indirect, on the part of the developed countries to obstruct the raising of the required amounts in the international capital market. It was estimated that collectively the non-oil exporting countries might thus have to earmark something like $ 20 billion (i e, less than a third of their present foreign exchange holdings, excluding gold) to implement the suggestion.

The second part of the proposal was that the non-oil developing countries should, at the same time, announce their intention to co-ordinate among themselves in replacing as much as possible of the balance of their exchange reserves, including gold held by them in monetary reserves, with commodity stockpiles, at the country level. These individual commodity stockpiles may cover (i) commodities which, though stockable, do not get covered by international commodity agreements (e g, there are commodities such as pepper and cardamom, of significant export interest to India, which do not figure in the present UNCTAD list), and (ii) commodities and manufactured goods which, though largely imported (e g, foodgrains and fertilisers), are of crucial importance to their economies, individually as well collectively. Several oil exporting countries are also severely dependent on imports of foodgrains and essential industrial inputs. These countries might feel inclined to support also the programmes of commodity stocking at national levels provided the list of commodities is so drawn up as to take care of the interests of these countries as well. Such programmes will help them even further in securing the real value of the surpluses they might continue to accumulate.

To the extent that the developing countries thus replace their foreign exchange holdings by commodity stocks, national or international, they will no doubt be reducing their reserve currency holdings. But that by itself should not be a cause for great concern because commodity reserves are quite as liquid as currency reserves, since international borrowing against the security of stocks of internationally traded commodities is by now very well established. The additional advantage to the developing countries of holding commodity rather than currency reserves will be that they will no longer run the risk of the decline in real value associated with the holding of currency reserves, particularly in a situation like the current one in which, while exchange rates fluctuate violently and unpredictably, there is little scope for shifting from one currency to another. On the other hand, commodity stocking should help in not only stabilising commodity prices and earnings, but also, over the long run, improving them. Therefore, in that long run the real value of reserves held in commodity stocks should also improve.

CONCLUDING OBSERVATIONS

The proposals outlined above call for action on the part of the developing countries collectively as well as regionally and individually. But even when they act individually it will be necessary for them to co-ordinate their actions so that they are mutually reinforcing and not in conflict. To the extent these proposals can be successfully implemented, it will be possible to rid the present international monetary scene of its most retrograde and objectionable aspects. Moreover, not only will the non-oil developing countries have attended to the serious problem of stabilising their commodity prices and incomes, which has been eluding solution for so long, but also the oil exporting countries can assure themselves thereby of imports of commodities of major interest to them at stable prices. The developing world cannot go on waiting for a world trading system which ensures them equitable terms for their exports and imports. Nor, of course, can they wait for ever for a world monetary system in which the gains from reserve generation are equitably distributed and the costs of exchange rate fluctuations less inequitably shared.

Both our proposals are however crucially predicated on a sort of coming together of the developing countries, including the oil-exporting countries, for the task of forging monetary arrangements of their own. The proposed commodity stockpiles financed out of their own funds will provide the necessary underpinning to the mutual payments arrangements that can be worked out at regional and inter-regional levels.

Notes

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1 See H G Johnson, 'Theoretical Problems of the International System', *Pakistan Development Review* (1967), Volume 7, pp 1 to 28, reproduced in R N Cooper (editor), "International Finance", Penguin Modern Classics (1969).

2 See United Nations, "Money, *Finance and Development: Papers* on International Reform", 1974.

3 See I S Gulati, "International Monetary Development and the Third World: A Proposal to Redress the Balance", R C Dutt Lectures on Political Economy, 1978, Orient Longman, 1980.

Bharat Heavy Electrical

BHARAT HEAVY ELECTRICAL's Electroporcelains Division is completing 50 years of operations and celebrating 1982 as the Golden Jubilee Year. Founded in 1932 by the then Government of Mysore under the guidance of M Visweswaraya, EPD has a historical background. The factory was set up initially as a government body under the name 'Government Porcelain Factory' to manufacture low tension and telephone insulators, tableware and artware. GPF entered into a technical collaboration with the world renowned insulator manufacturer, NGK of Japan, in 1954 for manufacture of high voltage insulators for the power industry. With a view to providing operational autonomy, the unit was converted into a public limited company in 1967 and renamed as 'Mysore Porcelains'. Production capacity of the factory at this stage was raised to 7,500 tonnes from 5,000 tonnes per year. However, as the undertaking continued to suffer losses and in view of the importance of porcelain insulators for the growth of the power sector in the country, the unit was handed over to BHEL in 1976 as a subsidiary. Later, the unit fully merged with BHEL as Electroporcelains Division in 1980. Some of the progressive measures taken by BHEL since the takeover are: introduction of professional management, induction of qualified personnel, modernisation of the plant in addition to, of course, providing the much needed financial support. This has resulted in significant improvement in the performance of the plant, as is amply evident by the steady growth in production and profitability. The product range of EPD includes disc, pin, post insulators and hardware for transmission/distribution and sub-station applications upto 400 kV, hollow insulators for electrical apparatus upto 400 kV and solid core insulators for 25 kV railway traction.

Rural Energy Scarcity and Nutrition

A New Perspective

Srilatha Batliwala

Almost all approaches to solving the problem of malnutrition concern themselves with raising food (and synonymously, calorie) intake to match the recommended daily allowances. In contrast, this paper considers the possibility of reducing calorie expenditure, i e, of conserving the energy of the undernourished.

This approach to closing the calorie gap must be seriously examined since it is the poorest who eat the least, but have to work the hardest for their survival. This is not proposed as an alternative to increasing food intake, but as an added dimension to any integrated approach to malnutrition — and indeed poverty itself.

AS growing numbers of people fall below the poverty line, the problem of malnutrition has become the focus of worldwide concern. Estimates of malnutrition in India vary widely. Figures for Protein Calorie Malnutrition (PCM) among pre-school children range from 50 to 60 million or between 70 and 90 per cent of all pre-schoolers in the country,[1,2,3,4]. For the overall population, unpublished dietary surveys conducted by UNICEF in 1974 found that almost one-third of our people were undernourished. P V Sukhatme has convincingly refuted these figures,[6,7] but even his revised estimate indicate that a large number of people — 25 per cent of the urban and 15 per cent of the rural population — are malnourished. The nutritional deprivation of certain 'vulnerable groups' — viz, pregnant and lactating women, pre-school children and economically weak sections — has been well documented. The impact of prolonged malnutrition is under debate.[8,9,10,11]

The effects of malnutrition, even if less widespread than earlier believed, are serious enough to warrant vigorous action. The correlation between nutrition and infection has been studied in pilot projects throughout the developing world.[12,13] The influence of maternal nutrition on infant birth weight and subsequent infant health needs no reiteration.[14,15]

The search for solutions to the problems of malnutrition has so far been based on the following approaches:

(i) Since food consumption is evidently positively *correlated to* agricultural productivity,[16] particularly in rural areas, 'Grow More Food' has been one of the major, though indirect, strategies for raising nutrition status.

(ii) Income and food intake are similarly correlated — more so in the urban context — and thus employment generation and raising income levels has been another indirect approach to improving nutrition.

(iii) Certain segments of the population identified as biologically, socially and economically 'vulnerable' *have been the targets of* supplementary feeding programmes, though generally with disappointing results.

(iv) The recognition of the 'leaky bucket' syndrome of loss of nutrition through constant infections and intestinal infestation has led to integrated programmes of supplementary nutrition, health care and environmental sanitation services.

All these approaches, except for the last, concern themselves with raising food (and synonymously, calorie) intake to match the recommended daily allowances. In contrast, this paper considers the possibility of reducing calorie expenditure, ie, of conserving the energy of the undernourished. This approach to closing the 'calorie gap' must be seriously examined since it is the poorest who eat the least, but have to work the hardest for their survival. It must be emphasised at the outset, however, that this is not proposed as an alternative to increasing food intake, but as an added dimension to any integrated approach to malnutrition — and indeed poverty itself.

ENERGY SCARCITY AND HUMAN LABOUR

Poverty and energy scarcity seem to go *together.*[17,18,19] *Especially* in the rural areas of developing countries, the shortage of energy resources leads to a great dependence on human energy for survival. In the developed world, commercial energy is freely available for the myriad life-supporting tasks such as cooking, heating, transporting, farming, and obtaining water for domestic needs.

In developing countries, however, the scarcity of such commercial energy creates a demand on human energy to meet most of these needs. To cite the most glaring example, increasing deforestation implies walking longer distances *to collect* firewood for cooking fuel — distances which are walked by human beings, and usually by women and children.

What then is the relationship between this human energy contribution and nutrition status? More importantly, what would be the impact on human nutrition if alternative technologies are used to accomplish these tasks, especially those technologies which replace human with inanimate energy? These are the questions which this paper attempts to discuss.

ENERGY PROBLEM AND HUMAN NUTRITION

What is the role and magnitude of human energy in the rural energy matrix? Until recently, the necessary data for such an exercise was not available. In 1977, the Application of Science and Technology to Rural Areas (ASTRA) programme of the Indian Institute of Science, Bangalore, launched a detailed energy survey of six villages in the vicinity of their rural extension centre in Karnataka state. The results of the survey have just been finalised and published.[20] The survey covered a population of 3,500 people in 560 households.

Table 1 summarises the source-wise contribution and sector-wise consumption of energy in this area. It shows that firewood which is used predominantly for cooking provides the bulk of the energy used in rural areas. If firewood is excluded, then human energy is a significant energy resource in the villages. In fact, the human contribution is very large in the agriculture and domestic sectors.

TABLE 1: PATTERN OF VILLAGE ENERGY SUPPLY AND CONSUMPTION

Source-wise Contribution		Sector-wise Consumption	
Source	(Per Cent)	Activity	(Per Cent)
Human	7.7	Agriculture	4.3
(Men)	(3.1)	Domestic	88.3
(Women)	(3.8)	Lighting	2.2
(Children)	(0.8)	Transport	0.5
Animal	2.7	Industry	4.7
Firewood	81.6		
Kerosene	2.1		
Electricity	0.6		
Other	5.3		

Source : ASTRA, 1981, "Rural Energy Consumption Patterns—A Field Study", Bangalore, Indian Institute of Science, p 80.

TABLE 2: CALORIE COST OF DOMESTIC ACTIVITIES (CALS/MINUTE)

Activity	Calorie Cost		
	Man	Woman	Child
(1) Gathering firewood			
(a) Walking to source	5.2	4.4*	4.6*
(b) Return trip with load	6.4	5.5*	5.7*
(2) Fetching water			
(a) Walking to source	5.2	4.4*	4.6*
(b) Return trip with load	6.4	5.5*	5.7*
(3) Cooking	2.5*	2.1*	2.2*
(4) Carrying food to farm /walking to farm	5.2	4.4*	4.6*
(5) Livestock grazing	2.8	2.4*	2.5*
(6) Others (sweeping, cleaning, child care, personal care, play, sitting, etc) average	1.5*	1.5*	1.7*

Sources : (i) N L Ramanathan and P G Nag, : "Energy Cost of Human Labour", National Institute of Occupational Health, Ahmedabad.
(ii) R Rajalakshmi, 1974 : "Applied Nutrition" (Second Edition), Oxford and IBH, New Delhi.

TABLE 3: CALORIE COST OF AGRICULTURAL ACTIVITIES (CALS/MINUTE)

Activity	Calorie Cost	
	Man	Woman
(1) Ploughing	5.5	4.7*
(2) Irrigation	3.3	2.8*
(3) Transplanting	5.1*	4.3*
(4) Weeding	5.1*	4.3*
(5) Harvesting (manual)	5.3*	4.5*
(6) Winnowing	5.3*	4.5*
(7) Threshing	5.4	4.6*
(8) Manuring	4.0*	3.4*
(9) Nursery	3.5*	3.0*
(10) Harrowing	6.5*	5.5*
(11) Transporting (by bullock cart)	2.0*	1.7*

Source : R L Ramanathan and P K Nag : "Energy Cost of Human Labour", National Institute of Occupational Health, Ahmedabad.
*All estimated or approximated figures.

Furthermore, the survey reveals that if we disaggregate human energy, the contribution of men, women and children is 31 per cent, 53 per cent and 16 per cent respectively (as percentages of total human hours per household per day). This data incidentally substantiates what was hitherto only speculation, that in many (if not most) rural areas, women work harder than men.

The most important information elicited by the ASTRA study is that most human energy was spent not so much in economically productive activity such as agriculture, but in survival tasks like fetching water and gathering firewood, most of which have been rendered unnecessary in urban areas. Thus, the lack of ready energy resources placed a heavy burden on human energy.

Having determined the magnitude of human energy contributions in the rural energy matrix, our next step is to translate the energy expenditure of the average man, woman and child into calories per day and compare the results with the average daily calorie intake. This is possible because the ASTRA study also surveyed the food consumption of the local population.

However, the translation of activities into energy costs proves to be a difficult exercise for the following reasons:

(1) A survey of the available literature shows that there appear to be no calorie cost studies for most of the important activities which are of concern to this paper. For instance, while nutrition textbooks give figures for piano-playing, climbing stairs and typewriting,[21] they do not mention fetching water or gathering firewood.

(2) Ramanathan and Nag[22] have reviewed almost all the available human energy cost studies in India in their paper "Energy Cost of Human Labour". They were able to find energy cost studies of only 10 agricultural activities, compared to over 70 industrial and military activities which had been measured. Perhaps this reflects the high priority given to the industrial and defence sectors even in nutrition research.

(3) In the case of women, studies of the calorie costs of their various activities seem to be almost non-existent, *or can be found only* for such pleasant domestic tasks such as sewing, knitting and singing. In fact, Ramanathan and Nag[23] were able to find female energy cost estimates, for only ten activities, all listed under the heading "sedentary people". This seems an odd description of 50 per cent of the population, most of whom manifestly work longer and harder than men, bearing the triple burden of reproduction, housework, and economic activity.

Under the circumstances, a zeroth-approximation solution was to try and estimate the female energy cost of a given activity as a proportion of the male cost, applying the formula

$$\left\{\frac{\text{energy cost/minute/adult male} \times \text{Basal Metabolic Rate/female}}{\text{Basal Metabolic Rate/male}}\right\} = \text{energy cost/minute/adult female.}$$

The Basal Metabolic Rate (BMR) for moderate workers was used throughout the formula.

From a rigorous point of view, this formula leaves much to be desired, but in the absence of any other relevant data, and in order to test the hypotheses of this paper, the formula provides some rough figures. However, the results obtained by applying the formula must be viewed only as guesstimates which indicate trends and not as *definitive figures.*

(4) The calorie expenditures of children also seem to have been determined only for those fortunate enough to go to school, play and grow. Nutritionists must awaken to the fact that most of India's children join the labour force when they are as young as six years, and provide energy contributions crucial to their families' survival. In order to derive the caloric cost equivalents for children, therefore, the formula

$$\left\{\frac{\text{energy cost/minute/adult male} \times \text{BMR/child}}{\text{BMR/adult male (moderate worker)}}\right\} = \text{energy cost/minute/child}$$

was used. The results must be viewed with the same caution as advised in the case of female energy cost estimates. The BMR used here is for a child aged 10 years.

TABLE 4: HOURS PER DAY SPENT ON DOMESTIC AND AGRICULTURAL ACTIVITIES

Activity	Hours Per Day		
	Man	Woman	Child
(A) Domestic			
(1) Gathering firewood	0.33	0.41	0.24
(2) Fetching water	0.02	0.78	0.13
(3) Cooking	0.02	2.28	0.18
(4) Carrying food to farm/walking to farm	1.00	1.14	—
(5) Livestock grazing	1.63	0.47	1.03
(B) Agricultural			
(1) Ploughing	0.18	—	—
(2) Irrigation	0.30	—	—
(3) Transplanting	0.08	0.33	—
(4) Weeding	0.08	0.33	—
(5) Harvesting	0.18	0.19	—
(6) Winnowing	—	0.09	—
(7) Threshing	0.14		—
(8) Manuring	0.13	0.04	—
(9) Nursery	0.07		—
(10) Harrowing	0.03	—	—
(11) Transporting	0.05	—	—
(C) Other activities*	9.76	7.94	8.42
(D) Res. and sleep (approx)	10.00	10.00	14:00

Source : Compiled from data given in ASTRA, 1981 : "Rural Energy Consumption Patterns—A Field Study", Indian Institute of Science, Bangalore
Note : * As in Table 2, item 6.

TABLE 5: ACTIVITY-WISE CALORIE EXPENDITURE PER DAY

Activity	Calories Per Day		
	Man	Woman	Child
(A) Domestic			
(1) Gathering firewood	115	122	74
(2) Fetching water	7	232	40
(3) Carrying food to farm/walking to farm	312	301	—
(4) Cooking	3	287	24
(5) Livestock grazing	274	68	155
Sub-total	711	1010	293
(B) Agricultural			
(1) Ploughing	59	—	—
(2) Irrigation	59	—	—
(3) Transplanting	25	85	—
(4) Weeding	25	85	—
(5) Harvesting	57	51	—
(6) Winnowing	—	24	—
(7) Threshing	45		—
(8) Manuring	31	10	—
(9) Nursery	15		—
(10) Harrowing	12	—	—
(11) Transporting	6	—	—
Sub-total	334	255	—
(C) Other Activities	878	715	655
(D) Rest and Sleep (approx)	550	500	650
Total	2473	2505	1598

Note : *As in Table 2, item 6.

(5) Finally, many of the energy cost figures encountered were somewhat doubtful. For example, harvesting, which is hard, back-breaking labour, is given as less calorie expensive (3.8 cals/minute) than threshing (5.4 cals/minutes). This may be true for mechanised, but not manual, harvesting. One is therefore compelled to make some arbitrary adjustment of the calorie cost of certain activities (again at the risk of incurring nutritionists' wrath) but erring on the side of caution.

Tables 2 and 3 list the tentative activity-wise energy cost per minute per man, woman and child respectively used in this paper. All estimated figures are starred. It is clear from the number of starred figures in the two Tables that most of the important agricultural and domestic activities especially as performed by women and children in a rural area, have not been measured in terms of energy cost. Let us now look at the average number of hours per day spent in the given activities by men, women and children, as depicted in Table 4. It may be noted that items C and D in Table 4 are the author's estimates based on personal observation at the ASTRA extension centre.

We are now in a position to calculate the average calorie expenditure per day per man, woman and child. The results are presented in Table 5. A few points regarding Table 5 need explanation before we discuss the results of our exercise. The working hours have been averaged over the whole year to give us a daily figure more appropriate for examining daily energy expenditure and for comparing it with food intake. But, it is obvious that during certain months of the year, the hours spent on agricultural activities are much higher than those represented in Table 4; at such periods of time, entire working days are spent in time-constrained tasks such as *ploughing, transplantings,* harvesting, threshing, etc.

However, while energy expenditure increases during the agricultural season, food intake also tends to increase though there may be a time lag during which intake is less than output. Interestingly, ASTRA's post-harvest nutrition surveys show exceedingly high per capita per day intakes, to the tune of 150 per cent of the recommended daily-allowance, even among the poorest people.

Secondly, in the ASTRA survey, children were classified into two age groups: 0 to 5 and 5 to 15 *years.* For the purpose of our calculations only children between 5 and 15 were included, and energy expenditure was taken for a child aged 10 years. However, it is not unusual to see even toddlers assisting parents in minor tasks around the house and farm.

Returning to Table 5, let us examine the implications of the exercise so far:

(1) It should not surprise anyone familiar with rural conditions that the calorie expenditure — or in other words, the work load — of women is higher than that of men. What is more even children are expending a significant number of calories on survival tasks. It is not inconceivable that if children's energy contribution had been monitored separately for boys and girls, the contribution of girls may have been higher. This data further substantiates the findings of Jain[24,25] and others[26] that a more realistic appraisal of women's economic contribution to society is necessary.

(2) *We also see that on the average.* the energy expenditure in domestic tasks is higher than on agricultural work. More so because while agricultural activity is seasonal, the domestic tasks monitored here are daily, life-supporting activities, which must be carried out regardless of the season.

(3) Most important, it is seen that a considerable part of the human energy expenditure results from the lack of alternative technologies and/or energy resources to meet these needs. For instance, gathering firewood, fetching water, cooking and the other domestic tasks account for a substantial share of women's and children's energy output, around 700 and 300 calories per day respectively. If fuel and water were available close to the user, the efficiency of cooking stoves improved, and animal fodder provided in other ways, this calorie expenditure could be conserved. This is where alternative technologies which replace human energy have an important role to play. We shall return to this point later.

Is there any need to reduce human energy expenditure at all? Will it not create an obese nation, and bring in its wake all the health problems of an overnourished population? There is little evidence to support such fears, as we shall see.

If we compare energy expenditure with food intake, we will be able to establish whether the people have adequate nutrition to sustain this level of activity. The ASTRA nutrition survey in the village Ungra, based on reporting of food purchase and use over a period of two months, revealed a per capita daily calorie intake of approximately 2,400. Unfortunately, such data does not reveal the distribution of food *within* the family, or the relative consumption of men, women and children. Various techniques, including multiple regression, were unable to disaggregate the data. However, we questioned local women on the distribution of food among family members. The staple in the local diet is the cereal 'ragi' (sorghum) which is cooked to a dough-like consistency and divided into balls or lumps for eating. It was observed and reported by local women *that the distribution of ragi* balls was generally in the ratio of 2:1:½ for a man, woman and child respectively. It is hazardous to extrapolate the differential calorie intake of men, *women and children* purely on this basis. But it is clear that if food consumption were monitored separately, there would be significant differences between the sexes and age-groups, with women and female children getting the smallest share, regardless of their energy needs.

There are other factors which belie the seeming adequacy of the per capita calorie intake compared to energy expenditure. The Narangwal[27] and other studies show that the loss of nutrients through diarrhoeas and other infections is substantial; thus, raising calorie intake without controlling infection was like pouring water in a leaky bucket. It is also estimated that 90 per cent of the rural population suffer from intestinal infestations, with parasites consuming as much as one-fourth the total calorie intake. Finally, the prevailing intake makes no allowances for pregnancy and lactation, when in fact one-third of adult Indian women are in that condition at any given time[28] and surveys show that the majority of such women get no additional nutrition at such times. Thus, there seems to be ample reason to believe that the nutrition status of the *people, and particularly of women and* children, needs to be improved.

Appropriate Technology and Nutrition Status

Majority of today's nutrition interventions, such as the various supplementary feeding programmes operated in India in the past decades,[29] have failed to make an impact. The reasons for the failure are many, including poor management, inadequate delivery systems, poor outreach, use of dubious biological criteria of 'vulnerability' rather than economic standards, and social factors such as sharing of supplementary food within the family.[31], [32], [33], [34]

In this context, appropriate technology may well be the most promising method of partially overcoming the hiatus created by tardy or inequitable economic development and the poor impact of feeding programmes.

Alternative energy sources can generate *fuel which will save significant* numbers of calories now expended in gathering firewood; efficient cooking stoves will reduce the hours spent on cooking; low-cost energy and water-piping techniques can bring water supply close to the user and conserve the human energy now spent in fetching water; tree lots and other innovations which provide fodder for livestock may reduce human energy spent on grazing. These innovations alone could conserve approximately 500, 700 and 300 male, female and child calories per day, on the basis of our estimates in Table 5. Again, there is an array of inexpensive design changes in agricultural implements which can improve energy usage and render many routine tasks less laborious.

In these ways, alternative energy sources and appropriate technologies have the potential to reduce the energy expenditure of human beings, and especially of the nutritionally 'vulnerable' sections — women and children. The energy thus conserved could conceivably decrease, or even close, the "calorie gap"[35] and permit them to utilise a greater part of their intake for growth, maintenance and resistance to disease.

Appropriate technology and energy interventions would have several economic and hence nutrition implications: human hours saved could be channeled into non-calorie intensive home industries which generate additional income and further increase food intake, to cite only one.

Similarly, there are significant implications for education: in the case of children, the child hours thus released would make schooling a realistic possibility for many children now deprived because of the demand for their energy to meet the family's needs. Adult hours released could similarly be used for literacy and education. Improved nutrition status would improve levels of learning.[36]

The health impact of this approach may also be considerable: the decline in demand for children to meet energy needs could theoretically promote the small family norm; this would have a highly positive impact on maternal

health and nutrition and thus on the health status of newborns.

Finally, the sociological impact of such an intervention must be considered. The most profound impact may be on women, who will be the greatest beneficiaries of energy-saving technologies. The womenhours released from drudgery may possibly play a dynamic role in their liberation and create time and options they are now denied.

These are only some speculations on the possible implications of the energy/appropriate technology/nutrition triangle: *the actual impact must be studied in detail.* However, what is the cost-effect and cost-benefit of this approach? More importantly, is it more cost beneficial than other strategies, *including existing* ones.

There are no immediate answers in the absence of detailed data and further analysis, but the questions themselves must be posed. It may be postulated that even if *alternative energy* sources and technologies are more expensive than present health and nutrition interventions, they may be easier to implement. Since energy scarcity is an acutely felt need in rural areas, particularly among the poorest, energy programmes may gain more rapid acceptance than other strategies which involve changes in traditional practices and methods and social relations, or large capital investment. We may also theorise that since the poorest sections expend the greatest human energy (labour being their only resource), this approach may inherently tend to benefit *them* more than the affluent.

No strategy, this or any other, can substitute for basic structural changes in society, or the equitable distribution of goods and resources. But it is clear that the energy/*appropriate technology*/nutrition nexus is a promising field of enquiry, whatever the socio-political context. In fact, such a strategy may help further the goals of socio-economic change by bringing the marginalised out of their twilight zone.

Directions for Future Research

(1) Relevant and accurate data on: (a) actual work patterns in rural areas; (*b*) measurement of women's and children's labour contribution; and (c) energy cost studies based on the above.

(2) Studies of the physiological dynamics of the human energy conservation approach.

(3) Longitudinal studies of the impact of alternative energy sources and other appropriate innovations on human nutrition status, especially on women and children.

(4) Studies of the social and economic cost-benefit of such interventions.

(5) Studies of socio-economic, anthropological and political dynamics of the approach.

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