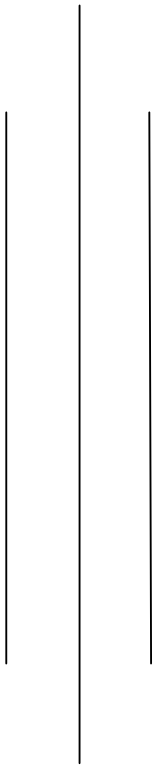
FINAL REPORT

Drinking Water Hydropower Project



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Submitted By:

Tanka Nath Sewa Samaj

Anarmani 4 Jhapa, Mechi Nepal

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Poverty Alleviation Fund

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ABSTRACT

The ***drinking water hydropower (DWHP) project*** is designed to provide household level consumption of drinking water and electricity. The main aim of the project is to solve the multiple problems of electricity, drinking water and income generation in household level through the small water resource.

First the DWHP project provides fresh drinking water to the targeted population and from the same water generates electricity for household consumption. The remaining water from electricity generating will be collected in a pond and it is used for fisheries. The pond provides year round small scale irrigation for vegetable in kitchen garden. To make the family independent in drinking water, electricity and small scale vegetable irrigation through small source of water by tiny investment is the central idea of the ***DWHP***.

People will be benefited for electricity drinking water and income generation. The electricity releases the people and student from smoggy kerosene lamp. It makes positive impact on their health it increases working efficiency. The electricity provides access to information through television and telephone. Access to information not only increases the awareness but also widen the range of livelihood opportunities.

INTRODUCTION:

Drinking water hydro power is an innovative electricity generation system designed to cope with the lighting demand of houses in rural communities where there is no electricity grid available. It can be fitted with the existing drinking water supply or irrigation system found in villages. In many villages of Nepal, drinking water is brought to home from sources like springs, ponds, river, and rivulets through the pipes which are of enough height to produce electricity. This drinking water brought from the source produces electricity which is boon for rural villages .The out flow water is used for fisheries and other house hold purpose and can be used for irrigation around the house. This system can be easily operated utilizing the drinking water from taps.

Objective:

To provide electricity and drinking water to rural people in cheap cost and make improvement in their sanitation, health condition and income generation.

The expected outcomes of the project are as follows;

a. In Nagi VDC directly 300 population of 30-40 household get benefit in drinking water and electricity.
b. Directly or indirectly the target population improves sanitation practice and health condition. Basically more benefit to student.
c. Promotes income of the targeted population by saving the money which expends for buying expensive kerosene and through vegetable farming, and fisheries.

Due to the implementation of this project people in rural villages do not have to go far away for drinking water. They get electricity for lightening purpose at night. Their income will rise. Due to the use of local resources makes them more self reliable, creative, innovative and their way of thinking will be broad. Due to this there will increase happiness in community.

WORKS ACCOMPLISHED

This organization conducted the project in following stages to implement the project idea and meet the objectives of the project.

STAGE I - **Feasibility Study (done in July-December 2008)**

Study of project site: In the first phase technical and social-economic base line survey was conducted. That survey provided us the detail and real information about water source, distance from settlement and amount of water. The working team was formed by project manager, socio-economist, mechanical technician, and electrical technician and civil technician.

Selection of targeted households: On the base of feasibility survey 35 households were selected for setting *Drinking Water Hydro Power*. To select the family the priority was given to the marginal family, who could not afford for alternative energy. A users' group was formed. The issue of social inclusion was also considered.

Survey of pipeline and structures: survey of pipeline and structures was done after feasibility study and selection of targeted household for the construction of the pipeline and taps. This helped us to calculate how much power will be generated and how to distribute electricity.

STAGE II - **Fabrication of water supply and Electricity Generating System (done in January-July 2009)**

One water supply and electricity generating system was fabricated and installed in February 2009. This system produces gross power of 961 watt and net electricity output power is 500 watt. This system is beneficial for 7 house holds. Each house gets an average of 70 watts from which they can light 7 bulbs of 10 watts CFL bulbs and also each house can watch colour television of power up to 70 watts. Other two system was installed in May 2009 which facilitated 14 household. From these 21 households were facilitated from electricity, drinking water and income generation.

Changing Pico hydropower to Drinking Water hydropower System: One Pico hydropower was changed to DWHP system because the system was stopped from 1.5 years due to lack of enough water. This Pico hydropower was not designed properly and it was designed for higher flow rate of water, capacity of the plant was 2 KW. This system was changed to DWHP which needed low flow rate of water and produced 1 KW. From this changed system 14 household is facilitated. This was completed in July 2009.

STAGE III- **Support income generating activities (done in July–August 2009)**

Pond digging and vegetable farming: The remaining water after use in drinking and sanitation is collected in a pond. The pond is used for fisheries. Water collected in pond is also used for vegetable farming. The fisheries and vegetable farming become a regular income source for rural family.

Testing, Training for maintenance and care: The training for maintenance and care of the system and income generation was given. The training was given in August 2009 along with Public Audit. The operational work of the ***Drinking Water Hydro Power*** is not hard so people can maintain it easily.

Hand over the project: After completing all task of the project it was handed to the family. But the responsibility of technical support will be continued if necessary. Detailed training was given about its care, maintenance and income generation.

STAGE IV – **Reporting and dissemination (done in August-October 2009)**

Monitoring and evaluation of project: After completion of the third phase. The monitoring and evaluation of the project was done and project report was prepared.

Publishing booklet: The objective of the project is not only providing electricity to the certain household, the main objective is promoting such cheap technology to address multiple problem of rural life. Therefore after completion of the project a booklet was published about such efficient alternative energy system including technical part as well socio-economic

benefit of the ***Drinking Water Hydro Power*** concept, so that people from other parts of this country may be benefited from this kind of technology.

Public Audit: Public Audit was done in August 2009 this gave all the financial information of the project to the beneficiaries.

CHANGING THE DESIGN

In proposal we stated to produce DC power of 12 volts and store this power in battery and use it, from this each house will get 10 to 20 watts. Now we have designed to produce AC power of 220 volts and power of 500 watts by which each house will get power of 70 watts in average. The DC electricity cannot be transmitted to long distance but AC system can be transmitted to long distance. If DC system is transmitted to long distance than maximum current will be lost due to heating of the wire, so DC system can be feasible if the houses are within 100 meters range. This systems cost more than DC system but it has many more advantages than DC power. People will have more power consumption from this system so, better lighting system, they can look television and run computer from this system but from DC system they cannot run computer.

In site the water capacity is 961 watts so using DC system of 60 watts is not feasible from engineering point of view because all other power will be lost, so we have designed to install 500 watts system to extract maximum power of the water. In DC system cost per watt is much more than AC system so they get more power from AC system in less cost.

The cost of the AC system is more than the DC system, but the AC system provides electricity to more houses than DC system ie, AC system will facilitate 7 to 10 houses but DC system facilitates 3 to 4 houses only so, the cost per houses will not be very high as compared to the DC system. By changing design the objectives and expected outcomes will be fulfilled within the same project cost and they will get more power and facility than proposed design. The partner organization will help people in income generating after completion of project. It will give loan for agriculture and fish farming and other development works in our project site.

PROBLEMS ENCOUNTERED/ REASONS FOR DELAY OF PROJECT

There were many problems encountered while implementing project, the terai strike and strike at eastern hilly region and mainly Panchthar strike by limbhuwan made project slow. There were many times strikes in panchthar which made travelling and transportation of materials very hard. These factors made our project slower than proposed time line.

Due to failure of Koshi bridge we had to return from our first survey trip. In our second trip due to lack of proper transportation we had to suffer a lot to reach Nagi V.D.C. Our bucket is of small size so designing and fabricating of small size bucket is harder than making bigger bucket. This designed and fabricated turbine may be the first installed turbine in this world.

HUMAN RESOURCE MOBILIZATION

Surya Raj Acharya was appointed as project manager by the organization who worked till the project was completed.

Srijwol Joshi was appointed as mechanical technician and worked for 7 month to design and fabricate the system and worked for the research of the turbine.

Kamal pd. Chapagain was appointed as civil technician who did the survey work of the field.

Pravesh kafle was appointed as electrical technician and worked for 5 month to design and fabricate the system and worked for the research of the generator.

Bishnu Paudyal was appointed as supervisor in field and worked till the project was completed.

Upendra Adhikari was appointed as technician in field and worked till the project was completed.

MAJOR ACHIEVEMENT

1. From the implementation of project 35 households are facilitated they got rid from kerosene lamp which has high running cost due to high price of kerosene. They are running radio, television, fax, telephone and other source of communication which increases the awareness and also widen the range of livelihood opportunities and make them to think for development. The electricity released the people and student from smoggy kerosene lamp. It makes positive impact on their health and increases working efficiency. At night people and students can work and read properly.
2. They are benefitted from Water supply for drinking and irrigation, this improved their health, sanitation and income generation. They can utilize the time that was wasted for bringing water from far away source.
3. They have increased their income by vegetable farming, fisheries, charging Lead Acid batteries and showing movies in television. This released them from hard life for basic needs and increased their livelihood.
4. Other houses are also practicing drinking water hydropower they were motivated of doing it by the training program and awareness program.
5. **This technology may be published in an international journal, which is passed in first screening process for taking part in competition in Bangladesh. The competition will be held in December 2009 in Bangladesh.**

EXPENDITURE (Rs. 14,07,700/-)

1. **Human resource (Rs. 4,36,400)**

   Project manager: July 2008 to August 2009 @9000 per month = 1,26,000/-

   Technician mechanical: @7000 for 7 months = 49,000/-

   Technician civil: @7100per month for 4 month = 28400/-

   Technician electrician: @7000 per month for 5 month = 35000/-

Supervisor in field: @8000 from July 2008 to August 2009 = 1, 12,000/-

Technician in field: @6000 from July 2008 to August 2009 = 84,000/-

Auditor fee: Rs. 2000/-

2. Travel (Rs. 55,000)

The cost of travelling of supervisor, technician and engineers are included. The travelling will be from Kathmandu to project site. Transportations cost are included.

3. Office administration

We have not established office because the human resource cost has gone more and materials cost also has gone more so the money from this part is taken to human resource.

4. Materials and equipment (Rs. 7,08,300)

This money was spend to buy raw materials for fabrication of the designed structures. Tools and machineries were also bought. The materials used for the systems are Generators, Turbines, IGC, Ballasts, Cement, Sand, Stones, Transmission Wires, Nuts, Bolts, Bulbs, Switches, Cables, and Penstock Pipes etc.

5. Research (Rs. 69,000)

The total cost for research of the turbine manufacturing and generator sizing and testing of the generator and turbine

6. **Training (Rs. 41,000)**

We have given training for maintenance and care of the system and income generation. This helped other people to know about the DWHP system and they also started installing this technology.

7. **Monitoring / Evaluation/ Information dissemination (Rs. 98,000)**

Monitoring/Evaluation was done and booklet is published. There was miscellaneous expenditure in this section.

Total expenditure = 14,07,700/-

CONCLUSION

The project implementation technology was deviated to better result because we stated in proposal to produce DC current but we produced AC current with much more power output. This cost more but has many more advantages, as engineer we do not want to loose any power from water and try to utilize all smaller power generated from drinking water tap. We deviated only technological aspect but our objective and outcomes of the project is not deviated.

This project is focused to those people who can't buy the expensive alternative system such as PV-based solar-home system for electricity and especially to school going children who have to read under kerosene *Tukis*.

There is huge possibility of implementing the concept of *Drinking Water Hydro Power* elsewhere because it can be implemented in other hill and mountain region, where small water source is available and there is possibility to bring water through pipe from vertical slope of the hill. This kind of situation is easily found in the mountainous and hilly villages in Nepal. Since many problems are addressed by this simple and cheap means there is high possibility of implementing this idea elsewhere.

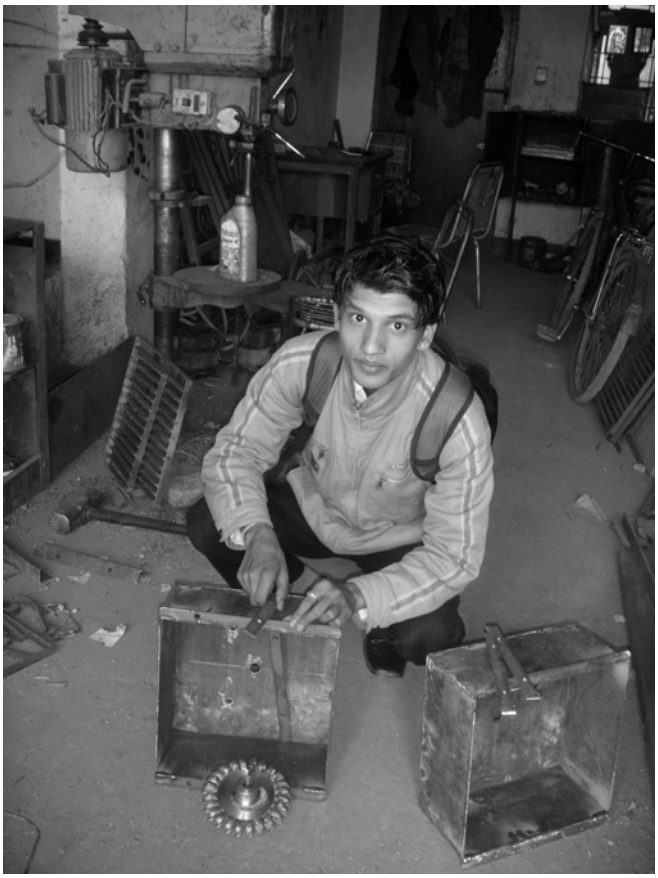
APPENDIX

Some photos from the project site

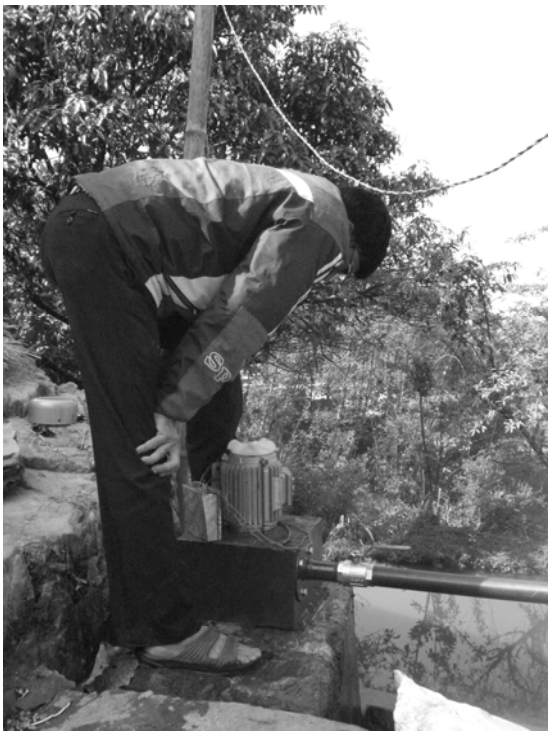
Transporting materials and equipment

Storage of pipes used for water supply

Installation of pipe



Electro mechanical system



Installation of Electro mechanical system

Training and Public Audit Program