

# Impact of Improve Cook Stove in the Rural Area: A case Study of Rimuwa Gulmi Nepal

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**Abstract** - Improved Cook Stove (ICS) has been promoted in the most of the rural area of Nepal. Most of the rural people of Nepal use biomass for cooking purpose using different types of technology for the combustion of biomass. Among them, ICS is more efficient and smokeless technology. Improve cook stove has been proved very useful for the women members of the family with chance of occurrence of health problems such as burning of eyes, headache, respiratory problem, skin problem. It is also found that social status was increased after ICS installation. In the society, the scope and benefits of ICS is increasing day by day. After installing ICS indoor air pollution and firewood consumption has been reduced drastically. Most of the people of the VDC (about 75.76% told that after installing ICS firewood consumption has been reduced by one third as compared to that with traditional cook stove (TCS). Similarly, as others the peoples of the Rimuwa VDC are using ICS mainly for cooking purpose; however for three months (during winter season) they have been using for space heating purpose as well.

Promoters of ICS argue they provide the “triple benefits” of improving health outcomes, preserving local ecosystems, and reducing green house gas emissions (Christopher, 2013).

Improved biomass cookstoves have long been identified as a promising option to reduce the negative impacts of cooking with traditional open fires. Interventions for disseminating ICS dates back to the 1970s and until the new millennium were mainly designed for increasing fuel efficiency, often because of a perceived link between deforestation and household energy. More recently, efforts to improve health by reducing the air pollution and safety impacts of traditional solid fuel use have come to be included in programs, as well as possibilities to mitigate climate change impacts of stoves. (Smith K. H., 2008)

For the collection of firewood, rural women spent a great part of this time. Furthermore, they spend considerable amount of time cooking and washing the utensils. The deforestation rate in Nepal is 1.3 % per annum (WECS, 1999)

**Key Words:** ICS, TCS, Fuelwood, Emission

## 1. INTRODUCTION

The huge numbers of the remaining household are still estimated to use Traditional Cook Stove (TCS) of various types such as three stone, tripod and non chimney mud stoves which are considered less efficient in combustion and thus consume more firewood and are responsible for high level of indoor air pollution which directly affects the human health. It is also considered to contribute in enhancing women's drudgery for collecting fire wood increase in deforestation and degradation of environment.

Efficiency of the traditional cook stove is around 10% and there is also problem of indoor pollution. Improved cook stove have efficiency around 20% and are environment friendly due to removed of exhaust smoke. It will help people to save fuel hygiene environment and quality of life, time saving of women and reduction of skin and respiratory disease.

More than 2.5 billion people all over the world cook with biomass based solid fuel in open fires. Besides consuming high amounts of fuel, these stoves are main source of indoor air pollution, responsible for an estimated 4 million annual premature deaths (Lim et al, 2010).

## 2. MATERIALS AND METHODS

This study has been carried out on the basis of exploratory as well as descriptive research design. Main focus of this study is to study about socioeconomic impact of Improve Cook Stove with regard to saving fuel wood, saving time, health impact, environmental benefit. In order to fulfill the objectives, information has been collected from the field survey. Questionnaire, focus group discussion, interview and observation are the main tools that have been utilized to obtain the information from the Improve Cook Stove users. Data has been collected by interview, field visit and observation, focus group discussion.

## 3. RESULTS AND DISCUSSIONS

After data collection and its analysis, findings of study have been presented as below;

### 3.1 Reasons for installing ICS

Table 1 shows the source of motivation to install the ICS. As the study has clearly stated that majority of the households have installed ICS because of motivation provided by installer, to promote installation of ICS in the VDC (which is currently around 11.74%), the promoting organization either GoN or private organization need to conduct awareness programs or motivational programs. Then only

there will be a good increase in installation trend which will further be supported by installation of neighbors.

**Table-1:** Source of motivation to install the ICS

Source of motivation	Household number	Percentage
Neighbor	3	4.5
Motivation by installer	60	91
Self motivation	3	4.5
Total	66	100

(Survey data, 2014)

### 3.2 Peoples' perception about advantage of ICS

The below mention table explain about the people's perception regarding different household and health issues regarding cooking stoves. Most of the people involved in the survey felt that after installation of ICS, it has mainly reduced smoke in the kitchen. After this people first preferences were reduction in consumption of firewood, contribution to deforestation and reduction in cooking time. It has also been shown that there is reduction in cooking time which is feeling of 10.61% ICS users and on in average cooking time also preferential parameter during use of ICS. Hygienic kitchen environment has lower preference for the user in comparison to other parameters. Another main advantage of ICS is reduction in cooking time as comparison.

**Table- 2:** Matrix about people perception about advantage of ICS

Advantage condition	Preference (%)							
	1st	2nd	3rd	4th	5th	6th	7th	8th
Reduction of smoke in kitchen	56	32	9	2	2	-	-	-
Relatively clean of cooking pot	-	3	12	44	38	2	2	-
Less firewood consume	20	44	20	12	3	-	2	-
Contribution for deforestation	12	3	2	12	30	35	5	2
Health benefit	2	6	18	3	17	21	33	-
Reduction in direct exposure	-	-	-	-	2	6	5	88
Hygienic kitchen environment	-	3	3	2	6	30	50	6
Reduction in cooking time	11	9	36	26	3	6	5	5

(Field survey 2014)

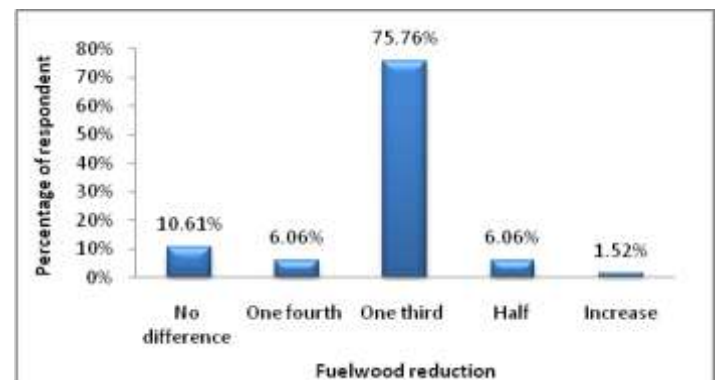
### 3.3 Reduction in firewood consumption

Survey has shown that there is reduction in firewood consumption after the use of ICS in household energy need for cooking and space heating. More than 75% of participants have mentioned that after the use of ICS,

firewood consumptions have been reduced by one third. This is a strong point for the promotion of ICS because along with efficient energy conversion, reduction in consumption of energy source (firewood) is also a major concern aspect in the rural areas.

Table 2 shows that firewood consumption has been reduced significantly after user of ICS. About 75% people have been found that firewood consumption has been decreased by one third. People expectation have been found increase of Firewood consumption, it may be due to defect on construction such as improper dimension, family size or biasness on the cook stove.

Figure 1 show that most of the people has found the reduction of firewood consumption by one third after use of ICS. So, saving of firewood produces positive impact on forest. The forest is protected the situation of environment degradation is improved.



(Field Survey, 2014)

**Figure-1:** Respondents feeling of firewood consumption

### 3.4 Effect in economic activities

ICS has also effect in economic activities directly and indirectly. Table 3 show that the problem of ICS in comparison to tripod stand. Most of the people have found body and space heating problems at the winter seasons. About 74% people have found the problem for heating during winter time. Most of the people use cookstove for heating at the winter time. About 18% people have found construction problem with more complex part regular maintenance and more technical aspect. Few people have point out the problem in use of firewood because firewood has to cut in small size in comparison to firewood.

**Table- 3:** Effect on economic activities after ICS

Description	Priority in percentage			
	I	II	III	IV
Reduce pay for firewood	96.97	1.52	0.00	1.52
Reduce pay for washing material	1.52	96.97	1.52	0.00
Increase economic activity	0.00	1.52	95.45	3.03

Reduction pay in health	1.52	0.00	3.03	95.45
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(Field Survey, 2014)

### 3.5 Maintenance of ICS

Some maintenance work is necessary for the ICS; following response has been found regarding maintenance of ICS. Being a new technology, its installation procedure and application, the task of maintenance may occur as normal process.

Table 4 shows that there is mixed response for the maintenance of ICS. About 39.39% has been found reduction of damage of fire place, about 15% has been found no difference for maintenance work during operation of stove and about 45% have found to increase the maintenance work of ICS in comparison to tripod stand.

**Table- 4:** Stove maintenance rate after use of ICS

Maintenance work	Numbers of respondents	Percentage
Decrease	26	39.39
Same	10	15.15
Increase	30	45.45
Total	66	100

(Field Survey, 2014)

### 3.6 Price affordability of ICS

Price affordability is one of the important factors for the promotion of any technology. Although ICS is cheaper technology but it may play role for the for lower status people. Users feeling about price affordability of ICS shown in Table 5.

Table 5 shows that ICS is not expensive for about 84% people but in case of 15% this ICS is expensive during construction work.

**Table- 5:** Regarding price of ICS

Feeling of expensive	Numbers of respondents	Percentage
Yes	10	15.15%
No	56	84.85%
Total	66	100%

(Field Survey, 2014)

### 3.7 Smoke reduction

In Nepalese practice, the smoke in cooking place is considered as normal phenomenon due to our design of cooking stove and fuel consuming pattern. Installation of ICS reduces the smoke and dirt in the utensils.

Table 6 show that there is smoke reduction which is feelings of about 95% people. This is due to use of chimney. Few people have found no difference between before and after use of ICS. It may be technical difficulty on ICS use. One person has found there is adverse effect of ICS for smoke reduction. This is due to effect of wind for the exhaust.

Exhaust chimney was in the wind flow direction. This type of problem can affect socially about the ICS.

**Table- 6:** Smoke in kitchen after use of ICS

Smoke in kitchen	Numbers of respondents	Percentage
Decrease	63	95.45
Same	2	3.03
Increase	1	1.52
Total	66	100

(Field Survey, 2014)

### 3.8 Respiratory problem

Due to reduction in of smoke in the kitchen, which will help to reduce respiratory problem for the effected peoples? Table 7 shows that there is feeling of reduction in respiratory and health problem after use of ICS. Especially, reduction in tear during kitchen work and other respiratory problem has been found. Actually, the problem of tear and smoking due to particulate matter because of incomplete combustion in TCS has been reduced by use of ICS as per the survey above.

**Table- 7:** Reduction in respiratory and health problem after use of ICS

Respiratory problem	Numbers of respondents	Percentage
Decrease	64	96.97
Same	2	3.03
Increase	0	0.00
Total	66	100

(Survey data, 2014)

### 3.9 Study time of students

ICS brought the impact on various sector like smoke reduction, saving of time in fodder collection, reduction in health problem etc. impact in some aspect of life practices may brought the changes in existing situation of human life. It is considered that installation of ICS brought change in study habit of the students. Study time has been increased in few people due to time saving for firewood collection, and in some cases clean kitchen at the evening time study. A student education has been found increased 25.76 % parents and 59.09% people has been found no change in education by ICS.

### 3.10 Problem associated ICS

During observation few problems has been pointed out by respondents. Body heating problem is the main problem of ICS during winter season which felt by 49 respondent (74.24%). About 18.18 % has found problem in construction of ICS which is compact.

Hence, the study focus on the social, economical aspect of the areas more clearly with ICS intervention and it also focus on the technology transfer benefits with social adaptability. Thus, the study is mainly emphasizing on these issues

considering technical problems for such intervention in the regions and also the problems that are faces due to unsystematic technology diffusion and transfer with clear picture for future intervention policies as recommendation.

#### 4. CONCLUSIONS AND RECOMMENDATIONS

ICS technology is intended to improve quality of life of rural people. The technology benefits rural people in many ways which can be outlined as decreased firewood and kerosene consumption which is environmental friendly as well as convenient.

Following conclusion were drawn the study:

- Improve cook stove has been proved very useful for the women members of the family.
- The chances of occurrence of health problems such as burning of eyes, headache, respiratory problem, skin problem, were reduced.
- Subsidy has been the main promoting factors for ICS installation. The additional subsidy provided by local community forest group is very encouraging.
- Social status was increased after ICS installation. In the society, the scope and benefits of ICS was increased. Social prestige was increased by its installation. It helps to promote ICS installation for others society members.
- Considering people's perception about ICS, after installing ICS indoor air pollution and firewood consumption time has been reduced.
- Most of the people of the VDC (about 75.76%) told that after installing ICS firewood consumption has been reduced by one third as compared to that with traditional stove.
- In the same way smoke in room, smoke in kitchen, respiratory problems, skin problems and black shoot in the room walls have reduced remarkably after the use of ICS. Similarly stove maintenance rate has also been decreased.
- Considering about price, majority of people feel that it is quite expensive as compared to traditional stove.
- Other beneficial aspects of using ICS are increase in study time of students, reduction in firewood collection time and improved economic condition of local people.
- Peoples of the Rimuwa VDC are using ICS mainly for cooking purpose; however for three months (during winter season) they have been using for space heating as well.

Considering the general findings of the study, some recommendation has been suggested on the desired future

of the implementation of ICS related activities to get desired positive impacts.

- For the dissemination of ICS technology to the poorer section of people, the financial supports like interest free loan and higher amount of subsidy should be provided to the lower class, low caste and socially deprived group of people.
- The use of ICS is mainly limited to cooking and heating to some extent.
- Training should be given to the people especially women on the techniques and methods of ICS management. Women should be encouraged in construction, operation and maintenance training. This would help towards gender balance issue.
- Social policies, strategies and programs at local level need to build up for ICS energy development in the rural areas.
- It is recommended that a series of in depth studies should be carried out to analyze the impact of ICS specially on the conservation of biomass and its relation to the cutting of trees and on the general environment as the study of the present nature could not penetrate into depth given to the limited duration of time, hence, a properly designed study should be conducted to generate some hard data on these issues.
- Form the study and field visit in has been found that installation of ICS in the Rimuwa VDC of Gulmi district has remarkable positive impact on the daily life of local people. Thus in coming days installations of ICS need to be promoted.
- The associated major problems are construction of ICS and its cost. So to promote the use of ICS, adequate numbers of stove masters are to be trained and provision of subsidy is to be made.

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