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THE ECONOMICS OF COOKING ENERGY SCENARIO IN ARID RAJASTHAN

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ABSTRACT

The analysis of non-commercial fuel supply and its use on randomly selected farms in arid Rajasthan revealed that about 60 per cent of fuel wood consumed on sample households was supplied by ones own farm. Fuelwood, dungcake and crop wastes accounted for 58, 28 and 14 per cent of total non-commercial fuels used in cooking food. The per household annual consumption of non-commercial fuels ranged between 3.13 to 5.62 t in different size of farms. However, the actual per capita energy derived from the non-commercial fuels consumed on sample farms was short by 22 per cent compared to requirement in country side conditions. It is inferred that the fuels are used inefficiently leading to diversion of valuable cowdung to hearths. The per farm cowdung used as fuel worth Rs. 108.00 was actually worth Rs. 302.00 in terms of nutrients (NPK) contained in it.

INTRODUCTION

Arid region of Rajasthan has less than one per cent of its area under forest cover. The Report of National Commission on Agriculture (1976) estimated the per capita availability of fuelwood for the entire state of Rajasthan at 208 kg per annum. On the assumption of a per cent decline in per capita consumption every year from 1985 onwards (assumed by the Commission) the per capita demand of fuelwood in arid Rajasthan was estimated at 175 kg per capita per annum by 2000 A.D. In view of the meagre area under forests it was noted that the region will be severely deficit in fuelwood, (Anantha Ram and Bhati 1988). However, while estimating the deficit, the contribution of ones own farm to the fuelwood supply, crop straw and cow dung as fuel material was not considered. Since some tracts in arid zone practice 'agro-forestry' which contribute significantly to fuelwood supply, a sample survey was conducted in 1989 in a cluster of two villages in Sikar district of Rajasthan to study the sources of fuelwood supply and consumption pattern of fuelwood along with other fuels for cooking purposes.

MATERIAL AND METHODS

Household level data were collected from 43 households randomly selected from different size group of farms in a cluster of two villages in Sikar district of Rajasthan. The district and villages were purposively selected in view of the

comparatively advanced agro-forestry practices in the district. The data regarding supply of various fuels and their use on sample farms were recorded on a pretested schedule from individual households, by intensive questioning. The energy equivalents of various fuels were derived following Khadi and village Industries Commission Report (KVIC 1975), where in the calorific values of various fuels are given. The annual cow dung production was estimated by following Neelakantan (1976). The collection efficiency of dung is assumed to be 66% of production as against the 40% assumed by Jairam and Maggo (1984) in view of the prevailing practice of dung collection from road side and grazing lands. The availability as dry cake is taken to be 20% of wet weight of dung. The estimation of nutrients in the dung is arrived at by following Pant (1984). Cow dung is valued at the ruling price of manure in the sample villages at Rs. 200/- per tonne. Fertiliser (domestic price 1988-89) are valued at N : Rs. 2350/- P : 3177/- and K : 1300/- per tonne Gulati (1990).

RESULTS AND DISCUSSION

Sources of fuelwood supply

The consumption of fuelwood and supply sources are presented in Table 1. Nearly 60 per cent of fuelwood consumed in the sample house-holds came from ones own farm. However the farm supply of fuelwood in small and medium farms was around 35 per cent only. The inference, therefore, is that although the agro-forestry system in vogue in the sample households supplied a major share of fuelwood consumed on large farms, the small and medium farms, over whelmingly depended on other sources like purchases for their daily fuelwood needs.

Table 1. Fuelwood supply and consumption per household on sample farms of arid Rajasthan-1988-89

Size group	Size of family	Size of land holding	Fuelwood trees on farm	Fuelwood consumed	Sources of fuelwood supply		
					Farm produced	Purchased	Collected from waste land
	(Nos)	(ha)	(Nos)	(t)	(t)	(t)	(t)
Small	7	1.15	17	1.38	0.68	0.89	0.31
				(100)	(36)	(48)	(16)
Medium	11	3.78	27	3.14	1.24	1.01	0.89
				(100)	(40)	(32)	(28)
Large	13	4.62	67	3.20	2.99	0.19	0.02
				(100)	(94)	(6)	(Neg)
Av	10	3.20	37	2.76	1.63	0.71	0.42
				(100)	(59)	(26)	(15)

Note :- (t) = tonnes

Figures in parantheses are percentage contribution of different sources to total fuelwood consumed.

Other fuels

Crop straw and dungcake are the two other important sources of non commercial fuel in the country side. Per household consumption of non-commercial fuel including fuelwood (Table 2) reveals that 58 per cent of total fuel consumed by the households for cooking came from fuelwood, followed by dung cake (28%) and crop straw (14%). More or less similar pattern was observed on different size groups with minor variations. In terms of physical quantity the consumption of all non-commercial fuels varied directly with size group. The per household consumption of non-commercial fuels varied between 3.13 t. on small farms to 5.62 t. on large farms. It is significant to note that an average of 1.34 t. of dung cake in dry weight was burnt as fuel annually in the sample households. The quantity of dung cake fuel burnt varying between 0.76 t. to 1.64 t. in different size groups.

Table 2. Non-Commercial fuel consumption per household for cooking on sample farms in arid Rajasthan 1988-89

Size group	Size of livestock (Nos in ACUs)	Size of operational holdings (ha)	Fuel Consumption			
			Fire wood (t)	Crop straw (t)	Dung Cake (t)	Total (t)
Small	3.1	1.30	1.88	0.49	0.76	3.13
			(60)	(16)	(24)	(100)
Medium	6.5	2.74	3.14	0.81	1.62	5.57
			(56)	(15)	(29)	(100)
Large	9.3	4.78	3.20	0.78	1.64	5.62
			(57)	(14)	(29)	(100)
Av	6.3	2.93	2.76	0.70	1.34	4.80
			(58)	(14)	(28)	(100)

Energy scenario

The physical quantities of fuel use per household presents only a partial picture. Therefore, in Table 3, the per capita availability of energy from different fuels in physical and energy terms are presented. The Khadi and Village Industries Commission (1975) estimated that 650.4 K calories of useful heat are needed to cook for one person for a day. On the above basis, the per capita energy per annum works out to 2.37 lakh K calories. Table 3 reveals that the energy used from different sources was well above calories needed for cooking purposes in all size groups. It is interesting to note that at the reported rate of different fuel use and the norms of useful energy needed for cooking dung cake or crop straw can on their own meet the requirement in energy terms. Apparently the energy balance sheet does not represent the true picture of countryside, because the calorific values of different fuels in energy terms are under ideal conditions wherein the different fuels are used most efficiently. The countryside obviously do not provide such ideal conditions.

Table 3. Per capita annual fuel/energy consumption for cooking on sample farms-1988-89

Size group	Fuel wood		Dung cake		Crop straw		Total		Energy (K cal.) available to requirement* (%)
	Qty. (Kg)	Energy (lakh. K cal)	Qty. (Kg)	Energy (lakh. K cal.)	Qty. (Kg)	Energy (lakh. K cal.)	Qty. (Kg)	Energy (lakh. K cal.)	
Small	265	12.48	107	2.24	70	2.34	442	17.06	74.6
Medium	288	13.56	149	3.12	75	2.51	512	19.19	84.0
Large	248	11.68	126	2.64	60	2.00	434	16.32	71.4
Av	275	12.95	130	2.72	68	2.27	473	17.94	78.5

Note : *Energy required per capita per year for cooking under countryside conditions is estimated at 22.85 lakh calories.

Table 4. Value of dungfuel burnt in terms of nutrients on the sample farms 1988-89

Size group	No. of animals	Estimated Dung production	Availability (collection efficiency @ 66% (t)	Dry solids @ 20%	Dungcake used in dry. wt.	Proportion of Dung in cake	Nutrients lost (NPK)	Value
	No.	(t)		(t)	(t)	(t)	(t)	(Rs)
Small	38	158.26	105.51	21.10	10.5	4.23	0.96	2382
					(0.76)	(0.30)	(0.07)	(170)
Medium	87	363.46	242.28	48.45	24.3	9.69	2.20	5447
					(1.62)	(0.65)	(0.15)	(363)
Large	116	485.01	323.34	64.67	22.9	9.16	2.08	5155
					(1.64)	(0.65)	(0.15)	(368)
Total	241	1006.73	671.13	134.22	57.7	23.08	5.25	12984
					(1.34)	(0.54)	(0.12)	(302)

Note : Figures in parentheses are average values per household.

Gupta and Ahuja (1990) held that the energy requirement of 620. kcalories per capita per day assumed by Advisory Board on Energy (G.O.I.) as questionable.

Alternatively, for rural households it may therefore, be reasonable to take physical quantities of fuelwood or its equivalent needed under the existing conditions. It has been estimated (Paranjape et al. 1981) that on an average a family of six persons needs about 8-10 kg of dry wood per day or 1.33 kg per capita per day at the rate of 8 kg per day per family of six persons. In other words the energy in calories will be 6261 K calories per capita per day. If 6261 K calories is taken as the requirement under the prevailing conditions, then per capita annual requirment works out to 22.85 lakh K calories. The per capita fuel consumption on sample farms, in energy terms (17.93 lakh K cal) was then found to be deficit by 22 per cent. The per capita deficit ranging from 16 per cent to 29 per cent in different size groups.

The discussion in the preceeding section leads to the inference that (a) the available fuels on the farms were used inefficiently because the actual fuel consumption in energy terms was nearly seven times the norm envisaged by KVIC (b) the norms of energy required as laid down by KVIC is on lowerside for the countryside because the hearths (cooking chula) and fuels normally available in countryside were not capable of yielding the useful energy envisaged and (c) as a result of inefficient use of available fuels a lot of cow dung has been diverted to hearth as fuel for cooking.

Value of dung used as fuel

Dung cakes used as fuel constituted 28 per cent of the total fuel consumed in the sample households. The average quantum of dung cakes used per household worked out to 1.3 tonnes in dry weight (Table 2). The total quantum of dung in the dung cakes used as fuel worked out to 23.08t. (dry) Table 4. It was estimated (Pant 1984) that one tonne of dry cattle dung contains the equivalent of 102 kg of Amonium sulphate (N), 85 kg of super phospate (P) and 41 kg of Potassium (K). Accordingly, cowdung used as fuel in the sample households (23.08 t.) contained 5.25 tonnes of nutrients valued at Rs. 12,984/-. The per household loss in nutrients in terms of NPK per annum worked out to 0.12 tonne. The loss in nutrients in different size groups varied between 0.07t. in small to 0.15t. in medium and large farms.

In monetary terms, the value of nutrients lost due to the use of dung as fuel worked out of Rs. 12,984/- in the sample households. The fuel value of dung (valued at Rs. 200/- per t in dry weight) gave a value of Rs. 4616/-. A comparison of values of dung as fuel and dung as nutrients gave a ratio of 1 : 2.81. In other words, per farm cow dung used as fuel worth Rs 108/- was worth Rs 302/- as nutrients on the sample farms.

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