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Domestic Energy Use in Rural Areas: A Study in Sherpur Thana under Bogra District

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a) Researcher's Identity

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b) Objectives

The specific objectives of the study were to:

- i. explore the sources of energy in the rural areas;
- ii. assess the consumption patterns of energy for the domestic purposes;
- iii. look into changes in energy usage patterns;
- iv. assess the extent of shortage of energy and reasons for the shortage; and
- v. highlight the alternative energy sources for future use.

c) Executive summary

The present study was conducted on the use of energy for household purposes in the rural areas intending to explore the sources, consumption patterns, changes in usage, and extent of shortage and reasons for the shortage. The study was based on both primary and secondary data. It was conducted in two villages of Sherpur Thana in Bogra district. There were 201 households in Chandijan and 139 in Mukundo. All the households were surveyed through a structured questionnaire. They were categorized according to their landholding size; completely landless who had no land, landless with homestead (0.01-0.49 acre), small scale farmers (0.50-2.49 acre), medium scale farmers (2.50-7.49 acre) and large farmers (7.50 acre & above land).

1. Types of Household

Most of the households in the study villages are landless (71.64% in Chandijan and 75.54% in Mukundo). The rest covering small, medium and large scale farmers in Chandijan are 18.41%, 8.46%, and 1.49% respectively and in Mukundo small and medium scale farmers are 18% and 6.47% respectively. There is no large scale farmer in Mukundo. Operational land is mostly concentrated in the hands of the medium and large scale farm households. As the land is the main sources of fuel, these are owned by the three categories of households; large, medium and small scale farmers.

2. Production of Fuel

Rural households mostly depend on crop residues, trees, and animal dung as their main sources of fuel. Crop residues receive much attention as the potential source of fuel energy in the study villages and paddy straw, the major crop residue, is widely used as fuel in the villages. The farmers cultivate paddy of both high yielding varieties (HYV) and local varieties in the two villages. Landless-2 has only 7.41% paddy straws, as they own small size of land compared to other categories. Medium and large scale farmers have an opportunity for getting more straw compared to small scale farmers and landless. Landless have a very negligible number of cattle heads in both villages .Evidently the landless households have less access to dung as fuel for having less number of cattle heads. The number of trees in Mukundo is more compared to Chandijan. In the case of ownership of trees in the study villages, medium scale farmers have the highest number of trees compared with other categories.

3. Use of Energy for Different Purposes

The study suggests that 98.50% households of Chandijan and 98.56% of Mukundo use biomass fuels (dung, branches, leaves, straws, rice hulls, bamboo residues, fuelwood) for cooking purposes. Besides, an insignificant number of households use wood dust and maize sticks as fuel. Most of the households also use these bio fuels for paddy parboiling. All the households of both villages use Kerosene; some use batteries for lighting purpose and an insignificant number of households in one village use electricity for lighting purpose. Besides, majority of the households use Kerosene as a sort of help for smooth burning of the other fuels used for cooking purpose. It is important to note that there are several potters in Chandijan who use biomass in the Kiln for burning the clay utensils. Paddy straw and dung have some other competing uses. As for instance, paddy straw is used as fodder and construction materials and dung for mannuring the crop field.

4. Procurement of Fuels

Fuels are procured in three ways in the study villages: collection from own sources, purchase and free collection from other sources, neighbors' land, open fields, and homestead land. As regards the collection from own sources, only a small segment of households in both villages get the biomass in sufficient quantity. It is reported that about 37% of households of Chandigan and 16% of Mukundo get it sufficiently from own sources. As for the procurement of biomass fuels the villagers of Chandigan get 55.16% from own sources, 7.79% of households get by purchasing and 37.05% of them from others' lands at free of cost. In the case of Mukundo regarding bio fuels, 47.29% comes from own sources, 7.05% of them by purchasing and 45.66% from others lands at free of cost.

5. Expenditure of Energy Consumption

Households purchase both commercial and traditional fuels. The study suggests that fuels cost per annum per household is Tk. 891.90 in Chandigan and Tk. 645.75 in Mukundo. It is reported from 29% of households who are landless face financial problems with regard to fuel consumption. Kerosene is needed throughout the year but they could not afford it due to their poverty.

6. Collection of Fuels

6.1. Family Members' Involvement in Fuel Collection

Collection of fuels for domestic purposes is a major task. It is found that adult female members are more involved in collection of fuels from their own sources (71.59%) and from others' lands (76.21%). As far as purchase from the local market is concerned, adult male members are responsible for it. Children are also involved in fuel collection. Family members of the poor households have to walk a long distance and spend 2/3 hours in a day for collecting fuels from others lands at free of cost.

6.2. Problems in Collection of Free Fuels

In the study villages, many households especially the poor are mostly dependent on the fuels from others lands at free of cost. The study shows that 63% of households in Chandigan and 84% in Mukundo face acute shortage of fuel. In the absence of cattle, bushes, and cultivable land of their own they have to meet their daily needs in respect of fuel either by purchasing or through collection at free of cost from three sources: relatives, neighbors and open fields. It is reported from 89% of respondents that in the past, some inferior quality of fuels were available at free of cost in the villages, but now-a-days, sources of those

free fuels are limited because of the expansion of their commercial usages in various purposes. As a result, the landless household's access to those fuels has become extremely narrowed down.

7. Marketing of Fuels

In the past marketing of fuels in the rural areas was almost non-existent. However, with the improvement of road, communication and increased commercial usages of various fuels, it has been evolved into a practice of marketing fuels in the rural areas. Some households of the study villages; 18.40% households of Chandijan and 7.19% of Mukundo are involved in marketing of fuels. They reportedly sell their fuel products either in the local hats or in their respective villages. It is interesting to note that in spite of the absence of any own source, a small segment of landless households also sell dung cakes, branches and crop residues collecting from other's lands at free of cost. Small, medium and large scale farmers sell biomass fuels only from their own sources. Apart from these, it is seen that rice hulls from the rice mills are sold to the businessmen and thereafter send them to other places for further marketing.

8. Changes

The study reveals some seasonal variations with regard to the use of different fuels. In the Summer season, 45% of the households in the study villages use branches/twigs/leaves as the first fuel with other biomass. During the Rainy season, 47.06% of households use dung as the first fuel with others; similarly in the Winter, 46% households use branches/leaves as the first fuel with dung and other fuels. Season wise discussion about biomass suggests that the usage of branches and dung is dominant.

Besides there were some changes with respect to the use of several traditional fuels over the last few decades. As for instance, at present 93% of households use branches, twigs, leaves but in the past only 32.35% households used them. As regards dung, its usage has been increased by 17%. Around 15% of households reportedly use various types of vegetables residues for cooking purpose whereas in the past these were given less importance. In the case of cropping patterns, cultivation of local varieties of paddy in the past was high compared to the present and due to increased HYV in cultivation, it has been a decline in the volume of crop residues leading to decrease in the supply of fuel as well.

9. Fuel Shortage and Its Impact

The study indicates the existence of a shortfall in fuel in the study area. This shortage has led to some adverse effects on the environment, changes in

social relationship and health as well. The respondents explained several reasons for fuel shortage. Firstly, they argued that due to population pressure, more land is brought under cultivation for producing food crops. Secondly, many of them argued that a large number of trees are destroyed in the absence of proper nursing. Thirdly, expansion of HYVs has increased a great reduction of total supply of straw. All these combined together have caused a shortfall in the total production of fuels compared to the past.

9.1 Environmental Changes

This shortfall has again created a pressure on tree resources leading to an adverse effect on the environment. Firstly, deforestation in the study area has caused the soil erosion with concomitant destruction of the natural leveling of the land. Secondly, in the past a large mass of weeds and tree leaves were left to rot in the field leading to increase in the natural fertility of the soil. But the change of green manuring in the natural way has gradually decreased in trees and weeds. This, in turn, has affected soil fertility. There were reports from the respondents of the study villages that the shortage of fuel has aggravated the felling of trees causing adverse effects on the environment. Some households reportedly cut trees but they do not plant any tree. The data from the study area suggest that 55.22% of households of Chandijan and 58.70% of Mukundo planted 39 types of trees during last five years but 59.27% and 20.14% households of the respective villages had not taken part in any plantation at all during the last five years. It is reported that some of them can not plant trees for money; some have no land for planting trees.

9.2 Social Changes

It was reported about several changes in the social relationships in respect of sharing traditional fuels among the villages. Firstly, among the villagers, farmers belonging to large and medium groups used to give tree/crop residues, dung etc., to the share croppers and other poor neighbors at free of cost in the past but at present they do not do so. Secondly, the landowners had not taken full share of crop residues in the past but now-a-days they take the proper share of crop residues from the share croppers. On top of that, in the past the poor people used to collect tree and other crop residues from the homestead areas of the rich households. But now their access to those sources has become squeezed.

9.3 Impact on Health

The use of inferior quality fuels produce a lot of smoke causing respiratory disease among women and children as they are to spend a

good deal of time in the kitchen. Besides, they need to walk here and there in search of fuels and collect these even from the dirty places. This may be the cause of their infectious diseases as well.

d) Observations and Recommendations

The study has shed some lights on the problems in respect of fuels. It clearly indicates that 37% of households of Chandijan and 16% of Mukundo village can use biomass sufficiently from their own sources and the rest of them can not manage it. Almost three-fourth of households in the study villages is landless and their own sources of fuels are very limited. Majority of them do not have their own sources and as such they face a lot of problems in collection of fuels in terms of money and land source. They usually depend on free biomass from others' lands/open areas at free of cost.

Almost, all of the households in the study area use biomass for household purposes. According to Kshirode, 1998, biomass contributes 83% of the total household requirement in the country and 67% of the total energy consumption is used for cooking alone. In case of biomass usage, according to Zuberi, 1996, use of agricultural residues, animal dung and leaves/twigs are not environment friendly; these are more needed for soil and water conservation. On the other hand, according to Kshirode, 1998, it can be used for less environmental pollution than commercial energy. It is considered to be Carbondioxide neutral so far its production and consumption is balanced and according to FAO, TWEDP, biomass is also environment friendly. However, biomass practices need to improve. Biomass is a renewable source of energy, which is always available if managed properly. In Bangladesh, biomass is more available than commercial fuel. Problems can be loomed large in course of time when sources of commercial fuels become less. Therefore, on the basis of the findings of the study, some steps can be taken to overcome the problems in fuel supply and to make better usage of fuels.

I. Introduction of Improved Stoves

About 99% of the households in the study area use traditional stoves which account for reducing 85-95% of heat. Three-fourth of the biomass energy is not properly used. BCSIR has invested on more improved stoves which can be introduced very soon. These Stoves are made at low cost. Therefore, more steps should be taken to introduce the improved stoves among the rural people. BCSIR should train up more personnel in the district, Thana and Union level. Then in every Union, community workers will set up improved stoves for

demonstration purpose so that villager can observe and take initiative in this respect. Besides, the government and non-government agencies can implement a project on this especially for rural areas.

II. Supply of Biomass Fuels

Use of fuel wood is increasing over the time. It is used in the brickfields as well as at the household level for cooking purposes. Simultaneously tree planting is also increasing day by day. However, many of these trees are destroyed in the absence of proper nursing. Special measures through social forestry project by the GOs/NGOs should be taken in extensive way with active participation of the villagers. This kind of measure is likely to enable the villagers to achieve three results; economic benefits in terms of generating income from trees, increased supply of residues as fuel and protection against environmental problems.

Besides, some fast growing plants like Dhaincha, Eucalyptus, Epil-epil and Bogamedula should be planted. The government should undertake special measures for motivating the owners of the rural industries like Brickfields plant to Chatalto trees in one-fourth of area of their industrial complex. Apart from environmental protection, this will ensure an increase in the supply of tree residues which can be used for fuel purposes.

III. Introduction of Model Kitchen

The smoke from biomass fuel in the kitchen causes a lot of sufferings to women and children and this is mainly due to lack of proper ventilation in the kitchen. In view of the existing situation, model kitchen with a proper ventilation system should be introduced at the community level with the help of NGOs.

IV. Introduction of Briquetting

Briquetting is relatively a new technology in Bangladesh. Briquetting is the process of converting loose biomass fuel into dense, compact and consolidated form through the application of temperature and pressure. Briquetting is likely to be the best method of producing well combustible products from agro residues. This is to be a suitable alternative to wood and coal. It burns more easily and effectively. Rice husk can be converted into briquettes which can be used as a substitute for firewood in stoves for cooking food, in brickfields, in road works and in other places which firewood is used as fuel. However, for fuel purpose, it needs to pay special attention for introducing briquetting in an effective way.

V. Establishment of Biogas Plant

It is argued that Bangladesh is in a favorable position in respect of the climatic conditions and availability of raw materials for biogas production. In Bangladesh, there are about 22 billion of cattle which excrete about $0.22 \times 10^9 \text{ M}^3$ of biogas annually which is equivalent to 1.52×10^6 tons of kerosene. With this amount of gas, 20% of household's energy requirement can be met.

However, many households need financial supports for installation of biogas plants. Therefore, biogas plants should be introduced with the help of credit supply. Small scale farmers, medium or large scale farmers should be encouraged to install biogas plant in their premises. Dung of 5-6 cows is required for cooking of 7-8 members of the family and for lighting purpose. At first the government in collaboration with the community can install some demonstration plants in some selected areas to disseminate the idea. Joint efforts will be encouraged for this purpose. If it seems effective then others will be interested.

VI Rural Electrification Facilities

Efforts should be made to expand rural electrification facilities. Many rural people are interested to get the supply of electricity for various purposes at the household level. But facility is not available. Through electrification facilities villagers can get opportunities to select themselves in various activities of small cottage industries and other fruitful work.

VII Supply of Gas

After opening the Bangabandhu Jamuna Bridge, gas will be available in the Northern areas of Bangladesh in near future. Then its usages will be expanded by encouraging the rural households through its supply at a low price. If landless and small scale farmers can not buy gas, at least medium and large scale farmers will be encouraged to buy. As a result, pressure on trees, crop residues and dung will be decreased in the rural areas and this in turn, will ensure the increase in the crop fields for the purpose of manuring crop land.

VIII Income Generating Activities

Poverty is a common scenario in rural Bangladesh. Poverty can be alleviated through income generating programme in the rural areas. With the enhancement of economic status, there is a likelihood of increasing the purchasing capacity of the rural households and this, in turn, will enable their ability to procure commercial fuels resulting in gradual decline in their dependence on certain fuels which are not environment friendly.