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Measurement of Willingness to Pay for Hydro–Energy: An Analysis of Demand Side in Hydro–Energy Pricing

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THEORY OF PRICING

The conventional pricing theory states that the price determination is a process in which two opposite forces of demand and supply find a point of active rest. In ordinary language, the equilibrium price is that price at which the quantity suplied and demanded are equal. The strength of forces of demand and supply are reflected in the position and shape of the demand and the supply curves.

One of the important determinants of supply price is the cost of production which, obviously, includes the normal profit. Similarly the demand price is based on utility in case of consumer goods and on productivity in case of factors of production. Free play of these market forces is possible only in the world of perfect competition. Since such type of market is non-existent in practice, the price can not fully reflect the unrestrained behaviour of economic agents. In the real world, the monopolistic competition is prevailing in most cases. Also there are cases where goods and services are institutionally supplied and no close substitutes for them are available in the market.

HYDRO-ENERGY PRICING IN NEPAL

Hydro-energy, which is almost totally supplied by Nepal Electricity Authority (NEA), is a good of typical nature and with varied use. The substitutes for hydro-energy constitute different comodities and services in different use. For example, in industry hydro-energy substitutes for labour (service) or petrolium goods. In lightning, it is substituted for bio-gas energy diesel plant energy, solar or wind energy. In case of rural Nepal it forms substitute for Kitchen fuel .The above statement of the fact shows that, though hydro-energy is commodity sold mostly by single seller, it has close or remote substitutes in the market. The price of hydro-energy is fixed by NEA in accordance with the guidelines of World Bank and directives of His Majesty's Government of Nepal. Due attention is given to the long run Marginal cost (LMC) while determining the price of electricity. Attempts have been made to take account of load, voltage and other factors so as to do justice to the consumers of different category. The present price does not cover the full cost of production so the NEA is incurring losses. On the other side, consumers are very much disappointed with the last price rise. In Kathmandu and other urban areas natural gas is gradually replacing the hydro-energy in kitchen.

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The excessive stress on supply side and negligence of demand side in the process of price determination have made neither partner satisfied - the seller (NEA) is incurring losses and the buyers are searching for other alternatives. So the study of demand side has been an urgent need for Nepal.

OBJECTIVE OF THE STUDY OF WILLINGNESS TO PAY

Actually the study on willingness to pay for hydro-energy is useful for policy makers for the following reasons :

- It helps in determining different levels of prices for different uses according to the willingnes to pay of the consumers;
- The difference between what consumers are asked to pay and what they are prepared to pay will show the degree of good -will on the part welfare state;
- If the demand price is much more less than the supply price, this will compel the seller to think over other alternatives that will reduce the existing cost;
- If consumers are enjoying a large amount of consumer surplus and, at the same time, the seller is incurring losses, the seller can raise the price with an eye on consumer;s surplus;
- Without knowing the demand side, i.e. the shape and position of demand curve, the supply side alone can not reveal the market value of hydro energy.

The above points make it clear that the study of willingness to pay and capacity to pay of consumers for hydro-energy is highly imperative.

WILLINGNESS TO PAY DEFINED

The willingness to pay for the product is reflected in the price which is offered by the consumer rather than go without the thing. Thus the maximum price which the consumer is prepared to pay for the commodity is the true measure of intensity of willingness to pay. On the other hand, the capacity to pay is the economic ability of the consumer to make the demand for goods. The capacity to pay also influences the willingness to pay. Actually, the willingness to pay together with capacity to pay determines the demand price for the commodity. The main factors that determine the degree of willingness to pay and capacity to pay are :

- Past, present and future incomes of the consumers,
- socio-cultural background and economic status of the consumer,
- need of the commodity, and
- expected utility or productivity.

Although it is easier to know the capacity to pay of the consumer, it is more difficult to know the willingness to pay of the consumer without asking them time to time and case by case. Even asked, the reliability of the answer is questinahble.

METHOD ILLUSTRATED

There must be an indirect method to reveal their willingness to pay. This method can be developed by studying the economic behaviour of the consumer. Here is an attempt to develop a method to find out the demand price for hydro-energy. The result what is obtained by the use of the prescribed method can work as a guideline for the

decision maker. The degree of accuracy may be questioned but the usefullness of the method, in our opinion, is unquestionable.

Measuring Willingness to Pay for Hydro-Energy in Case of Lift Irrigation

The demand for hydro-energy is a derived demand. The demand for irrigation creates the demand for hydro-energy. Actually the demand for irrigation itself is a derived demand, i.e. derived from the demand for agriculteral productivity. Irrigation is one of the input components of agriculture. There are land, labour, fertilizer, seeds and others which come under the list of agricultural inputs. The economic basis of demand for all inputs is their respective productivities. In accordance to the principle of Economics, the producer will have maximum profit only in that situation when the last unit of money spent on the various factors of production yields the same worth of output. Viewed from this principle, we can say that the producer does not pay more money for the input which has the same productivity as other input. The demand price is same for all inputs which have equal productivities. Let us take an example, there is one hectare of rented land which yields two matric tons of wheat without irrigation and two and half metric tons of wheat with irrigation. The market price of wheat is Rs. 100 per metric ton. With this information we can construct following hypothetical table.

Table 1
Cost and Return of Wheat Production

(in Rupees)

Without Irrigation				With Irrigation			
Cost		Return		Cost		Return	
Item	Amount	Item	Amount	Item	Amount	Item	Amount
Rent for land	100	Sale of two metric tons		Rent for land	100	Sale of two and half metric	
Interest on capital	25	wheat	200	Interest on capital	25	tons of	
Labour	25			Labour	25	wheat	250
				irrigation	-		
Total	150		200		150		250

The farmer;s existing agricultural practice (without irrigation) shows that to get Rs. 200 he is investing (paying) Rs. 150. His economic behaviour shows that to get Rs. 1, he is prepared to pay 150/200 = Rs.0.75.

Table 1 shows that with irrigation the income of the farmer has increased by Rs. 50. As his economic behaviour shows that to earn Rs. 1.00 he is prepared to sacrifice Rs. 0.75 (investment), to obtain this extra Rs. 50 he will be prepared to pay

Rs. 37.75 (i.e. 75 percent of Rs. 50). If the farmer is supposed to pay Rs. 10 per season for canalisation, the demand price for the hydro-energy required to supply the water for the wheat cultivation in one hectare of land does not exceed Rs. 27.75. If the farmer is asked to pay more, it will be in his benefit to avoid irrigation and engage in extensive cultivation. It is because the investment of Rs. 37.75 in extensive cultivation gives him yield worth of Rs. 50.

Here it is assumed that a) there is no limited supply of land and other inputs for individual farmer; (b) the price for a/c the inputs and their respective producivity remain constant, and; c) the farmer is rational. If these assumptions do not hold true, certain changes in the method of measuring willingness to pay for hydro-energy would essential.

Measuring Willingness to Pay for Hydro-Energy in Case of Cottage Industry

As has been already mentioned, hydro-energy forms a substitute for other energies, including human one. Depending on technology, to produce a fixed quantity of goods a fixed units of energy is required. For that fixed unit of energy a given amount of money has to be spent. How much money the producer will be prepared to pay for the hydro-energy will totally depend on the amount of money which he must pay for other alternative energies for the same purpose. For example, to produce 100 metres of cloth, the producer was spending a sum of Rs. 1000 for labour (human energy). Now the producer will not pay more than Rs. 1000 for the hydro energy needed to produce 100 metres of cloth, including of course, the interest on capital which is necessary while using hydro-energy in production. One thing that must be noted here is that the production per time is very high with hydro energy, so more turn-overs are possible. So the producer will choose hydro-energy instead of human energy even if it costs a little more. To avoid all such uncertainties we asume that the demand for cloth in the market is adequately met by the manual production.

Similar method can be used to find out the willingness to pay for hydro-energy in all other sectors where the alternative energies are used and their market price is available.

CONCLUSION

The above explained method can provide rough estimation of willingness to pay for hydro-energy in its different uses. Various techniques of production function can be a support for finding out the factor contribution. The accuracy can be doubtful but the result can be very useful to decision maker involved in pricing of hydro-energy. Of course, other methods can be developed by studying the price slasticity of demand for hydro-energy. But Where there is the dearth of data, the proposed method can be a help to the decision maker.

SELECTED REFERENCES

Briscoe J. and et. al (1990), "Toward Equitable and Sustainable Rural Water Supplies : A contingent valuation Study in Brazil," *The World Economic Review*, Vol. 4, No. 2.

Bronfenbrenner M. and et.al. (1987), *Micro Economics*, : Houghton Mifflin Company, Boston.

Sharma, S. P. (ed) (1988), *EnergyPricing Policies in Nepal* , International Labour organization, New Delhi.

Shrestha A. P. (1991), *Hydropower in Nepal : Issues and Concepts of Development*, Resource Nepal, Kathmandu.

WECS (1985), *Commercial Energy, cost and Princing situation in Nepal* Kathmandu: WECS/HMG/N, Kathmandu.