100	-	-	-	-
Lighting										
Fuel wood	100	-	-	-	-	100	-	-	-	-

	Electrified area – before the project (n=80)					Non-electrified area – before the project (n=40)				
	Nev	ST	Fr	V Fr	Alw.	Nev	ST	Fr	V Fr	Alw.
Solar (PV)	100	-	-	-	-	45	-	10	-	45
Electricity	100.0	-	-	-	-	100	-	-	-	-
Candles	96	3	1	-	-	98	1	1	-	-
Gas	99	1	-	-	-	98	1	1	-	-
Kerosene	-	-	-	-	100	28	8	10	-	55
Home business										
Fuel wood	99	1	-	-	-	90	10	-	-	10
Solar (PV)	100	-	-	-	-	95	-	-	-	5
Electricity	100.0	-	-	-	-	100	-	-	-	-
Charcoal	100	-	-	-	-	99	1	-	-	-
Gas	100	-	-	-	-	100	-	-	-	-
Kerosene	99	-	-	-	1	75	10	-	-	13

Table A5.2- 15: Household (%) energy sources in Jhimruk after the project
(Nev – Never, ST – Sometimes; F – Frequently, V Fr – Very Frequently, Alw – Always)

	Electrified area – after the project (n=80)					Non-electrified area – after the project (n=40)				
	Nev	ST	Fr	V Fr	Alw.	Nev	ST	Fr	V Fr	Alw.
Cooking/boiling water										
Fuel wood	5	1	1	-	93	9	-	-	-	91
Charcoal	100	-	-	-	-	100	-	-	-	-
Electricity	100	-	-	-	-	100	-	-	-	-
Gas	95	-	-	-	5	96	-	-	-	4
Kerosene	98	1	1	1	-	98	2	-	-	-
Heating /bath washing water										
Fuel wood	77	20	3	-	-	100	-	-	-	-
Charcoal	100	0	-	-	-	100	-	-	-	-
Electricity	100	-	-	-	-	100	-	-	-	-
Gas	99	-	1	-	-	100	-	-	-	-
Kerosene	100	-	-	-	-	100	-	-	-	-
Lighting										
Fuel wood	100	-	-	-	-	100	-	-	-	-
Solar (PV)	99	1	-	-	-	48	10	-	-	42
Electricity	11	1	-	-	88	100	-	-	-	-
Candles	67	31	-	-	-	43	13	4	34	-
Gas	99	1	-	-	-	99	1	-	-	-
Kerosene	71	22	6	-	-	43	8	10	-	58
Home business										
Fuel wood	99	1	-	-	-	100	-	-	-	-
Solar (PV)	100	-	-	-	-	95	5	-	-	-
Electricity	88	2	-	-	11	100	-	-	-	-
Charcoal	99	-	-	1	-	100	-	-	-	-
Gas	100	-	-	-	-	100	-	-	-	-
Kerosene	99	-	-	-	1	75	-	13	13	-

There has not been much change in the use of dry batteries. Their consumption has slightly been reduced because of electricity and PV system.

Use of candles has increased, even though it is not taken as permanent source of light. The power cut in power is considered as the reason for increased in candle. In the past, they used to have a stock (in electrified area) of kerosene and ready lamp. But after the project they do not maintain this necessitating the use of candle for emergency. Availability of it in recent times is furthering its use.

18 % households reported that they have used solar power. This is mainly because households in non-electrified area use it. On average, a household using the PVs, had invested about NPR 15.000 for a set of PV. Only 14 % of them reported that they have been satisfied with it. The problem is that it gets damaged and needs constant repairing. Moreover, battery life is limited.

The introduction of new energy sources like electricity and PV does not seem to have impact on fuel wood collection pattern. The collection time seems to be marginally reduced and this is not significant. The gender dimension of fuel wood collection reveals that the tendency of male to collect fuel wood has increased. But because of migration of males, it is still done by women, and some times children – both boy and girl – are also used in this work.

A5.2.4.3 Major findings and conclusions

- There has been a marginal reduction in fuel wood consumption. This has been possible not because of new sources of energy, but mainly because of decline in family size and introduction of improved cooking stove. Use of gas could also a factor in this reduction as its use for cooking and boiling water has slightly increased.
- The expense for energy has almost doubled. The increase in expenses in non-electrified area was higher, mainly because solar has been used there, which is considered expensive to use than the electricity.
- The use of other sources of energy (like battery, kerosene) has declined.
- About 11 % households did not use electricity at all, even for lighting in electrified area. They are not connected to it.
- There is use of electricity for business purpose in electrified area. 13 % households reported that they always use electricity in their businesses.
- There is no significant or perceptible impact in the fuel wood collection pattern.

A5.2.5 Electrification:

A5.2.5.1 Types of subscription:

Tables A5.2-17 to 21 provide information on types of subscription, tariffs and electricity consumption in the sample, and in totality, according to BPC consumer statistics. The surveyed households had three types of subscription: social tariff, domestic tariff and industrial tariff. About 24 % had social tariff, 74 % had domestic tariff and 2 % had industrial tariff.

Table A5.2- 16: Types of electricity subscription in Jhimruk.

	Social Tariff	Domestic Tariff	Industrial Tariff	Total
Household	20	59	1	80
%	25	74	1	100

One-fourth of the households in electrified area did not have meter, they have cut-outs. Of them, 25 % 50 W cut-out, 40 % 100 W and 35 % 250 W.

Table A5.2- 17: Households having non-metered electricity connection in Jhimruk.

	Non metered (Cut-out)			
	50Watt	100Watt	250Watt	Total
Households	5	8	7	20
% in total households in electrified area (n=80)	6	10	9	25
% among the non-metered households (n=20)	25	40	35	100

Among the 60 (75%) households), 5 % had 500 W and 80 % had 1000 W. 15% of the households have no connection.

Table A5.2- 18: Households having metered electricity connection in Jhimruk

	No	
		Metered based on 5Amp (up to

	connection	1000watt)		
		500W	1000W	Total
Households	9	3	48	60
% in total households in electrified area (n=80)	11	4	60	75
% among the non-metered households (n=60)	15	5	80	100

The following table from BPC consumer statistics attempts to check how representative the household sample is with regard to overall electrification patterns.

Table A5.2- 19: BPC consumer category regime in Jhimruk

Subscription category	of 5,987 total consumers
Non-metered	
50W	2.6%
100W	20.6%
250W	5.6%
400W	0.3%
Total cut-outs	29.0%
Total meters domestic	69.9%
Total meters industrial	1.1%
Households connected in electrified area	58.2% of 10.287
Disconnected households	4.4% (266)

Source: BPC consumer statistics

The tables shows that metered consumers are over represented in the sample (75%). In reality only 69.9% have a domestic metered connection. Among the cut-out consumers, the 100W category is under represented, while both 50W and 250W are over represented. As is shown below, this does not have a significant impact on the analysis. Of interest is also that the number of non-connected household overall is more than 58%, while in the survey sample only 11% have no connection.

The tariff structure for Jhimruk is the same as in Andhi Khola for un-metered consumers, but it is different for metered consumers. This is do to the fact the Jhimruk communities have insisted on the application of Nepal Electricity Authority (NEA) tariffs. These have a complex structure, depending on the type of subscription and consumption level. For the purpose of Jhimruk, it is appropriate to consider the lower tariff level only, as there are no large consumers. Both tariffs are reflected in the table below, including the computation of monthly charges.

Table A5.2- 20: Tariff structure in Jhimruk and monthly charges to consumers

Subscribed Demand (watts)	Monthly Charge (NPR/month)	BPC average kWh/month	Charge per kWh (NPR)
Un-metered (cut-out) consumers			
25	19	12.5	1.50
50	39	14.5	2.70
100	66	23	2.90
250	116	51	2.25
400	179	66	1.80
Metered consumers			
	Fixed charge (NPR/month)	Energy charge in excess of 20kWh (NPR/kWh)	
Typically 1000W	80	7.30	

Source: BPC consumer statistics and other data

The applied tariff structure implies that metered consumers pay a minimum of NPR 80 per month, regardless of consumption below 20 kWh. The consumption pattern prevailing, results in the average monthly costs for consumers and related unit rates shown in table 22.

Table A5.2- 21: Consumption and electricity cost in Jhimruk

Subscription category	% of all consumers	average monthly charge (NPR)	average monthly consumption (kWh)	average charge NPR per kWh
cut-out (50 - 400 W)	29.0%	74	28	2.64
cut-out (50 + 100W)*	23.4%	63	25	2.52
meter, domestic	69.9%	101	23	4.39
meter, industrial	1.1%	1,151	260	4.43

* sub-group of overall cut-out subscribers

A5.2.5.2 Conclusion

Actual consumer data, deviating to some extent from survey data, are used to draw conclusions for the whole electrified area in Jhimruk.

- In the Jhimruk area, there are 5.987 consumers, which benefits about 46.700 people benefit directly through electricity use at home.
- 29% of all consumers subscribe to one of the social tariffs, and consume on average 28 kWh per month, at a cost of NPR 74. This results in an average social tariff of NPR 2.64 per kWh. Subscribers in the two lowest categories (considered the poorest), dominate with about 80% of all cut-out subscribers. These consume on average 25 kWh, and pay NPR 63 per month. Their unit rate turns out to be NPR 2.52
- Metered consumers make up 69.9% of the total of 5,987 connections. Monthly average consumption is 23 kWh, at a cost of NPR 101. the resulting tariff rate is NPR 4.39 per kWh, as a consequence of having opted for NEA tariffs.
- Industrial consumers consume on average 260 kWh/month, and pay NPR 1,151 per month. The tariff rate is NPR 4.43 per unit, pretty much equal to the overall average.
- As a result from the above, the tariff structure and consumption patterns prevailing show a distinct social element, with a pro-poor tariff of roughly 57 to 60% of the metered domestic rate.

Some further characteristics of electricity connections are:

- Among the households in the electrified area in Jhimruk, only 58.2% are connected. These households are poor households, who could not afford electricity.
- Some households have over time been disconnected because they could not pay their bill. 266 in number, or about 4.4%.
- Average connection charge per household - NPR 1,496
- Average wiring charge/household - NPR 3,080
- Number Lights-Bulbs/household - 6.88
- Reconnection was done only for 3 households. The charge ranged from NPR 250 to 484.
- All consumers pay bills to BPC/Utility. 64 % households paid the bill on a monthly basis, 9 % paid in advance (pre-paid) and 27 % pay bi-monthly. According to BPC and local leaders, the formation of user organisations was rejected by the people.

A5.2.6 Impact of electricity on household work hours, education & health

With the availability of electricity, it seems that tendency to watch TV and listening to radio has increased (Table A5.2- 22). Time spent in these activities has increased significantly in electrified area after the project. There is no noticeable change in non-electrified area, even though an insignificant time in TV watching is also spent there. Radio listening has marginally declined in non-electrified area. Radio listening was higher in electrified area even before the project, and it increased slightly after the project.

The main change is seen is in study hours of the students. It has doubled in the electrified area after the project. The increase in non-electrified area is very marginal.

In other productive work hours, there is no significant increase after the project. Compared to non-electrified area, where the situation has remained the same in most respect, a small amount of time is used for productive work after the dark.

Table A5.2- 22: Various tasks done at night before and after the project in Jhimruk
Electrified area (n=80) v/s Non-electrified area (n=40). E – electrified and NE – non-electrified.

Tasks	**Before**		**After**	
	E	**NE**	**E**	**NE**
Watching TV in hrs	0.00	0.00	0.93	0.1
Listening Radio in Hrs	1.23	0.48	1.31	0.3
How many hrs. family spend for the following activities after dark?				
Children studying hrs.	0.85	0.40	1.76	0.50
Women studying / reading hrs.	0.13	0.18	0.23	0.10
Men studying / reading in hrs.	0.10	0.00	0.07	0.0
Productive work by children in hrs	0.00	0.00	0.00	0.00
Productive work by Women in hrs	0.00	0.00	0.03	0.00
Productive work by Men in hrs	0.00	0.00	0.03	0.00
Some other works	0.00	0.00	0.74	0.36
Reading/conversation/showing/explaining something in hrs.	0.00	0.00	0.04	0.00

Respondents' perception on impact of electricity on education is positive. About 65 % expressed that it is positive at the household level education and 44 % said that it is also positive for the community level education (see table below).

Table A5.2- 23: Impact of electricity on education in Jhimruk (n=80).

	Household level		Community level	
	No change	Improved	No change	Improved
households	15	65	45	35
%	19	81	56	44

The response on the impact of electricity on human health was similar to that on education. About 76 % respondents reported that it has helped in improving the health at the household level and 45 % reported that it has helped in improving the health at the community level.

Table A5.2- 24: Impact of electricity on human health in Jhimruk (n=80)

	Household level		Community level	
	No change	Improved	No change	Improved
households	19	61	44	36
%	24	76	55	45

A5.2.7 Use of household appliances

Table A5.2- 25: Households (%) using different household appliances in Jhimruk

B= borrowed P = Purchased, E – electrified area (n=80), NE – Non-electrified area (n=40),.

Appliances	**Before**				**After**			
	E		**NE**		**E**		**NE**	
	B	**P**	**B**	**P**	**B**	**P**	**B**	**P**
Radio	20	35	-	10	5	52	-	10
Cassette player	-	14	-	3	1	30	-	-
B & W TV	-	1	2	-	1	9	1	1
Colour TV	1	-	-	-	3	28	1	1
Electric fan	-	-	-	-	5	15	1	1
Refrigerator	-	-	-	-	3	5	-	-
Any of others	1	1	-	-	5	5	1	2

There is some significant increase in the use of appliances like radio, cassette player, colour TV, electric fan and B&W TV in the electrified area after the project. There has not been much change in the non-electrified area. It is seen that 1 or two households in non-electrified area also have appliances to be used with electricity (Table A5.2- 25). They were brought by someone working in away from home like in India or in cities where these could previously be used.

A5.2.7.1 Conclusions

- With the availability of electricity, it seems that tendency to watch TV and listening to radio has increased. Time spent in these activities has increased significantly in electrified area after the project.
- The main change is seen is in study hours of the students. It has doubled in the electrified area after the project. The increase in non-electrified area is very marginal.
- In other productive work hours, there is no significant increase after the project.
- Respondents' perception on impact of electricity on education and health is positive. Case studies and discussions with hospital and health office staff also reveal that electricity has been helpful in the improvement of health services in the hospital as well as in private clinics. This has also been useful for sanitation. Access to water in project area has also been facilitated by electricity as they can lift water, use not only for fields but also for home use. Access to drinking water has also improved after the project, reducing the working load on women and girls.
- There is some significant increase in the use of appliances like radio, cassette player, colour TV, electric fan and B&W TV in the electrified area after the project.

A5.3 Andhi Khola and Jhimruk Compared and Major Findings

Andhi Khola and Jhimruk differs in many respects, especially the former had a long history of social development since 1982, whereas Jhimruk is a new project with not much social development components in it. There is also a locational advantage for Andhi Khola. A major highway linking two important towns passes through this area and this has helped in development of a bazaar at Galyang, which has become a semi-urban area in itself. This has also helped in development of a small industrial base, even though it is limited to local market only. Jhimruk is in a district which has been an under-developed district, and much inflicted by political conflict in the last decade. The comparison has to take these points into consideration.

There is perceptible change in wealth status of households in Andhi Khola. The wealth generally has increased because of employment, more production and remittances. But overall poverty reduced in Andhi Khola after the project, even though disparity seems to have persisted. There are now less 'very poor' households. In Jhimruk, as compared to non-electrified area, wealth status marginally increased which owes a lot to new business opportunities and some employment within the project. This seems to have compensated the loss incurred due to diversion of water from irrigation.

Ownership of physical assets and quality of house (in terms of house wall and roof type) seemed better and has significantly increased in Andhi Khola as compared to Jhimruk. The ownership of motorbike, private car is significantly high in Andhi Khola and has increased after the project. This again has taken place mainly in the semi-urban area in Andhi Khola.

In terms of associations and people's organizations formed (social assets), Andhi Khola seems to have more social assets as compared to Jhimruk. This is also linked to the nature of the project, i.e., Andhi Khola had emphasized earlier this aspect of development.

Access to piped drinking water has improved generally now, and it is so in all the areas now. This is linked to government's programs and developmental activities from AKP also. In Jhimruk access to piped water seemed to have increased in both electrified and non-electrified area. Now households have to spend less time in collecting drinking water. There is more access to Andhi Khola as compared to Jhimruk.

A significant part of water collection is still done by women. Selective male out-migration could also be one of the reasons, but girls fetching water seems dominant, and much higher than that of boys. It is reported that now (after the project), nonetheless participation of males in water collection has grown. This could also be a matter of general awareness.

Households having access to toilet has increased in both areas (Andhi Khola and Jhimruk), but there are now only 13 % households in Andhi Khola that do not have access to toilet. But in Jhimruk, it is still 48 %.

Some significant decline in involvement in agriculture is seen in Jhimruk, especially in non-electrified area. Electricity is helping people to stay in the village due to new business opportunities. Andhi Khola, people's involvement in farming has remained same which is mainly because of availability of irrigation facility.

The project brought some business opportunities for the local people. There are more businesses (including industries) in Andhi Khola as compared to Jhimruk, and they are invariably associated with the availability of electricity. The decision to have these businesses is also solely due to electricity. In Jhimruk also, there are more and new business opportunities in electrified area. About 23 % respondents in Andhi Khola and 9 % in Jhimruk felt that business increased somewhat because of the project. The difference is obviously seen in the number of industries. These are more in semi-urban area of Andhi Khola.

Food security seemed to have increased in Andhi Khola (considering the growth in population also), where as it has declined in Jhimruk. This is related to availability of water. The diversion of this water in Jhimruk is one of the reasons for decline in food security. In Andhi Khola, availability of irrigation water has helped in increasing the food production, and thus food self-sufficiency.

Migration has increased in all the areas. In Jhimruk, this has prominently increased in non-electrified areas. Whereas in electrified, people returned after having electricity in order to run businesses like poultry and vegetable production (see case studies).

A small proportion of households (4.1 % in Andhi Khola and 6.7 % in Jhimruk) obtained employment (including permanent and wage employment) in the project. Only a few 0.8 % in Andhi Khola and 1.7 % in Jhimruk have permanent jobs. Only one of them was a woman.

There may be a reduction in the consumption of fuel wood in Andhi Khola and in Jhimruk after the project. The studies failed to provide reliable data on overall energy use patterns. Hence this subject needs further scrutiny (done in the Nepal case studies report, Annex 3).

The overall cost of the energy consumption has increased, according to the data collected. However, when inflation is accounted for, a data problem in the Andhi Khola survey becomes evident: Cost of energy today is lower than twelve years ago, and this cannot be the case. Therefore, only the relative cost of energy, which has remained the same as a percentage of total income (10 %) is considered valid. In Jhimruk on the other hand, data indicate an absolute increase in cost of energy, at a plausible level. The increase can be explained because of greater use of LPG gas and higher electricity consumption. The cost driver is entirely LPG, as electricity tariffs have remained the same. There is also a difference in cost of energy, between the non-electrified and electrified area: Costs in non-electrified areas appear to have increased more than in electrified areas. This result may be correct, because kerosene, which is the main alternative when electricity is not available, has gone up considerably. Further, it is noted that in relative terms, the cost of energy in Jhimruk was found to be almost 7% of income, while it was only about half that percentage before electrification.

Social tariff subscription is more common in Andhi Khola and domestic tariff subscription is more common in Jhimruk. However, the overall cost structure favours the social tariff subscribers more in Jhimruk than is the case in Andhi Khola. In Jhimruk, social tariff subscribers pay on average about 40% less per unit, in Andhi Khola it is about 24% less.

Electricity is consumption is higher in Andhi Khola, especially among the metered consumers as compared to Jhimruk. However, unit costs are higher overall in Jhimruk, due to choosing NEA tariffs for metered consumption. The average unit rate in Jhimruk is NPR 4.43, as compared to about NPR 3.00 in Andhi Khola. The reason for this is twofold: a) adoption of NEA tariff for metered consumption, and b) the tendency of BPC to favour metered connections in more recent years, affecting Jhimruk more than Andhi Khola. Electricity consumption is significantly (almost double) in semi-urban areas as compared to rural area in Andhi Khola.

Users' group concept for collecting tariff as was practiced in Andhi Khola was considered useful and it also helped in building social and community assets. This was not so in Jhimruk, where the people refused to adopt it.

The non-connection rate is high in Jhimruk. More than 58% are not connected to electricity in Jhimruk, but this was not the case in Andhi Khola. The poorer households could not afford the initial cost and thus did not connect the electricity.

Use of electrical appliances is higher in Andhi Khola as compared to Jhimruk and before the project. Especially the use of radio, colour TV, refrigerator, and electric fan is high in Andhi Khola. In Jhimruk, in the electrified area, their use has increased (as compared to non-electrified area), but it is a more modes increase, when compared to Andhi Khola.

The use of electrical appliances is very high in semi-urban area of Andhi Khola as compared to its rural area.

There has been positive impact of electricity for education and health, particularly of the girls. This was seen more significant in Andhi Khola after the project. In Jhimruk also, study hours of the children increased significantly in electrified area after having the electricity. Electricity has helped in providing better health services in public and private clinics in local areas, and during the night time also. A feeling of improved security has come from electrification, especially for females.

In somewhat generalised terms a family consumes about 30 kWh of electricity per month, providing basic lighting needs using 2 to 3 bulbs. This comes at a cost of less than NPR 100 per month. By

using electricity, the saving is mostly on kerosene, on the average 3 litres per month. At today's retail price in the area, this would cost NPR 165.[12] Hence, the advantage of electricity is clear. For those that can pay a monthly bill regularly, it is cheaper than alternatives, gives much better light, and can be used for other purposes. The advantage of using kerosene instead for light, is that costs can be avoided by saving, while electricity carries a basic lump-sum fee. This is a valid consideration for only 2% of the households in the Andhi Khola area, but for 58% of the households in the Jhimruk area.

The initial investment for household electrification is about NPR 4,000 for a standard connection and house wiring. In Jhimruk, it appears that about 4% of the subscribers have overestimated their financial capacity. They have initially subscribed to electricity, have paid the initial cost, and were then at one point disconnected due to non-payment. No case of this is known from Andhi Khola.

[12] Retail price obtained in local bazaars in Galyang and Jhimruk areas: NPR 55 /liter

NOTE: ANSWER ALLQUESTIONS BEFORE PROJECT AND AFTER PROJECT					Before	After
Date:_____	Interview Number					
APK, previously interviewed?	[0] No	[1] Yes				
Time interview began:		Time ended:				
Name of Respondent:						
Address of Respondent:						
Household ID Number:	Q1					
VDC	Q2					
Ward	Q3					
Respondent's Relation to Head	Q4					
[1] Head of the Family	[2] Spouse					
Gender of respondent	Q5					
[1] Male	[2] Female		before	after		
Number of family members, incl. Children		Q6				
How many female?		Q7				
How many male?		Q8				
Number of children						
ABOVE 5 to 15		Q9				
BELOW 5		Q10				
(Calculate Total adults = Q6 - Q9 - Q10)		Q11				
Wealth Rank (fill in after ranking/assessment)		Q12				
[1] Rich [2] Medium [3] Poor [4] Very Poor						

Appendix 1

	NOTE: ANSWER ALLQUESTIONS BEFORE PROJECT AND AFTER PROJECT					Before	After
	Social Status (HU) HOUSING UNIT & other OWNERSHIP						
HU	**Caste of respondent**						
HU1	**Who owns this house/accomodation?**	[1] Husband	[2] Wife		HU1		
		[3] together	[4] Other, specify				
		[5] not owned, but rented					
HU2	**Number of rooms**	(do not count kitchen/bathrooms)			HU2		
HU3	**Since when do you live here?**	enter year, or 1 if always		HU3			
HU4	**If you moved here after project, what is the reason?**			HU4			
Observations		[1] access to power [3] resettled by project	[2] access to other project benefits [4] Other, specify				
	mark one of the following						
HU5	Main type of dwelling - walls				HU5		
	[1] Brick-built construction, [2] mud & stone, [3] RCC column						
	[4] wooden boards or corrugated sheet	[5] Other, specify:					
HU6	Main type of dwelling - roofs				HU6		
	[1] Tile/slate	[4] RCC slab					
	[2] Corruated iron	[5] Other, specify					
	[3] Thatch		[0] No	[1] Yes			
HU7	**Is there a change in house quality or size since project?**			HU7			
	Specify reason						
HU8	**Ownership of other assets?**						
HU8.1	Bicycle						
HU8.2	Scooter or Motorbyke						
HU8.3	Power tiller						
HU8.4	Private car						
HU.8.4a	Truck/bus/tractor						
HU8.5	Water storage tank						
HU9	**What are your sources of drinking water?**		[0] No	[1] Yes			
HU9.1	Spring/river/lake				HU9.1		
HU9.2	Dug well				HU9.2		
HU9.3	Tube well				HU9.3		
HU9.4	Public Fountain/stand post				HU9.4		
HU9.4a	Private tap						
HU9.5	Other, specify:	[0] No	Yes, pls. enter as below		HU9.5		

	NOTE: ANSWER ALLQUESTIONS BEFORE PROJECT AND AFTER PROJECT					Before	After
HU10	**Is pump used for drinking water?**	[2] electric	[3] manual	[4] other	HU10		
HU11	**If not from the tap, how long does it take to collect drinking water, per day?**				HU11		
	[1] Less than 5min	[3] More than half but less than 1 hour					
	[2] More than 5 but less than 30 min.	[4] More than 1 hour, [5] if more, specify					
HU12	**Who collects the household water?**				HU12		
	[1] The wife	[4] The husband, [5] both husband & wife					
	[2] Girls	[6] both, boys & girls					
	[3] Boys	[7] other, specify					
HU13	**If this changed since project, why?**	[0] No	[1] Yes		HU12		
	specify						
HU13	**Type of toilets**				HU13		
	[1] Bathroom /WC	[2] Latrine	[3] Don't have				
HU14	**Other project impact on living conditions? Specify**						
	(AG) AGRICULTURE					**Before**	**After**
AG1	**Do people living in this house farm?**	[0] No	[1] Yes		AG1		
AG2	**For the land that you farm, what is your relationship with the owner?**				AG2		
	[-1] No response		[-8] Not applicable				
	[1] Owner	[3] both, owned and tenancy, [4] using land for free					
	[2] Tenancy/shared tenancy	[5] Other, specify:					
AG3	**What is the total area you farm? (in ropani, or "hal", other unit, specify)**				AG3		
AG3.1	Irrigated?				AG3.1		
AG3.2	Non-irrigated?				AG3.2		
AG3.3	Overall land holding increased since project, why? Specify below. Give increase area						
AG3.3	Overall land holding decreased since project, why? Specify below. Give decrease						
	_____						
AG4	**How is irrigation done?**				AG4		
	[1] Lifted from river or well by pump	[2] gravity canal	[3] from drinking water excess				
	[4] other	[5] by AQUA AKP canal					
AG4a	**Production loss due to irrig water loss? Specify in % of previous prod.**						
AG5	**If pump is used, how is it powered?**	[0] No	[1] Yes		AG5		
AG5.1	Manual power				AG5.1		
AG5.2	Animal driven				AG5.2		
AG5.3	Electric pump				AG5.3		
AG5.4	Diesel/petrol pump				AG5.4		
AG6	**How many pumps do you use**	enter number			AG6		

	NOTE: ANSWER ALLQUESTIONS BEFORE PROJECT AND AFTER PROJECT				Before	After
	(SE) SOCIOECONOMIC					
SE1	**Do you have/run a business?**	[0] No	[1] Yes	SE1		
SE2	**At home or outside?**	[2] home	[3] outside	SE2		
SE3	**If yes, what is the type of business?**			SE3		
	[1] Hairdresser/barber, [2] tailor/dressmaker	[6] Video/movie rental/parlour				
	[3] Carpentry, [4] Repair/service shop	[7] Other, specify:				
	[5] Food stand/restaurant/tea shop	[8] Grocery & other shop				
SE4	**Are you using electricity for your business?**					
	[0] No, [1] for light, [2] for other applicances, [3] for both			SE4		
SE5	**Was electricity access a major factor in decision to start business?**		SE6			
		[0] No	[1] Yes			
SE6	**Since when do you run business?**	enter year	SE7			
SE7	**How many people work in the business?**	enter numbers	SE8			
SE8	**How many get a salary?**		SE9			
SE9	**SOURCES OF INCOME**					
SE9.1	Subsistence farming: Production enough for how many months? Enter no of months			SE9.1		
SE9.2	Income from agriculture and livestock	[0] No	[1] Yes	SE9.2		
SE9.3	Government subsidy/pension			SE9.3		
SE9.4	Remittance from family members working abroad/outside area			SE9.4		
SE9.5	Business income			SE9.5		
SE9.6	Income of family member in permanent employment			SE9.6		
SE9.7	Income of family member in wage employment			SE9.7		
SE9.8	Other income, specify:			SE9.8		
SE10	**What happened when project came?**	[0] No change	[1] business increased somewhat			
		[2] increased a lot	[3] decreased		SE10.1	
SE10.1	Why? Please specifiy					
SE10.2	Family member found permanent employment	[0] No	[1] Yes		SE10.2	
SE10.3	Family member found wage employment				SE10.3	
SE10.4	Directly through the project?	[0] No, [1] Yes, permanent, [2] yes, casual			SE10.4	
SE10.5	Who of family? Specify					

	NOTE: ANSWER ALLQUESTIONS BEFORE PROJECT AND AFTER PROJECT			Before	After
	(EGY) ENERGY: FUEL CONSUMPTION				
Please indicate which of the fuels your household has used/is using for any activity. Give quantity per month					
EGY	**How much do you spend on energy/fuels per month?**				
EGY1	**Fuelwood, kg**	convert bhari to 40 kg	EGY1		
EGY2	**Charcoal, kg**		EGY3		
EGY4	**Kerosene, liters**		EGY4		
EGY5	**Solar energy (maintenance cost only)**		EGY5		
EGY7	**Dry-cell batteries, number**		EGY7		
EGY8	**Other batteries (cost for recharging)**		EGY8		
EGY9	**Candles number**		EGY9		
EGY10	**Other**		EGY10		
EGY11	**Electricity, units (kWh)**		EGY11		
EGY12	**Gas LPG**		EGY12		
EGY13	**How much do you spend on energy/fuels per month?**		EGY13		
EGY14	**How many % of total income do you spend on energy?**		EGY14		
EGY15	**Can you explain why you spend more/less (relative/absolute) than before?**				

	APPLICATIONS AND ENERGY/FUEL USED		**Before**	**After**
APP1	**Energy/fuel for cooking, incl. boiling drinking water: What do you use in your household?** [-8] not applicable			
APP1.1	Fuelwood	enter code according to the use below		
APP1.2	Charcoal	**[0] Never** (0% to 1%)		
APP1.3	Electricity	**[1] Sometimes** (2% to 30%)		
APP1.4	Gas	**[2] Frequently** (31% to 69%)		
APP1.5	Kerosene	**[3] Very frequently** (70% to 98%)		
APP1.6	Other, specify	**[9] Always** (99% to 100%)		
APP2	**Energy/fuel for heating bath/washing water: What do you use in your household?** if not applicable, enter -8			
APP2.1	Fuelwood	enter code according to the use below		
APP2.2	Charcoal	**[0] Never** (0% to 1%)		
APP2.3	Electricity	**[1] Sometimes** (2% to 30%)		
APP2.4	Gas	**[2] Frequently** (31% to 69%)		
APP2.5	Kerosene	**[3] Very frequently** (70% to 98%)		
APP2.6	Other, specify	**[9] Always** (99% to 100%)		

	NOTE: ANSWER ALLQUESTIONS BEFORE PROJECT AND AFTER PROJECT		Before	After
APP3	**Energy/fuel for lighting: What do you use in your household?**			
APP3.1	Fuelwood	enter code according to the use below		
APP3.2	Solar PV	**[0] Never** (0% to 1%)		
APP3.3	Electricity	**[1] Sometimes** (2% to 30%)		
APP3.4	Candles	**[2] Frequently** (31% to 69%)		
APP3.5	Gas	**[3] Very frequently** (70% to 98%)		
APP3.6	Kerosene	**[9] Always** (99% to 100%)		
APP3.7	Other, specify			
APP4	**Energy/fuel for home business: What do you use?** if not applicable, enter -8			
APP4.1	Fuelwood	enter code according to the use below		
APP4.2	Solar PV	**[0] Never** (0% to 1%)		
APP4.3	Electricity	**[1] Sometimes** (2% to 30%)		
APP4.4	Charcoal	**[2] Frequently** (31% to 69%)		
APP4.5	Gas	**[3] Very frequently** (70% to 98%)		
APP4.6	Kerosene	**[9] Always** (99% to 100%)		
APP4.7	Other, specify			
APP5	**Energy/fuel for other important use, specify** _____ for example room heating, cooling if not applicable, enter -8	enter code according to the use below		
APP5.1	Fuelwood	**[0] Never** (0% to 1%)		
APP5.2	Solar PV	**[1] Sometimes** (2% to 30%)		
APP5.3	Electricity	**[2] Frequently** (31% to 69%)		
APP5.4	Charcoal	**[3] Very frequently** (70% to 98%)		
APP5.5	Gas	**[9] Always** (99% to 100%)		
APP5.6	Kerosene			
APP5.7	Other, specify			

	NOTE: ANSWER ALLQUESTIONS BEFORE PROJECT AND AFTER PROJECT				Before	After
	(FW) FUELWOOD					
If household did not use fuelwood, write [-8] in all fields						
FW1	**How do you obtain your fuelwood?**	[-1] No response	[-8] Not applicable	FW1		
	[1] Collect/given only	[3] Purchase and collect				
	[2] Purchase only	[4] Other, specify:				
FW2	**If collected, how long does it take to obtain a bundle of fuelwood?**			FW2		
	[1] Less than 1 hour	[2] More than 1 but less than 3 hours				
	[3] More than 3 hour, but less than 6	[4] More than 6 hours, [5] other, specify				
FW3	**Who collects?**			FW3		
	[1] The wife	[4] The husband, [5] both, husband & wife				
	[2] Girls	[6] both, boys & girls				
	[3] Boys	[7] other, specify				
FW4	**If this changed since project, why?**	[0] No	[1] Yes	FW4		
	specify					
	(SOL) SOLAR ENERGY				**Before**	**After**
SOL1	**Does your household own any solar PV system?**	[0] No	[1] Yes	SOL1		
SOL1.1	When did you buy it?	(year)				
SOL1.2	How much did you pay?	local currency				
SOL1.3	Are you satisfied?	[0] No	[1] Yes			
	(DRY) DRY-CELL BATTERIES				**Before**	**After**
If household did not use dry-cell batteries, write [-8]						
DRY1	**What do you use drycell batteries for?**	[0] No	[1] Yes	DRY1		
	[-1] No response	[-8] Not applicable				
DRY1.1	Radio/cassette player			DRY1.1		
DRY1.2	torches			DRY1.2		
DRY1.3	Other, specify:			DRY1.3		
	(BAT) OTHER BATTERIES – VEHICULAR				**Before**	**After**
If household did not use vehicular batteries, write [-8]						
BAT1	**Do you use vehicular batteries, and for what?**			BAT1		
	[-1] No response	[0] No	[1] Yes			
BAT1.1	Radio/cassette player			BAT1.1		
BAT1.2	Lighting / emergency light			BAT1.2		
BAT1.3	Television			BAT1.3		
BAT1.4	Other, specify:			BAT1.4		

	NOTE: ANSWER ALLQUESTIONS BEFORE PROJECT AND AFTER PROJECT					Before	After
	(CAN) CANDLES						
If household did not use candles, write [-8]							
CAN1	**Are candles used for light/emergency light?**		[0] No	[1] Yes	CAN1		
	(ELE) ELECTRICITY						
If household is not electrified, write [-8]							
ELE1	**Since when has your house electricity?**		enter year		ELE1		
ELE1.1	Type of subscription				ELE1.1		
	metered: [1] Social tariff, [2] domestic tariff, [3] industrial						
	non-metered: [4] 25W, [5] 50W, [6] 250W						
ELE1.2	How much did you have to pay for the connection?		nothing = 0		ELE1.2		
ELE1.3	Who paid for in-house wiring?	[0] household	[1] Utility	[2] other	ELE1.3		
ELE1.4	if by the household, how much?				ELE1.4		
ELE1.5	Did you have to reconnect? After having been cut due to non-payment				ELE1.5		
ELE1.6	If you did, how much did you pay?				ELE1.6		
ELE1.7	Did you get an official receipt for the amount paid?		[0] No	[1] Yes	ELE1.7		
ELE2	**How do you use electricity?**						
ELE2.1	**Lights/bulbs**	enter number of lights					
ELE2.2	**Appliances?**	[0] No	[1] borrowed	[2] bought/owned			
ELE2.3	Radio	[3] provided by project or others			ELE2.3		
ELE2.4	Casette/CD/DVD player				ELE2.4		
ELE2.5	Black-and-white TV				ELE2.5		
ELE2.6	Color TV				ELE2.6		
ELE2.7	Electric flat iron				ELE2.7		
ELE2.8	Electric fan				ELE2.8		
ELE2.9	Water heater				ELE2.9		

	NOTE: ANSWER ALLQUESTIONS BEFORE PROJECT AND AFTER PROJECT						Before	After
ELE2.10	Room heater					ELE2.10		
ELE2.11	Refrigerator					ELE2.11		
ELE2.12	Electric stove/hot plate					ELE2.12		
ELE2.13	Electric oven/range/micro wave					ELE2.13		
ELE2.14	Electric water pump					ELE2.14		
ELE2.15	Sewing machine					ELE2.15		
ELE2.16	Power tools (e.g., power drills)					ELE2.16		
ELE2.17	Computer					ELE2.17		
ELE2.18	Other, specify:					ELE2.18		
ELE2.19	Hair dryer					ELE2.19		
ELE2.20	Electric kettle					ELE2.20		
ELE2.21	Mobile phone					ELE2.21		
ELE2.22	Refrigerator					ELE2.22		
ELE2.23	Electric mixer					ELE2.23		
ELE2.24	Other, specify:					ELE2.24		
ELE3	**To whom do you pay the electric charges/bill?**					ELE3		
	[0] None (no meter or illegal connection)	[1] BPC /Utility	[2] usergroup					
	[2] Landlord, [3] Neighbor	[4] Other, specify:						
ELE4	**How often are you supposed to pay?**					ELE4		
	[1] Monthly, [2] pre-paid	[3] Other, specify:						
ELE5	**Total charges for last month**				enter amount	ELE5		
	Take details from shown electricity bill							
ELE6	**How many households are sharing the electricity bill?**				enter number	ELE6		
ELE7	**If shared to neighbor, how much does she/he pay per month?**				enter amount	ELE7		
ELE8	**How is this rate determined?**					ELE8		
	[1] Number of lights/appliances	[3] Do not know.						
	[2] separate non-utility meter	[-8] Not applicable.						
ELE9	**Are there power failures?**		[0] No	[1] Yes		ELE9		
ELE9.1	How often?	[1] Often	[2] Rarely	[3] Never		ELE9.1		
ELE10	**Power fluctuation? (brightness of light varies)**					ELE10		
ELE10.1	Damage due to fluctuation?		[0] No	[1] Yes		ELE10.1		
ELE10.2	How often?	[1] Often	[2] Rarely	[3] Never		ELE10.2		
ELE11	**Do you charge others devices on mains socket?**		[0] No	[1] Yes, paid		[2]Yes for free		
ELE12	**Do you share appliances you own with others**		[0] No	[1] Yes, paid		[2]Yes for free		

	NOTE: ANSWER ALLQUESTIONS BEFORE PROJECT AND AFTER PROJECT					Before	After
	(ACT) ELECTRICITY-RELATED HOUSEHOLD PRACTICE AND ACTIVITIES						
ACT1	**Does the household leave lights on throughout the night?**				ACT1		
		[0] Never	[1] Sometimes	[2] Always			
ACT1.1	Is this for security reasons?	[0] No	[1] Yes		ACT1.1		
ACT2	**Is there a difference in work in the home at night, since having electricity?**					ACT2	
		[0] No change	[1] Yes, more work	[2] Yes, less work			
ACT2.1	If there is change, who is working more?	[1] The wife	[4] The husband			ACT2.1	
ACT2.2	If there is change, who is working less?	[2] Girls	[5] both, boys & girls			ACT2.2	
ACT2.3	Please explain	[3] Boys	[6] All,	[7] other, specify,			
ACT2.4	Do you think the security feeling increased after electricity?		[0] No	[1] Yes			
ACT3	**How many hours does the family spend each day (24 hrs) watching TV?**				ACT3		
ACT4	**How many hours does the family spend each day (24 hrs) listening to radio?**				ACT4		
ACT5	**How many hrs does the family spend for the following activities after dark (night)?**				ACT5		
ACT5.1a	Children studying				ACT5.1a		
ACT5.1b	Women studying/reading				ACT5.1b		
ACT5.1c	Men studying/reading				ACT5.1c		
ACT5.2a	Productive work to save or earn money by children				ACT5.2a		
ACT5.2b	Productive work to save or earn money by women				ACT5.2b		
ACT5.2c	Productive work to save or earn money by men				ACT5.2c		
ACT5.3	Some other work		enter total time in hours		ACT3.3		
ACT5.4	reading, conversation, showing/explaining something				ACT3.4		
ACT5.5	Other, specify:				ACT3.5		
	EDUCATION					**Before**	**After**
Put on negative or affirmative answers							
ED1	**How does the electricity affect the studies of the children in this house?**						
	[0] no change	[1] improved	[2] got worse		ED1		
	Explain:_____						
ED2	How does the electricity affect the study habits in the community as a whole, in your opinion?						
	Explain:_____						
	HEALTH					**Before**	**After**
HEA1	**How does the electricity affect the health of this family?**						
	_____						
HEA2	How does the electricity affect the health in the community as a whole, in your opinion?						
	_____						
	_____						
	Name of Interviewer: _____						