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The Perception about the Biogas Technology Adoption: A Case Study of District Faisalabad (Punjab, Pakistan)

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Abstract: The main objective of this study is to know the people's perception about the adoption of biogas. This study is restricted to only district Faisalabad. This is an exploratory research which used to provide the adoption behavior of the respondent for biogas technology in the rural areas. A purposive sampling technique was used to select the adopters to know the reasons for adoption of biogas technology. In total 147 respondents were interviewed from the rural area of the district Faisalabad. The study examines sources of information, reason for installing biogas plant, motivation of installing, source of fuel used after installing biogas and the satisfactory level of the respondents. This study helps to understand the reason behind the adoption of biogas technology and furnish the intervention strategies for development.

Key words: People's perception · Biogas · Faisalabad

INTRODUCTION

The biogas is formed by bacteria in the bio-degradation procedure of organic materials under [1]anaerobic conditions. Methanogens (methane creating bacteria) are the final in a chain of bacteria, which diverse organic material and return the breakdown materials to the environment. In this procedure biogas is produced [1].

It is a versatile source of energy which meets several end uses, including lighting, cooking and power generation [2]. It provides better combustion than the less efficient cooking fuels like firewood, charcoal and dry dung cake. It is comparatively clean and hygienic [3] because bacteria and other pathogens are destroyed through anaerobic treatment. It substantially reduced drudgery for women [4] and indoor smoke and resultant ocular and respiratory diseases, biogas digesters participate in the improved health and decrease in medical expenditure [5].

Bioenergy not only contributes to energy diversification strategy but also substitution of energy imports making it an important energy source for economic and national security reasons [6]. With respect to energy, it is clear that with time renewable sources will play a more significant role than the conventional sources of energy.

The livestock segment plays an important role in the agricultural economy in Pakistan. Whereas agriculture contributes on average twenty four percent to the country's Gross Domestic Product GDP in between 1956 to 2006. The buffaloes population increased by more than three hundred percent, cattle by one hundred and fifty three percent, sheep by three hundred and twenty four percent, goats by seven hundred and twenty three percent and camels by fifty percent. The 2006 Census showed that there are an estimated 29.56 million cattle and 27.33 million buffaloes in the country making a joint population of close to 57 million buffaloes and cattle (Pakistan Livestock Census 2006).

[1]The absence of air, organism is radiating energy in the nonexistence of oxygen.

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Faisalabad district is chosen for this study, this district is characterized with huge number of small and large farmers and such type of farming society is assumed to be more involved in dairy farming and these features are favorable in adoption of biogas. Moreover, a program is initiated by the Punjab Rural Support Program (PRSP) to provide financial assistance, information and technical knowledge regarding the installation of biogas plants.

Faisalabad is the third big city of the Pakistan having good market for the biogas technology. The consumption of the natural gas in this city is much higher and in the future nearer it could be tough to provide the facility of natural gas all over the district. It has eight towns and that towns had different tendency to adopt the biogas technology. The central town had the large number of biogas plants because of more awareness, social contacts, role of media and the level of education.

Research Question: What is the perception of the people to adopt biogas technology?

Objectives:

- To discuss the behavioral attitude towards adoption of biogas.
- To understand the motivation behind adoption.

Review of Literature: The reason of the literature review was to become familiar with national and international related researches. The under mentioned studies would help us to better understand the determinants that lead to adopt the biogas technology. It was found that biogas technology has some economic and social benefits as Quin and Nyns (1996) during a study on the effects of individual economic status of adoption of biogas declare that biogas is more accepted by the middle and upper group farmers. Same conclusions can be drained when the benefits of the trees and plant is not only the production of gas but also bio-fertilizer. It means that at the regional or community level, the correct selection of the site for the biogas plant is also important [7].

In this era where there is a huge shortage of energy it can be used for an alternate energy source. Prasertsan and Sajjakulnukit (2005) suggested measures to promote the renewable energy sources and specially biogas as an alternate energy source [8]. Amjid *et al.* (2011) found that renewable energy resources are the best alternate to the conventional fuels and energy resources. Biogas energy production systems are in demand and their number is rising gradually [9].

Other studies, Parikh (1976) explained techno-economic assessment for cost-benefit analyses for the profitability of a biogas unit from the user's side. Society is expected to benefit more than the individual in biogas programs [10]. Abort and Vancil (1977) conducted a study on the economic feasibility of biogas recovery system. Most commonly economics analysis shows that adoption of biogas depends upon the cost and benefit associated with biogas production [11]. García *et al.* (2010) conducted a comprehensive economic evaluation of a dissemination program of improve cook stove in rural Mexico, where 80 percent of the whole population using fuel wood for a primary energy generation [12].

MATERIALS AND METHODS

Statistical tool are applied to get appropriate results and useful suggestions.

Data: Total sample size of one hundred and forty seven respondents was taken through purposive sampling technique and data were collected with the help of face to face interviews and a self designed questionnaire.

Methodology: For a brief descriptive analysis was used to identify the general pattern and trends in the collected data. The analysis was done with the help of SPSS-18.

RESULTS AND DISCUSSION

Source of Information for Biogas Digester Installation: Although Faisalabad district has much potential adopters of biogas but still the adoption rate is not satisfactory. Social marketing, publicity, peer pressure and media played a vital role in the dissimination of information regarding the buiogas installation. Peoples considered the biogas technology good for health, good for environment and having economic benefits therefore they adopt this technology.

The demonstration effect or peer pressure was noted the most informative factor and the second most informative factor was [2]BCC with the percentage of forty and twenty four respectively. Eleven percent of the total

[2]Biogas Construction Companies that motivates peoples to install the biogas plants.

Table 1: Source of information for biogas digester installation

Source of information	No. of respondents	Percentage
Friends	16	11
Relatives	15	10
NGOs	19	13
Demonstration effects	59	40
Biogas construction company	35	24
Print Media	3	2
Total	147	100

Table 2: Motivation for installation of biogas plant

Motivation for installation of biogas plant	No. of respondents	Percentage
Indoor air pollution	18	12
Saved time and energy	22	15
Subsidies given by the Government	32	22
Social benefits/prestigious	7	5
Health care	3	2
Easy to use	29	20
Non availability of Natural gas	24	16
Low costly	12	8
Total	147	100

Table 3: Source of fuel after biogas

Source of fuel after biogas	No. of respondents	Percentage
Fuel wood	79	54
LPG	30	20
Dung cake	2	1
Only biogas	37	25
Total	147	100

Table 4: Level of satisfaction

Satisfaction level	No. of the respondents	Percentage
Fully Satisfied	109	74
Partially Satisfied	32	22
Not Satisfied	6	4
Total	147	100

households indicated that their source of information about biogas was friends and ten percent said that their source of information were relatives. Thirteen percent indicated they got information through local NGOs. Only two percent households get the information from print media.

Social benefits, economic benefits and health benefits that were earned by the adopters make other peoples to adopt the biogas technology. In other words social and peer pressure make the peoples to adopt the biogas technology [13]. Secondly the private companies with the collaboration of NGOs were doing good marketing in the area and making peoples to adopt it. Although that companies has their own interest in making people to adopt the biogas technology.

Motivation for Installing Biogas Plant: Twenty two percent of the households stated that the discount/subsidy provided by the project motivated them to install the biogas plants. Twenty percent respondents responded that it was comfortable and easy to operate. Sixteen percent peoples said that they adopted it because they had not natural gas in their area. Fifteen percent respondents stated that biogas saved their time and energy and twelve percent respondents said that they installed the biogas plants to escape from indoor air pollution as they had no other source of fuel available while Five percent households indicated that they were motivated to install the biogas plant as it provided them with social benefits.

Peoples were found less aware from the health and environmental benefits of biogas technology. As two percent of the households told that they adopted biogas as it would provide them health, environmental and economic benefits, respectively. Eight percent respondents said that it was less costly.

Most of the peoples adopted this technology because of government subsidy though that amount was not enough to plant a biogas plant. Secondly peoples reported that, it is easy to use and thirdly many household adopted this technology because of non availability of the natural gas. Non availability of natural gas forced the peoples to use the fuel wood, dung cake, kerosene oil etc that could harm the peoples' health. To escape from the pollution and to get the clean environment peoples were inclined towards the adoption of biogas [14].

Source of Fuel after Biogas Adoption: It was observed that after the adoption of the biogas peoples were still using other alternates of biogas because of many reasons like, shortage of animal manure, lesser efficiency of biogas plants in winter season, overhauling of plants etc. Around fifty four percent households reported that they had not enough gas for cooking hence they used fuel wood also. While twenty percent households said they are using LPG, along with biogas and only one percent peoples were using dung cake. Twenty five percent peoples were depending only on a single source of energy i.e. biogas

Level of Satisfaction: Seventy four percent of the households said that their biogas plant was fully functioning and they were fully satisfied. Twenty two percent said that their plants were partially functional and therefore they were partially satisfied. Four percent said their plants were not well functioning and therefore they were not satisfied.

When reasons for satisfaction were analyzed peoples responded that their reasons for satisfaction were due to availability of enough gas for cooking, their wives were very happy from the availability of the biogas. Many people indicated that their work load has been reduced with the availability of the biogas. Some of households also indicated that they had enough gas for lighting and making their environment neat and clean.

CONCLUSION

Most often an existing plant owner who is happy from his plant's working is considered as the most effective source of information and motivation for potential households. Another largest reason for motivation to install a biogas plant was the increasing difficulty in collecting the firewood. It is not only getting scarce but also getting more expensive to buy. Price of LPG is also skyrocketing and it is already hard to get into rural areas. Installation of a biogas plant saves the households from all these expenses and accompanying hassles.

The majority of the biogas households were getting enough gas for their cooking while there were still a significant number of households who did not have sufficient gas especially in winter season. This can be linked with the lack of awareness and training of the households with the need to carry out the recommended operation and maintenance functions at recommended intervals. This can also be linked to the issues of not being able to supply the household with appropriate and biogas specific appliances.

Suggestion:

- The development of social enterprises is important to make this interventions successful and sustainable. Private sector companies are not at present active in the biogas sector. A little number of NGOs are active in the manufacturing of biogas plants but on a very small level. Private companies need to be attracted to the sector and their capacity enhanced to build high quality biogas plants.

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