Fuelwood Scarcity in Pakistan

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The National Commission on Agriculture (1988) underlined shortage of fuelwood in the country and projected a much bigger gap between demand and supply by turn of the century. Several other studies have made similar assertions about fuelwood situation in Pakistan (1,2,3,5).These assessments are mostly based on physical models of supply and demand. These models estimate future demand on the basis of projected population size and per capita needs, and compare it with the production potential of the existing resources. While relevance of these models can hardly be held in doubt, it is imperative that the economic indicators of scarcity may also be examined. This would provide a better understanding of the situation and help in making better decisions. Some of these indicators are discussed below.

Price rises

The increase in real price of a commodity is considered to be a sure sign of its scarcity. When imbalance appears between demand and supply, price rises to bring about necessary adjustment. Fuelwood is mostly collected as a free good in the rural areas and is traded only in the urban areas. Therefore, the price indicator is relevant to fuelwood situation in urban areas only.

According to Economic Survey of Pakistan 1989-90, the retail market price of fuelwood increased from Rs. 3.39 per 40 kg in 1956-57 to Rs.39.78 in 1988-89. Regression analysis brings out that the price level has increased by 16.63 times during the 33 year period. It reflects average annual compound growth rate of 9.39 percent. In comparison, the general consumer price index rose by 11.14 times during the same period and the average annual compound rate of growth was 8.11 percent. Thus the price of fuelwood has risen at a much faster rate than the general consumer price index.

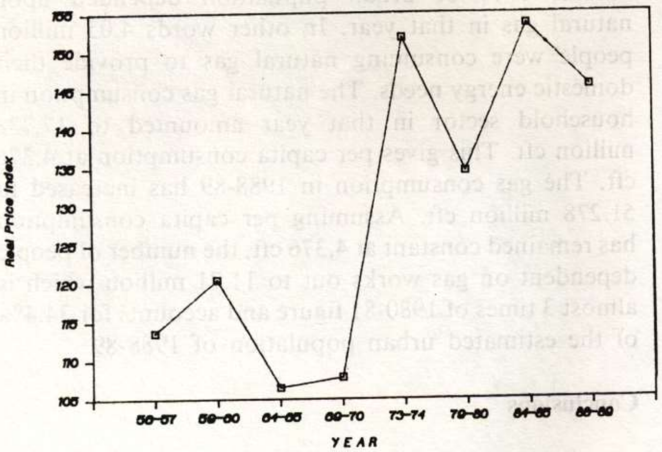
The real fuelwood prices (over and above the inflation rate) increased by 46% during the period between 1956-57 and 1988-89 reflecting an average annual compound growth rate of 1.16 percent. Thus in comparison with 1956-57, fuelwood has become a relatively more scarce commodity in 1988-89. It is noteworthy that the real price of fuelwood remained steady upto 1972-73. In the wake of sharp increase in oil prices in that year, real fuelwood price rose sharply registering and increase of about 30% in one single year. Thereafter price remained stable until 1981-82 when the second round of increase in oil prices took place. Since 1981-82, the real price of fuelwood has changed little. A study of real prices over short run does not reflect scarcity of fuelwood. However, in the long run interventions of unforeseen factors tend to raise the level of real prices. Viewed in the long run perspective of 33 years, the real prices of fuelwood exhibit an upward trend and reflect increasing scarcity of fuelwood. (Fig. 1)

Exchange value

Goods and services derive value from their scarcity. Inevitably when the scarcity of a good increases, its exchange power vis-a-vis other commodities also increases. This provides an other indicator to assess the scarcity. The comparative statement of quantities of some of the essential goods that a unit of firewood (40 kg) could purchase in 1956-57 and 1988-89 is given below. (8)

Commodity	Unit	1956-57	1988-89	% change
1. Vegetable ghee	Kg	1.06	2.23	+ 100
2. Wheat flour	Kg	8.92	13.60	+ 95
3. Coarse cloth	Metre	2.30	4.25	+ 85
4. Sugar	Kg	2.85	4.10	+ 44
5. Tea	Grams	468	593	+ 27
6. Kerosine Oil	Litre	9.41	10.86	+ 15
7. Milk	Litre	6.00	6.15	+ 3
8. Salt	Kg	21.18	21.73	+ 3

REAL FIREWOOD PRICES



It is evident from above data that a unit of firewood in 1988-89 compared to 1956-57 purchases 110% more of vegetable ghee, 95% of wheat flour, 85% of coarse cloth, 44% of sugar, 27% of tea, 15% of kerosine oil, 3% of milk and salt. The value of firewood has improved markedly in relation to vegetable ghee, wheat flour, cloth, sugar and tea. It is clearly the result of increased scarcity of fuelwood.

Trade Balance

Another economic indicator could be the impact on the balance of payments. Increased scarcity of a good stimulates its imports. As high transportation costs prohibit import of fuelwood the increased scarcity of fuelwood has tended to foster imports of substitutes. One of the close substitutes of fuelwood is kerosine oil. The imports of kerosine oil have fluctuated widely depending on prices in the international markets. The following table gives the imports of kerosine oil during 1976-77 to 1988-89. (6)

Year	Quantity (Tonnes)	Value (Million Rs)
1976-77	436,850	522
1977-78	510,350	675
1978-79	607,750	823
1979-80	593,390	1,582
1980-81	420,037	1,391
1981-82	352,578	1,324
1982-83	392,230	1,599
1983-84	411,198	1,510
1984-85	495,395	1,919
1985-86	491,596	1,758
1986-87	618,238	1,526
1987-88	576,439	1,676
1988-89	614,028	1,848

The regression analysis shows that both quantity and value of imports of kerosine have exhibited an upward trend. The quantity has increased at the compound rate of 1.5% per annum and value at the rate of 9.0% per annum. It is a heavy burden on the balance of payments which is already under severe strain.

Increase in Consumption of Substitutes

The increase in scarcity of a given commodity tends to stimulate consumption of substitutes because the latter become relatively cheaper. This provides an other indicator for the assessment of the scarcity of fuelwood. Fortunately data on consumption of substitutes of fuelwood i.e. kerosine oil and natural gas are available. The following table shows the consumption of kerosine oil and natural gas since 1971-72. (8)

Year	Kerosine consumption in domestic sector (Tonnes)	Natural gas consumption in domestic sector (Million C.ft)
1971-72	380,991	2,261
1974-75	538,028	5,065
1979-80	625,861	14,283
1984-85	678,897	37,372
1988-89	971,037	51,278

During the 18 year period between 1971-72 and 1988-89, the kerosine oil consumption has increased by 2.54 times and of natural gas by 22.68 times. The per capita consumption of kerosine oil has increased from 6.0 in 1971-72 to 9.0 kg in 1988-89. The enormous increase in the consumption of substitutes is a clear indication of comparative expensiveness and scarcity of fuelwood.

The comparative prices of kerosine oil and firewood per billion joules (GJ) of delivered energy are shown below. The calorific value of firewood is assumed at 16 million joules per kg and of kerosine oil at 35 milliom joules per litre. (Leach, 1986).

Leach (1986) estimates if kerosine costs less than 3 times as much as firewood per unit of delivered energy, one may expect consumers to switch to kerosine, as the price ratio of kerosine to firewood has remained less than 3, the 'cheap kerosine' policy has induced consumers to switch over to kerosine.

According to housing census of 1981, 16% of urban and 1% of rural population consumed kerosine

Year	Kerosine Oil (Rs./GJ)	Firewood (Rs/GJ)	Ratio of K.Oil to firewood
1956-57	11.43	5.30	2.15
1959-60	9.71	6.15	1.58
1964-65	10.28	6.11	1.68
1969-70	13.14	7.54	1.74
1972-73	20.57	9.92	2.07
1974-75	27.43	19.70	1.39
1979-80	58.28	29.88	1.95
1984-85	101.14	51.30	1.97
1988-89	104.56	62.14	1.68

oil as cooking fuel. The number of consumers totalled 4.418 million, of which 3.814 million (86%) were in urban areas and the rest 0.604 million (14%) in rural areas. the kerosine oil consumption in that year amounted to 516,958 tonnes (6). This gives kerosine consumption per consumer at 117 kg. Kerosine consumption increased to 971,037 tonnes in 1988-89. On the basis of consumption of 117 kg per consumer, the number of consumers in 1988-89 work out to be 8.299 million. Assuming urban-rural ratio at 86:14, the number of consumers in urban areas is estimated at 7.138 million which is 87% greater than the 1980-81 figure. It accounts for 21% of the estimated urban population of 1980-81.

Similarly the comparatively lower prices of natural gas have promoted its consumption in the house hold sector. The price of natural gas per billion joules [GJ] of delivered energy during the last decade are shown below. The calorific value of natural gas is taken at 1.03395 million Kj per 1000 cft of gas. (6)

Year	Gas Price (Rs. 1000 cft)	Gas price (Rs/GJ)	Firewood Price (Rs/GJ)
June, 79	9.63/12.00	9.31/11.60	29.88
April, 81	9.63/12.00	9.31/11.60	37.27
January, 82	14.00/21.00	13.54/20.31	43.48
June, 83	16.00/24.00	15.47/23.21	44.72
June, 84	18.00/27.00	17.40/26.11	48.52
June, 85	18.00/27.00	17.40/26.11	51.29
May, 86	18.00/27.00	17.40/27.00	52.09
June, 87	22.50/27.00	21.76/27.00	54.54

The gas price per GJ of delivered energy is 33 to 50 percent of firewood price. However it does not include the capital cost of the appliances. According to 1981 census, 17% of urban population depended upon natural gas in that year. In other words 4.05 million people were consuming natural gas to provide their domestic energy needs. The natural gas consumption in household sector in that year amounted to 17,738 million cft. This gives per capita consumption at 4,376 cft. The gas consumption in 1988-89 has increased to 51.278 million cft. Assuming per capita consumption has remained constant at 4,376 cft, the number of people dependent on gas works out to 11.71 million which is almost 3 times of 1980-81 figure and accounts for 34.4% of the estimated urban population of 1988-89.

Conclusions

— During the 33 years period between 1956-57 and 1988-89, firewood has become a relatively more scarce and more expensive commodity.

— Fuelwood supplies at competitive prices fall short of the demand.

— The availability of alternative fuels at comparatively cheaper rates is gradually displacing the use of fuelwood in urban areas.

— To improve competitiveness of fuelwood, its production will have to be subsidized.

— The future behaviour of prices of alternative fuels will significantly affect the demand for fuelwood. If the era of 'cheap oil' comes to an end, people will switch back to fuelwood.

— Fuelwood supplies at competitive prices will have favourable effect on the balance of payments.

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