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ANALYSIS ON ELECTRICAL ENERGY CONSUMPTION OF AGRICULTURAL SECTOR IN UTTARAKHAND STATE

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ABSTRACT

Agricultural work requires energy as an important input to production. Agriculture uses energy directly as fuel or electricity to operate machinery and equipment, to heat or cool buildings, and for lighting on the farm, and indirectly in the fertilizers and chemicals produced off the farm. Three interconnected concerns dominate the discussion of agricultural energy. First, a recent spike in oil and other energy prices has highlighted once again the costs of energy-connected agricultural inputs such as fertilizer, electricity and fuels for trucks and tractors. Second, agriculture is a producer of feedstock for bioenergy. Both increased energy prices and government policy have again stimulated interest in bioenergy as a substitute for fossil fuels. Third, environmental concerns related to both regional air quality and global climate change has encouraged investigation of alternative energy sources as well as policies to change the energy relationships. In this paper, the energy consumed in agricultural sector of the hilly state of Uttarakhand is compared with the total energy consumed.

Keywords: Agricultural energy, Total energy, Uttarakhand.

1. INTRODUCTION

There is a growing demand of electrical energy for agricultural usage requirements in India. Electrical Utilities of many states have been facing acute power shortage which led to unrest in the farmers in many states. It is observed in the last few decades, the underground water levels have been falling down drastically and cultivated area has been increasing by cutting the forests. Hence, there is growing demand for electrical energy for irrigation. The generation is not growing proportionately to the growing demand. On the other side, the available energy is also not properly utilized for Agricultural purposes. The farmers have to be educated in the area of energy conservation and proper utilization of available resources in the country. This paper highlights the differences in the energy requirements and actual energy consumption with statistics and attempts to identify inter-linkages between agriculture and Electricity.

There has been an increase in consumption of electricity by agricultural sector. 73% of Indian population depends directly or indirectly on agriculture. About 50% of Indian populations are farmers.

About 20% of the farmers have electric pumps. Hence, only 10% of population directly benefit from agricultural electricity use. In most of the states, agricultural consumption is un-metered. Consumers pay a flat rate tariff which is also highly subsidized. However, a large part of the subsidy is cornered by richer, larger farmers. In Maharashtra state, 80% of the farmers depend on rain fed agriculture. Out of the remaining 20% farmers, those with large land-holdings (2% of the farmers) capture 20% of the subsidy [1].

This situation however leads to a vicious cycle of problems. There is no benefit to small or marginal farmers. Improper targeting of agricultural subsidy has led to improper crop selection and competitive well deepening. This in turn has led to over use of ground water and lowering of the ground water table which has a severe impact on the poor farmers. In some states the situation is extremely dire. In Maharashtra, the water tables are falling by 2-6 meters each year. In Punjab, 79% of ground water blocks are either overexploited or critical. In Haryana, in 59% of blocks, water tables have dropped from 10-15m to 400-450 m. In TamilNadu, 46% of blocks are either critical or overexploited. In Rajasthan the level is going down by 1-3m every year.

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Groundwater levels have fallen to such an extent in this state that mining is required to extract water which cannot be replenished by rain [2].

The overall impact of all these factors is that as water levels fall, power use increases to pump the same quantity of water out of the ground. The cost of well deepening and replacing pumps by pumps of higher rating is paid by farmers who can afford this cost.

Some measures are being taken by various State Regulatory Commissions as well as power utilities to target subsidies to improve the situation. For example, in Andhra Pradesh, big farmers do not get free power and farmers in draught prone areas are charged at a lower tariff. In Haryana, the tariff is linked to the depth of the water table in the region. In Karnataka, the tariff depends upon the economic status of the farmer [3].

It has been realized that there is scope for improving efficiency of electricity use by pump sets. The current efficiency levels are 20-30%. It is estimated that of 7-10% is possible by the use of efficient motors, installing capacitors, use of plastic pipes instead of iron and use of frictionless foot valves [1]. In addition to reducing consumption, improving efficiency of the agriculture power use has an additional benefit of improved quality of power supply due to reduced losses and improved voltage levels. Better voltage in turn improves water discharge and reduces motor burnouts.

Many measures have been introduced to reduce agricultural consumption. Schemes like 'single phasing', (providing power supply on single phase so that agriculture pumps do not operate, while the household lights can work), separate feeders for agricultural pumps, metering distribution transformers supplying pump sets are examples. These help to get better understanding of the agricultural consumption and can also enable restricted supply of electricity for pumps. Some states like Andhra Pradesh, Madya Pradesh and Uttar Pradesh have limited the hours of supply (7, 6 and 10 hours/day respectively) to reduce the water and power use [3].

Another important issue is that proper measurement of agriculture power consumption is not available and it is often estimated. Since the agricultural consumption remains un-metered, there is a tendency to over-estimate, which helps in power utilities to hide their transmission and distribution losses and pilferage. Many have pointed out that the agriculture consumption is much lower than what is projected. The results of survey in some states show that farmers consume 27% less than the utilities estimate and that transmission and distribution losses are therefore correspondingly higher than the utilities claim. (47% compared with the official 33%). It is possible that the large part of the losses is due to pilferage by residential, commercial and low-voltage industrial consumers [1].

In addition to all these other concerns, power supply to agriculture is highly un-reliable with frequent power cuts and low voltages. The poor quality of supply leads to transformer and motor burnouts.

Very often, farmers have to undertake repair and maintenance work of service connections and transformers. Thus, even though the tariff is low, the farmer pays high price for the power by having to replace motors very often and not having power supply when needed.

The supply to agriculture is limited to a few fixed hours throughout the day. Agriculture receives power mostly during the non-peak hours. Thus, the cost of supply to agriculture is actually low as they are cut-off from the grid when the most expensive power is used by the other sectors like industrial, residential and commercial sectors.

In this work, the total electrical energy requirements of the state (Uttarakhand) has been taken and compared it with the agricultural energy usage in the state. Some measures are also suggested for effective energy utilization.

2. STUDIES CONDUCTED

Table 1 shows the installed generating capacity of electricity (Utilities) in Uttarakhand as on 31.03.2010 and 31.03.2011. It shows that the installed generating capacity in case of thermal and nuclear is zero. It remains constant in case of hydro and increases slightly in case of renewable energy source.

Table 1: Installed Generating Capacity of Electricity (Utilities) in Uttarakhand as on 31.03.2010 and 31.03.2011 [4-5]

Type of energy source	As on 31.03.10 (GW)	As on 31.03.11 (GW)
Hydro	1.65	1.65
Thermal	0	0
Nuclear	0	0
Renewable**	0.13	0.15
Total	1.79	1.8

** Renewable Energy Sources includes Small Hydro Projects,Wind Power,Biomass Power Biomass Gesifier,Urban & Industrial Waste and Solar Power.

The electricity profile of some major hilly district of the state are given in Table 2.

Table 2 : Profile of electricity consumption in hill regions of Uttarakhand, 2006-07 (Kilowatt-hour) [6-7]

District	Domestic	Commercial	Industrial	Agriculture
Almora	58584	11115	1613	781
Bageshwar	15408	3766	2654	444
Chamoli	43644	3520	0	640
Champawat	14706	4216	1560	225
Pauri Garhwal	38746	8062	1230	369
Pithoragarh	31850	3742	557	836
Rudraprayag	12196	1459	593	897
Source :UREDA				

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The Table 3 shows the electricity Consumption by Different Sectors (Thousand Kilowatt-hour) where we can observe the difference in the total energy and agricultural energy consumption in the state.

Table 3 : Electricity Consumption by Different Sectors (Thousand Kilowatt-hour) [8]

Sectors	Uttarakhand		
	2001-02	2006-07	2007-08
Domestic	996.26	1126.99	1162.9
Commercial	254.2	582.63	712.43
Industrial	475.9	1569.73	2729.29
Agriculture	321.17	385.62	300.2
Others*	181.57	220.99	272.73
Total	2229.09	3885.96	5177.55

* Others include street lighting, water works and traction & railways.

A graph is plotted between total electrical energy consumption and energy consumption in agricultural sector in the state for 3 years, namely, 2001-02, 2006-07 and 2007-08 as shown in Fig.1 below.

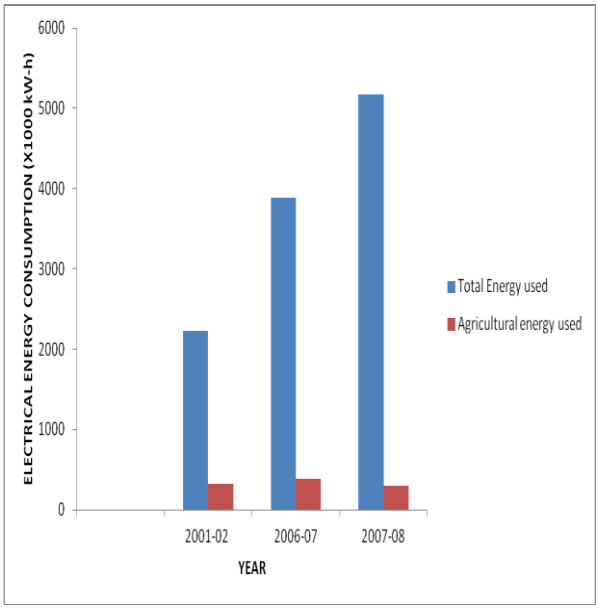

Fig.1. Graph showing variation of total energy consumption and energy consumed in Agricultural sector

Thus, the trend of energy consumption is seen as above. This can be seen that the energy consumption in agriculture sector in the state is much lower than the total electrical energy consumption. We can consider the above fact in two ways. One, that the farmers in the state are well aware about the energy conservation in the farm. On the other hand, we can also infer that the farmers are still using obsolete methods of farming and other agriculture operations.

And, from the economic condition of Uttarakhand, it is very much possible that the latter happens to be true.

The annual electricity sale to agriculture sector is 0.3 Billion Units. The major energy consumption is in the area of energizing agricultural pumps. The population of state Tube Wells is around 21100, accounting for a connected load of 131 MW. Based on several studies carried out on agricultural pump set efficiency, it has been found that the pump efficiency varies from 25-35% due to various factors. By adopting BEE star labeled agricultural pump sets, the efficiency can be enhanced up to 50-52%. It is estimated that, by replacement of existing pumps with the BEE star labeled pumps, the achievable saving potential is 30-40% and sectoral saving potential works out to be 90 Million Units per year. The energy saving potential assessment has been carried out based on annual electricity sale since breakup of consumption for pumps and allied areas is awaited [9].

Farmers have to be educated on conservation of water and electrical energy and an intelligent system has to be devised which gives the information of water requirement to the farmers and energy requirement to the utility from time to time for optimum utilization of electrical energy. The decision making system should be supplied with the data of crop pattern, rain fall pattern and land pattern for efficient utilization of electrical energy. An automatic control system can be developed to trip the pump motor by sensing the humidity of the land under irrigation.

In this regards, the cheaper sources of power (hydro and old thermal) could be reserved for agriculture. It is also suggested that the agriculture consumers could be charged only the fuel cost of power generation. The fixed cost could be paid by those who use power during peak hours. T.L. Shankar had worked out details of this model for Andhra Pradesh and Karnataka, but no state has implemented so far. [10]

We need to comprehensively handle all the linked issues-improving power supply quality, targeting of subsidy accounting power consumption, rationalizing the crop pattern, improving the irrigation techniques, optimizing ground water use, regulating farmers, ensuring fair price and market for agricultural products and providing timely credit.

3. CONCLUSIONS

Measures to bridge the gap between electrical energy required and consumed have to be taken on high priority to solve the power crisis in Uttarakhand. The given comparison of the total energy consumption and agricultural energy consumption depicts the pace of development in the state. It can be commented that the agriculture sector in the state has to be developed more in terms of technology inputs. It is not wrong if the energy consumption is higher in any sector, rather the stress should be on that the energy consumed should be utilized in such an effective manner that maximum possible output is reaped and benefits harnessed.

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