ORISSA ECONOMIC JOURNAL

- Problems & Prospects of Agricultural Development in Orissa
- Debt Crisis in Developing Countries

VOLUME XXI 1988 No. One & Two

ORISSA ECONOMIC JOURNAL

Volume XXI Jan-June & July-Dec. No. One & Two

Editor :--

Dr. Baidyanath Mishra, M.A., A.M., Ph.D.
Deputy Chairman,
State Planning Board,
Bhubaneswar.

ORISSA ECONOMICS ASSOCIATION
BHUBANESWAR

Members of the Executive Body 1988—89

ORISSA ECONOMICS ASSOCIATION

1. Dr. N. P. Patro, President
   Professor of Economics, G. M. College, Sambalpur.
2. Dr. N. C. Mohanty, Vice-President
   Reader in Economics, Panchayat College, Bargarh.
3. Sri R. K. Mishra, Secretary,
   Reader in Economics, Ravenshaw College, Cuttack.
4. Sri B. K. Mohanty, Asst. Secretary,
   Lecturer in Economics, Ravenshaw College, Cuttack.
5. Dr. Baidyanath Misra, Editor,
   Deputy Chairman, State Planning Board. Secretariat, Bhubaneswar.
6. Sri Manmohan Das,
   Vice-Principal, M. P. C. College, Baripada.
7. Sri K. N. Mohapatra.
   Department of Economics, Govt. Science College Rourkela.
8. D. G. C. Kar, Professor,
   Department of Analytical and Applied Economics, Utkal University.
9. Dr. J. P. Patnaik, Reader,
   Department of Economics, Sambalpur University.
10. Dr. P. C. Mohapatra,
    Department of Economics, V. Deb College, Jeypore, Dist. Koraput.
11. Sri Benudhar Misra, Principal,
    Binayak Acharya College Berhampur.
12. Dr. R. Padhi Sharma.
    Department of Economics, Berhampur University.
13. Sri L. M. Sahoo,
    Department of Economics, Salipur College, Salipur.

14. Dr. S. K. Das,
Department of Economics, B. J. B. College, Bhubaneswar.

15. Miss. Geeta Samantaray,
Department of Economics, Patamundai College, Patamundai.

16. Smt. Satyabhama Das,
Govt. Women's College. Bolangir.

17. Sri B. B. Mishra,
Department of Economics, G. M. College, Sambalpur-

18. Sri K. K. Sen,
Reader in Economics M. P. C. College, Baripada.

19. Sri B. P. Dash,
Reader in Economics, Khallikote College, Berhampur.

20. Sri B. Nayak,
Reader in Economics, G. M. Evening College, Sambalpur.

21. Sri B. Purohit,
Department of Economics, Govt. College, Bhawanipatana,

22. Sri K. Dash,
Department of Economics, D. D. College, Keonjhar.

CONTENTS

Mahasweta Art Printers, Kesharpur, Cuttack-1

21st. Annual Conference
ORISSA ECONOMICS ASSOCIATION :

Report of the Secretary :-

Mr. President, Hon'ble Governor of Orissa, Our Chief Guest, Our Guest of Honour, Dr Mishra, Chairman, Reception Committee. Local Secretary,Organising Secretary, Fellow Delegates, Distinguished Invitees, Ladies and Gentlemen.

I deem it a unique privilege to welcome you all to this 21st, Annual Conference of the Orissa Economics Association. We are singularly fortunate to have in our midst today Sri B. N. Pande, Hon'ble Governor, as our Chief Guest. I take this opportunity to express my sincere gratitude to you Sir, for your kind gesture in consenting to inaugurate this Conference. Hon'ble Pande is the Champion of Gandhian principles and ideologies and in his usual way he stressed on the Gandhian methods of eradicating poverty in the State when he inaugurated the seminar on Rural Development organised under the auspices of this Association in 1982.

This Association of ours is the first subject Association at the State and at the national level which was formed in 1968. During these years it has been nurtured by the blessings and good will of the teachers, administrators and planners of the State the Association was constituted with some lofty objectives to impart training to teachers in Economics for improving standard of teaching in the subject. Another important objective was to organise annual conference and to discuss current economic issues relating to the country in general and to our State in particular. We have not been able to fulfil all the objectives owing to numerous constraints. Nevertheless, this Association has the unique pride in organising the Annual Conferences regularly

during the last two decades. The Association had the objective to establish a Social Science Research Institute so that active research study on different economie problems of the State could be taken up by the scholars. This long cherished desire of our Association has been fulfilled and the Institute in the form of the Centre for Development studies has been established and it has started functioning under the stewardship of Dr. Baidyanath Mishra.

The Association has about 200 members in its Roll of which 120 are life members. The Orissa Economic journal containing the papers discussed in the Annual Conferences, is published regurarly.

Administrated price-hike has raised enough controversies and keeping this in view, we have decided to discuss the problem of Administered prices, in this conference. I am grateful to Dr. K. M. Pattnaik, previous Vice-Chancellor, Utkal University to have agreed to present lead paper in the problem. Another crucial problem that hinders the process of industrial development is the energy and the delegates to the conference will focus light on the problem of Energy in Orissa. Sri S. Sunder Rajan. Additional Deputy Commissioner Govt. of Orissa will present the key-note address on this topic. We are grateful to him for the trouble, he has taken to present the keynote address . Besides these we have arranged a symposium in colaboration with the Deptt. of Science & Technology, Govt. of Orissa on "Ecology. Environment and Economic Development" in the conference. For the last two years, we have been organising the Bhubaneswar Mangaraj Memorial Lecturer series in honour of an illustrious teacher of Banki. In the ensuing conference the second lecture in the series will be delivered by Dr. Bidyadhar Mishra, Previous Vice-Chancellor,Utkal University. He would speak on "Public Sector in India". I am thankful to Sri Ashok Singh, The Editor, Eco-Orissa, for donating Rs.5000/- for organising the Lecture series.

Finance is the serious constraint for the Association. We receive a recurring grants in-aid of Rs. 4000/- each from the Youth Welfare Board, Orissa and Director, Higher Education. I take this opportunity to express my grateful thanks to Dr. Baidyanath Mishra, Secretary, Youth Welfare Board and Dr. G. S. Das, Director, Higher Education for their benevolence.

Research in Econmics has been monthly interdisciplinary. In order to realise this and to interact with our fellow teachers in other Social Sciences we are making efforts to associate them with the Association.

This Conference has been organised under the auspices of S. C. S. College, Puri, and I am extremely thankful to Principal C. R. Das, Chairman Reception Committee to host this Conference. I am grateful to my teachers -old guards in Econmics, Dr. Sadasiv Mishra, Dr. D. C. Mishra, Dr. Bidyadhar Mishra, Dr. Baidyanath Mishra, Dr. K. M. Pattnaik, Dr. G. S. Das, and many others for their sympathy, good will and regular participation in the deliberation of the Conference. I am grateful to the paper writers and persons who would present their key-note addresses in different sessions of this Conference. I am grateful to all the members of the Executive Body for their ungrudging co-operation in all activities of the Association. I am particularly thankful to Dr. G. C. Kar our President for his guidance in all matters of the Association. Sri R. K. Das, Chartard Accountant deserves our thanks for auditing the Accounts for 86-87 of the Association without any audit fee.

Lastly, I am thankful to you all, Ladies and Gentlemen, for giving me a patient hearing.

Thanking you.

B. Nayak
Secretary.

Farmers' Agitation, Inter-Sectoral Terms of Trade and Development Issues in India

PRESIDENTIAL ADDRESS

Delivered by :
Dr. G. C. KAR,
Professor of Economics, Utkal University
&
President, Orissa Economics Association

Hon'ble Dr. Pande, esteemed past Presidents and teachers of Economics, Chairman Reception Committee, fellow delegates, ladies and gentlemen.

I felt greatly honoured when the members of this august body of distiguished economists elected me as the President of the Association in their Annual meeting Last year. I must frankly admit that I didnot deserve the honour that the members have bestowed on me. It was the reflection of their love and affection towards me and not of my capabilities to chair such a distinguished and honoured office. I thank them for their generosity.

Ladies and gentlemen, I take this occasion to share with you some thoughts that have been agitating my mind for quite sometime and to which I caption "Farmers' agitation, inter-sectoral terms of trade development issues".

The Post-Green-revolution farmers' agitation has taken a new dimension that differs fundamentally in character from the earlier ones. Farmers' movements during the British Raj were primarily directed at bringing about structural changes and against exploitative land and irrigation taxes and tenurial relationship prevalent during the regime. The Post-indepedence era saw not only the farmers' demand for the enforcement of the structural changes introduced since independence and their further improvement, but also, for larger and better infrastructural facilities and their availability to them at minimal cost. Their agitation was against increase in land revenue, irrigation cess and imposition of betterment levy.

An unbiased examination of the history of farmers' agitation (of the landowning class) would reveal that the earlier Post-Green Revolution agitations were conceived as tactical moves to insulate the agricultural sector from the perview of the State exchequer as a probable source of hither-to-untapped revenue source.

The first three Plans had enormously benefitted the agricultural sector in terms of Plan outlays, provision of crucial inputs and technology which virtually changed the agricultural scenario, particularly of some of the Northern tates. Yet agriculture's Scontribution to the State exchequer was meager. K. N. Raj Committee estimated in 1967-70 that the share of direct taxes including agricultural income tax, land revenue, cess and surcharges on cash crop, constituted only eleven per cent of the total tax revenue collected by all States. The incidence of direct tax burden as a percentage of total agricultural income was only a meagre 0. 94%.
The over all ratio of contribution to tax revenue by agriculture and industry sector which stood at 1 : 2. 25 in 1951-52 declined to 1 : 3 in 1968-69 inspite of agricultural prosperity emerging from Green Revolution (2)

Surprisingly the burden and incidence of direct agricultural taxes are inversely linked to agricultural prosperity. In Punjab, for example, the share of direct tax on agriculture as a per cent of total tax collection constituted only 2.83 per cent (as against the all-india average of 11.09 per cent) and the tax incidence constituted only 0.25 per cent of total income in the farm sector (as against the All-India average of 0.94 per cent).

On the evidence of these facts Raj Committee recommended for higher agricultural income tax, land revenue and other measures to mobilise resources from the farm sector to finance economic development of the country The effort, however, was promptly thwarted by the strong farmers' lobby.

To ward-off the possible unslaught on the agricultural sector, the rich farmers throughout the country were quick enough to organise successful

opposition to any attempt of additional resource mobilisation from the agricultural sector by the state Governments. India's rural scene being one where rich farmers play a pivotal role in forming and blending rural public opinion, the state governments could not dare try enhancement of direct taxes on agriculture. The only alternative left open for the Government was to try at reducing the existing concessions and subsidies to agriculture, or at least, to pass on the burden of any further rise in the prices of those items which so far had been liberally subsidised by the government.

The turning point came in early 1970's particularly when a large chunk of the additional burden of higher fertilizer and petroleum prices was passed on to the farmers. Here in lies the root of the present agitation.

Among the more notable agitations of the recent Years, the Punjab Farmers' agitation (3) that began in January 1983. the Meerut farmers' agitation of 1988 and current Jail varo agitations are some of the more noted volcanic erruptions of a decade long dissatisfaction of the farmers.

The notable features of these movements are the participation of all farmers big and small and, the leadership provided by the farmers themselves. These movements cannot be dismissed as the ones politically motivated. The current agitations are based on some apparent economic logic also, having support of a section of elite. If the past forms a basis for the future, it is apprehended that these movements may lead to conceding of some major concessions on the part of the Government.

This prompts an analysis of the issues to determine whether their demand on any sound economic rationale.

The main issue in the charter of damand is based on the argument that agriculture has been deteriorating vis-a-vis the industrial sector over the last one decade or so. This has led to impoverisation of the agricultural sector. They argue that higher costs of inputs and lower prices of farm cutputs, over the years, have brought in an imbalance. The economic conditiion of the farming community has been sharply deteriorating due to a disproportionate rise in the prices of different goods, prices of agricultural goods falling far short of those

of maunfacturing goods which the agricultural sector uses both as inputs and goods consumed in their daytoday life. Among their demands notable are those that relate to lowering of prices of fertilizer, electricity and agricultural implements etc (meaning their further subsidisation). On the price front they demand for higher prices of farm products, which they argue, would be obtained through a liberal price policy of the Commission for Agricultural Costs & Prices (C.A.C.P). formerly known as APC, or its non-existence. It is alleged that the procurement price fixed by CACP does not take care of the actual cost conditions prevalent in the agricultural seetor. These demands need to be examined more carefully for they not only relate to agriculture alone but to industry as well and for that matter, to the whole economy.

The issue and the logic :

A study of the long-term sectoral terms of trade (barter terms) between agriculture and industry shows that between 1950-51 and 1983-84 there existed in the terms of trade three distinct phases. In the first phase ending in 1960-61 the net barter terms of trade remained almost unchanged. During the 2nd phase, i e. between 1960-61 to 1973-74 there was a considerable improvement in the barter terms favouring agriculture. In the phase begining from 1973-74, the terms of trade has deteriorated to the inconvenience of the agricultural sector. (4) Kahlon and Tyagi, (2) however have questioned the pioneering work of Thamarajakshi and others on methodological ground. Even the income terms of trade, based on volvmes of export of one sector to the other and calculated after construction of indices to accommodate the series of commodities exchanged either using current year weights or base year weights, has been questioned dy them. They have discarded those studies as having a priori reasoning that would ' under estimate the rise in prices of non-agricultural goods and inflate the prices of agricultural goods*'.

Their own estimation, based on Paasche's formula, having 32 items representing purchases by agricultural sector from non-agricultural sector and 22 commodities as sale to non-agricultural sector, and with CSO data to derive weights, and farm-gate price as the relevant price, show that the terms of trade has moved against agriculture from 120.5 in 1967-68 to 80.9 in 1977-78. Although there is no unanimity on the date from which the adverse terms

of trade commenced, still most of them have put it between 1973-74 and 1975-76. Various exercises on sectoral terms of trade between agriculture and industry have been worked out showing the trends between the goods of both the sectors for intermediate use. final use, and a combination of both the uses.

Suffice would be to conclude that with minor variations in the details, almost all the studies go to point out that since mid-seventies the sectoral terms of trade (both barter and income terms) has been adverse to agriculture.

A case for reduction in input prices of manufacturing goods :

Would it now be argued that a declining trend in terms of trade to the disadvantage of the agricultural sector be made good either by (1) reduction in the prices of crucial inputs used in agriculture or (2) by a reduction in the prices of the manufactured goods entering consumption of the farm households or (3) by increasing the prices of the farm products or (4) by taking to all of these methods.

Input Prices :

The Green Revolution in Indian agriculture has ushered in an era of greater use of chemical fertilizer, improved seeds, energy and irrigation. In terms of cash outlay, fertilizer tops the list. per hectare consumption of chemical fertilizer that stood at 1.9kg in 1960-61 has increased to 36.6kg in 1983-84. (6) Between 1973.74 and 1983-84 average per hectare consumption of fertilizer in the country has more than doubled from 16.7 kg to 43.5kg inspite of a declining terms of trade. per hectare consunption of fertilizer in agriculturally advanced States is much higher than the All-India average. Punjab for example, consumed 14.3kgs per hectare during 1983-84 (7)

A point that needs to be carefully nosed is that the fertilizer consumption concentrated in only 60 districts of the country accounting for more than half of total fertilizer consumption

Total fertilizer consumption which stood at a meager 0.07 million tonnes (69.000 tonnes) at the begining of the First plan reached 5.3 million tonnes in 1979-80 and 8.6 million tonnes in 1986-87 (8)

Fertilizer is an item which is heavily subsidised by the Government. The annual budgetary burden on fertilizer subsidy was Rs 2.210 crores during

1987-88 and in budget estimation for the year 1988-89 the allocation is Rs.3,000 crores (9). Fertilizer subsidy as a percent of total revenue (Consolidated Fund of India) constitutes roughly 4.6 % and is about 10% of the net tax revenue in 1988-89 budget has been shown as Rs.31,000 crores).

Fertilizer subsidy coupled with subsidy on electricity and irrigation works out to a figure that puts the exchequer on a footing difficult to justify on the grounds of productivity as well as equity.

Plan outlays on agriculture and allied activities , flood control and irrigation have remained well above 20% of the total. Benefits of investment in the power sector (Comprising about 18-20 per cent of the total plan out lay) have been consideraly (by about 20 per cent) absored by the agricultural sector that too at subsidised rates. A conservative estimation of both plan and non-plan expenditure on agricultural sector would put it at 35 to 40 per cent of the total expenditure.

On these grounds a plea for further subsidization of inputs can not be accepted, more so, when the benefits of subsidization are unevenly appropreated.

An analysis of the flow of benefits of Green Revolution accross the country and accross the categories of farmers with different land holding reveals that the benefits have concentrated in only 60 districts of the country (out of more than 400 districts).

The gains of technological change in agriculture has concentrated in northern states like Punjab, western U. P., Haryana and a few patche shere and there in the rest of the country. Further the gains have accrued to only big farmers as they are the ones who have resources to invest and large surpluses for the market. Any further attenpt to reduce input cost (or offer of higher price) will benefit a few districts, a certair region and a small section of large and affluent farmers as opposed to a vast stretch and a overwhelmingly large section of the farming community. This would further widen the already-wide gap in regional and inter-personal income distribution, and, therefore, anti-welfare in orientation.

Prices of industrial products :

It is argued that if the prices of other industrial products that enter the consumption basket of the farmers are reduced, impoverization of the agricultural sector could be checked and the farmers would gain in real terms. This sounds fair particularly when price and output trends in the industrial sector are on the rise, the rate of rise being faster than that of agriculture.

A glance over the production figeres show that output of food grains increased at a compound annual growth rate of 2.59 per cent between early fifties and early eighties. The growth rate of marketed surplus also went up since mid sixties even after a considerable reduction in food imports, and the period did not notice any decline in net percapita availability of food which was all firm around 450 grams a day per head. The index number of industrial production between early fifties and early eighties registered an annual compounded growth rate of around 5.73 per cent. This relatively higher growth rate in the industrial sector could be sustained more because there was no wage-goods constraint due to steady supply of food grains and agricultural raw materials for industrial use at a relatively cheapper rate

An overall better performance of the industrial sector over the agricultural sector has helped the agricultural sector more in terms of higher demand for agricultural output.

Relative interdependence between agriculture and industry sector has been compilted by Rangarajan (10) for India where he has shown that an increase of Re 1/ in the final demand for agricultural goods results in the output of manufacturing goods of nine paise, where as an increse of Re.1/ in the final demand for manufactured goods results in the output of agricultural goods of 26 paise. Tnis finding show that industry depends more on agriculture than vice versa. Price incentives in industrial sector helps more the agricultural sectot interms of higher demand (and higher absorption of their output) than the vice versa. If this be true, the contention of reduction of prices of industrial goods, relative to the prices of

agricultural goods would affect agriculture adversely through slackening of industrial production and income generation in that sector.

Agricultural Price Policy :

A basic objective of agricultural price policy is to guarantee a minimum price to the farmers for major products, so that uncertainty in prices and incomes are minimised. State intervention in agriculture by way of guaranteeing a minimum support price for the major agricultural outputs has always been considered desirable in all countries of the world. This consideration, along with the consideration of keeping foodgrain prices relatively stable through public distribution system) to overcome the wage goods constraints has prompted the government to announce a minimum/ support price and procurement price at the commencement of every sowing season. The distinction between support and procurement price being marginal the former was taken out and the government today is obliged to purchase at procurement/ support price all stocks offered for sale.

Although some kind of a price policy existed since the 2nd World War a more serious exercise in fixing the procurement price was taken up by the Agricultural Price Commission that came into existence in 1965. The Commission was renamed af Commission for Agricultural Costs and Prices (CASP) recentl- when the farmers' demanded the commission to recommend procurement/support price on the basis of costs of productions. It is alleged that the CACP's recommendations with regard to price are unremunerative as such prices leave no margin over costs. It is further alleged that Govt pr curement operations (at lower prices) distort market equilibrium price to the disadvantage of the farmers.

Economists, however, differed on this point, while some consider that government pric policy in India has acted as a constraint on agriculture, others argue that it has benefitted the sector significantly. [11]

Let's first examine to what extent procurement have interfered in the farmers' freedom in the disposal of farm products. It is true even after

independence for a number of years restrictions in the sale and movement of food grains continued and compulsory procurement also prevailed. But towareds mid-seventies many of the restrictions were withdrawn and in late Seventies agricultural marketing was made totally free A study of procurement figures show that between 1965 and 1986 total procuement of food grains increased from 4.03 million tonnes to 19. 69 million tonnes. Between 1974 and 1986 procurement registered an overall growth by about 350 per cent. It is during this period all restrictions on the sale and movement of foodgrains were removed. Procurement as a percent of net foodgrains production increased from 5· 2 in 1965 to 6. 2 in 1974 (period marked by several restrictions), and to 15 per cent in 1986 (the period when all restrictions were with drawn) (12) It is significant to note that in recent years, inspite of a huge buffer stock, procurement operations had to continue to stabilise farmers' income. In the absence of government procurement (and inview of increased agricultural production) price would have definitely depressed affecting farmers' in come to the detriment of the agricultural sector.

Government's Procurement Policy and the support price has helped rather than hindered the agricultural sector.

In the price front, support/ procurement prices of wheat and rice were Rs 54 and Rr 40 per quintal in 1965, which increased to Rs 166 and Rs 150 respectively in 1987-83. It has been established that except in situation when the farm harvest price was much higher than procurement price levy was not imposed and since the mid-sevnties the gap between farm harvest price and procurement price has become nominal. (13)

It may also be pointed out that Governments' procurement operations to strengthen the public distribution system was not all too successful in siphoning all marketed surpluses. A study (14) shows that in 1980-81 only about 30% of market arrivals of rice and 60% of wheat was procured by Govt. agencies thus leaving a substantial quantity to be traded elsewhere other than the procurement network The public distribution system, inspite of its apparently massive operation, have failed to meet the

total requirement of foodgrains of all vulnerable sections of society Mongia (15) has estimated that in 1980 the total food requirements of the vulnerable sections worked out to 29 million tonnes, where as till that date foodgrains handled had never exceeded half of the requirement. These facts, by and large prove that food procurement operation has not interfered in the normal market mechanism to the extent alleged except for the earlier years of Green Revolution. A large chunk of goodgrain requirements have been met by the farmers under the relatively free play of the forces of demand and supply. Procurement and PDS have ironed out the fluctuation in the agricultural prices and has helped stabilising farmers' income.

An interesting feature of the Government procurement is that in recent years (under complete free condition) nearly the entire procurement of both wheat and rice come from traditionl wheat belt of the country. Punjab, Haryana and U. P. account for 96 per cent of country's wheat procurement (Punjab, accouting for 60-70 per cent) and Punjab alone now aclount for nearly 100 per cent of country's rice procurement. The farmers' lobby of these states are now against the price policy adopted by the govt.

Procurement have probably helped the small farmers' more by keeping the post-harvest price at an assured minimum level which, other wise would have fallen sharply due to enormous agricu tural production in the post Green revolution years. The retention capacity of the small and marginal farmers' being low, a lower post-harvest price in the abseuce of support price would have affected them most.

It is not the procurement or the support operation which is questioned, but the prices at which these are carried out are considerd the villains.

The demand for fixing procurement price on the basis of costs of production was certainly looked into by even the first APC in its maiden report. But such an exercise was not possible in the absence of production data for different crops and for different regions.

Even if such costs were made available (it may be noted that on the recommendation of APC. costs of production of different agricultural produce were collected across the country under the Comprehensive Farm Management Schemes) fixation of price on the basis of costs would have been a herculian task in view of the large heterogenity in costs, both paid-out and self-supplied, in different regions and among different classes of farmers.

A minimum-cost criterian would affect small farmers adverely as small farms are high-cost units. The adoption of this criterion would affect two-third of the farming Community. Maximum-cost pricing puts excessive burden on the exchequer (through food grains subsidy) when supply of foodgrain at low prices through public distribution system has been accepted as a national priority in view of its several implications on the process of economic development. Moreover, such a policy would encourage inefficiency to perpetuate in the agricultural sector.

Average-cost pricing is riddled with unsurmontable problems. Adoption of such a method becomes irrational when the distribution of the costs are not bell-shaped (normal distribution . In our country land is skewedly distributed and inverse relationship exists between the size of holding and costs per unit of output. Average cost pricing will make as many as 50 to 66% of holdings economically non-viable.

Bulk-line-cost pricing has the difficulty of determining the cut-off line.

So it must be admitted that fixation of procurement price on the basis of cost of production is unsatisfactory, whatever be the determination of cost. This is so, because of the very nature of the problem which is complicated due to the existence of a highly skewed distribution of operational holdings, and smaller farmers incurring higher cost per unit of output. Whereas on welfare ground rhe small holdings need to be supported most, efficiency consideration demands that only the low-cost producers (the big farmers) need to be protected. Such a conflict is eternal, therefore, cannot be resolved.

It is relevant to examine what the rate of return has been against the background of the present procurement price offered by the government Rajbans Kaur (16)has calculated the rate of return of wheat cultivation in Punjab. Her work shows that the rate of return has temained rositive and well above 10 per cent on an average between 1970 71 and 1978 79 (the period that she examind) except for three years when it was less than 10 % . the cost in her calculation is cost'C' of Farm Management technique and, therefore, the Farm Business income (the more relevant determinant of rate of return) must have been much higher.

One diacerning fegture noticed in her work is that the average rate of return over cost in early seventies (tbe immediate Green-Revolution years) was very high and was around 24 per cent over the total cost. These couldbe due to the much discussed adoption path of new technology (Schumpeterian. innovation). The innovators (in this case the early adoptors of HYV technique) gained most in terms of profit But with the adoption of the technology by laggards, the initial advantages in cost and prices were wiped out' reducing the overall profitability of the new technology. It is the high profit years that the nterprising farmers lament. What has happened to agriculture is a common feature in the industrial sector-but with a difference. Where as in the industrial sector innovations are more frequent giving periodic jolts to profitability in agriculture, these are rarerities. it may be noted that no noteworthy technological break-through has yet taken place in the agriculture sector sfter the seed-fertilizer innovotion of the midrixties. This is the reason that explains the production-profitability gap in the farm sector, and not a faulty price policy.

The relative poor performance of agriculture needs to be found out elsewhere and not in the input or output prices.

Ashok Gulati (17) has shown the elasticity of supply response of wheat to price incentives for the coutry as a whole which in his model work out to just a meagre 0. 141. But for irrigation the elasticity is as high as 2. 5. (18)

Thus, it may be concluded that it is not the price policy but the technology that is more relevant in framing all futuoe agricultural policies.

Some Concluding remarks :

The issue cf inter-sectoral terms of trade' in the present day contex. is nct an economic issue. Rather it is on issu of political economy where political considerations loom large. The stakes are manp and of far-reaching sinificance.

That inspite of the irrationality in the demands of the farmers if support/ procurement prices are enhansed significantly on parity considerations, its im pact on the Public distribution system and the economic will be deleterious.

As has been pointed out earlier, the public distribution system has not been able to cater to the needs of the vulnerable sections in the society even by half of its requirements of food grains. Moreover, the cost of public distribution (consumers' subsidy, cost of buffer stock and interest subsidy) is on the incaease. Between 1972-73 and 1984-85, it has increased from Rs-117 croes to Rs 855 crores (19), the budgetary implication of which is significant, Enhancement of procurement prices and the consequent increase in retail prices will seriously affect the industrial sector through the wage-goods constraint'. Rising agrieultural prices will only transfer income from low income urban consumers and rural landless laboures to high income farmers.

The contention that transfer of larger incomes to the agricultural sector through larger marketable surpluses and high agricultural prices would lead to greater private capital formation and innovations in the sector, has been unfounded in the Indian context. Higher prices of agricultural goods is rather capitalised only in higher land value pushing up the cost interms of rental value) without a corresponding rise in the values of output.

'Parity' considerations demand not an enhancement in the prices of agricultural outputs or reduction in input costs (for they benefit only the already-rich big farmers'), but ameliorations of the small and marginal farmers' who are hard-hit by the incrase in the prices of essential consumer's goods. A more efficient public distribution system with inclusion

of larger number of essential consumers' goods in its trade net-work will benefit the farming Community more than the present unholy and misguided alliance of big and small farmers. For any benefit interms of higher prices or lower input costs will benefit the big farmers only.

The history of economic development of all advanced countries clearly demonstrates that it is agriculture which supports industrial development of the country and in the process developes itself. Japan with initial handicaps similar to those of our country depended enermously on the agricultural sector to finance her economic development. This sector was mercilessly taxed to develop the manufacturing sector. Heavy tax-burden led to the technological innovations, replacement of inefficient ones and changes in the cost components of agriculture and taking up of subsidiary occupations by agriculturist. None of these happened in Indian agriculture Nor the government is willing to initite these for political reasons.

It may, therefore, be concluded that a demand for 'equivalence' based on inter-sectoral terms of trade is a misguided tactics of big the farmers. 'Development implies a faster rate of growth of the non-agricultural sector, and to press for a 'mathematical parity' and that too through higher agricultural prices (and or lower input costs) is to make nonsense of a critical issue. (19)

Ladies and gentlemen thank you once again for giving me apatient hearing.

Notes and References.

1. Govt. of India, Report of the Committee on taxation of agricultural wealth and income 1972.
2. Batra, M. M. Inter sectoral-linkages : Flow of surpluses for financing investment, IJAE, Conference No, December 19 9.
3. For a graphic description of Punjab farmers' agitation see. 'Farmers' Agitation Response to Development crises of Agriculture by Sugha Singh Gill and K. C. Sanghal. Economic political weekly, Oct 6. 1984.
4. This has been clearly shown in a pionering work of Thamarajakshi, and in her keynote paper, "Inter relationship between agriculture and Industry' Conference No of Indian Economic Association, Dec 1985.

The point has also been made by Isher Ahluwalia in "Inter-relationship between Agriculture and industry'. Cooference No, Dec 1985.

5. A. S. Kahlon and D. S. Tyagi, "Agricultural price policy in India, 1980, Their methodology has been sharply criticised by others. See for example, Intersectoral terms of trade in India, a study of Concept and method, by Nalini Vital, Economic and political weekly, Dec 27 1986 (A 147)
6. Report of the Committee on Agricultural Productivity in Eastern India. Reserve Bank of India, 1984, vol-II pp 433.
7. Govt. of India, Planning Commission, Sixth five year plan 1980-85, (pp 106).
8. Govt, of India, Ministry of Finance, Economie Survey. 1986-87, and the earlier issues.
9. Govt. of India, Ministry of Finance, Expenditure Budget 1988 89 vol-1, pp 51.
10. Rangarajan C, Agricultural growth and industrial performance in india. International food policy Research Institute, Research Report No 33.
11. In the first category are the economists like T. W. schultz, David Hooper, A. S. Kahlon and D. S Tyagi. in the second category notable are Walter Falcon, Keith Gsiffin, John Mellor, M. L. Dantwala, Ashok Mitra etc.
12. Calculations are based on data from 'Economic Survey' various issues.
13. George, P. S, "Some aspects of public distribution of food grains in India". Economic and Political weekly, Sept 99, 1984.
14. Ibid, Page, 106.
15. Mongia J. N. "food policy' India's Economic Policies, 1980,
16. Rajbans Kaur, Agricultural Price policy in developing countries with special reference to India, Ph. D, thesis--table quoted in Farmers' agitation--response to development crise,--opp Cit,
17. Gulati Ashok, 'Agricultural price policy in India, an econometric approach 1987.
18. P. S. George, Some aspects of public distribution of food grains, op, cit.
19 Vital Nalini, Inter-sectoral terms of trade in India, a study of concept and method, Economic and political weekly, Dec 27, 1987 P. P. A. 162.

SECOND BHUBANESWAR MANGARAJ LECTURE. 1988

The Public Sector in India

Dr. Bidyadhar Mishra

Mr. President, Members of the Economics Association, Ladies ond Gentlemen.

Let me at the outset express my thanks to the members of the Economice Association for giving me this honour of delivering the lecture this year in the lecture series instituted in honour of Sri Bhubaneswar Mangaraj, a renouned and devoted teacher. I have choosen the subject, "The Public Sector in India" because various issues relating to the subject are being debated in the country.

A few months back, The Prime Minister spoke in Madras that the Public Sector has been a white elephant and is draining the wealth of the country. In a subsequent meeting of the executive heads of Public Sector Enterprises in Delhi and in other meetings elsewhere, he said that the public sector is playing a pivotal role in the Indian Economy. The Government is committed to the public sector and will continue the policy of controlling the commanding heights of the Economy through the public sector and there was no question of privatisation of the public sector. Hewas criticisd heavily by a section of the press for not being consistent in his statements.

In the first week of this month J. Vengal Rao, the Central Industry Minister while placing the proposal for transfer of Scooter India Limited to a private concern. Bajaj Auto, in both the Houses of the Parliament stated that the Scooter India Ltd. has become outdated and is incurring a heavy loss of two crores a month. Its production is only 23% of its installed capacity. To save the workers, there was no other alternative except to transfer it to Bajaj.

In the Parliament it was pointed out that against assets of rupees 200 crores, the enterprise was-being sold for only rupees thrity crores and the down payment was only five crores. If such concession would have been extended to the concern earlier, things would not have come to such a pass. To the fear expressed by the opposition that it was the beginning of privatisation of the public sector, the minister said that the government remained committed to the public sector but this particular unit has become out-dated and there was no other alternative except the transfer. the Government promised to present a white paper on the measures they propose to take on public sector enterprises which is yet to come.. In the seventh plan it was estimated that the public sector enterprises would contribute 53 per cent of the resources for the central plan but the actual contribution in 1982-86 was 34 per cent and in 1986-87, 39 percent. The short fall is creating a resource crisis in the execution of the plan. These facts indicate the embrassing situation faced by the government and the country with regard to the public sector undertakings. The people and the government have great expectations from the public enterprises, which are not being fulfilled and cause a sense of frustration. The government cannot get away the commitment of assigning pivatal role to the public enterprises and the socialist pattern of economy, at the same time it is unable to operate the enterprises so as to produce the desired results.

Public enterprises in Other Countries:

As is generally known the dominant role assigned to Public enterises in the economy is not peculiar to this country. Leaving aside the communist countries where all means of production and distribution are socialised and private enterprises are practically non-existant, in the economies of almost all developed countries of western Europe and all countries of South America public enterprises occupy an important place, particularly after the second world war. in most of these countries. transport systems' Airways, Railways, canals, generation and petroleum production are in the public sector. Besides these, in many of these countries, banks, insurance companies, air craft and automobile manufacturing, steel plants, engineering and chemical

manufactures are nationalised. In U.K. about 25 per cent of the labour force are public employees and 15% of the G.N.P. is produced by public corporations. Even in the U.S.A. and Canada, the land of free enterprises, many credit institutions, water supply, transport, generation and distribution of electricity and gas, provision of port and air-port facilities are under public authorities.

In almost all developing cuntries, the governments have to undertake the enterpreneuiral function if the projected speed of economic development is to be created and maintained. It is the duty of the State to provide the basic faciliites like power, transport and communications and credit institutions and play an important role in the development of basic and heavy industries. The State has to step in and pioneer all those industries in which private entrepreneurs show no inclinations to develop. The government has to keep in view the long term strategy rather than existing and immediate demands They have also to prevent growth of monopolies, promote social justice and regional balance. As Hanson said, "for a government which wishes to set its own pace, nothing can be more futile than waiting for a capitalist spirit to develop" .

Growth of the public Sector in India

Though the Railways, Post and Telegraph services the Reserve Bank of India ordinance and air-craft factories in India were managed by the central Government before Independence,a systematic step to establish public enterprises and to introduce the institutional frame work of mixed economy was taken by the Industrial Policy Resolutions of April 1948, eight months after independence.

India at the time of indpendence found itself highly under-developed. Basic and key industris like steel. power, fertilizer, atomic energy, machine tools, chemicals, heavy electricals and heavy engineering were not developed. Capital was scarce and shy, innovators and entrepreneurs were conspicuous by their absence,technical knowhow and skilled labour were meagre and financial institutions to finance industry, trade and agriculture did not develop.

The government had no other alternative except to choose a mixed economy with increasing emphasis on public enterprises to achieve rapid industrialisatian and accelerate economic growth.

It is well known that, under the Industrial Resolution of 1948, industries were divided into four categories. Firstly, arms and ammunitions, railways, and atomic energy were made exclusive monopoly of the central Government. Secondly, in six industries such as coal, and steel, air-craft nanufacture, ship-building, manufacture of telephone, telegraph and wireles apparatus and mineral oil, new undertakings were to be established by the state, which would be managed through public corporations. Existing units in the private sector would be allowed to continue and the case of their nationalisation would be examind after ten years. In the third category were eighteen industries to operate under private sector which were subject to the control and regulations of the central Goverument with regard to location, investment and technology. In this group were salt, automobilies, electric engineering, fertilizers, pharmaceuticals and drugs, cotton and woollen textiles, cement, sugar, news-print, sea transport, minerals etc. in the fourth category were other industrial activties left to private enterprise. In this field the state would progressively participate and would intervene if progress of an industry under private ownership was not satisfactory.

This was the first step to control the capitalist form of industrial organistion and introduce the frame work of mixed economy. The Industries Development and Regulation Act providing the licensing system to canalise investment in the desired directions according to plan priorities was passed in 1952.

By the end of the First Five Year plan in 1956, some important changes had teken place. The new constitution of India was in operation, government had accepted the objective of establishing socialist pattern of society and the second plan accorded high priority to industrialisation and establishment of heavy industries. For these an expansion of the public

sector and the assumption of the State of direct responsibilities for development of industries over a wide area and infrastructure facilities for transport and State trading were considered necessary. The Government therefore introduced the Industrial pclicy Resolution of 1956.

The Resolution classified the industries into three categories. Under the first category were put 17 basic and strategic industries, the future development of which would be the exclusive responsibility of the State. The list included all the industries mentioned in the first and the second list of the 1948 resolution and eight more from the third list. In this list were arms and ammunitions and defence equiments, atomic energy, iron and steel, heavy electricals, heavy plant and machinery for iron and steel production, mining and machine tools manufacture, mining of coal, iron ore, gold, manganese, chrome. copper, zinc, air craft manufacture and air transport, railways ship-building, telephone and telegraph cables, geneation and distrribution of electricity. The existing units in these would be allowed to expand.

In the second list were put 12 industries where public and private industries will exist side by side but which will be progressively state owned. In this list were Road and Sea transport, aluminium and non-ferrous metals, machine tools and ferro-alloys, fertilizer, chemical pulp, synthetic rubber etc.

The third group contained the remaining indnstries where the private sector would play the primary role Thus under the policy, the Government assumed wide powers to undertake any type of industrial prodution. Eugene Black, the world Bank President at the time, commented on the policy that the policy if rigidly applied would only result in imposing heavy additional burdens on the already strained financial and administrative resources of the public sector and thus restricting the rate of development in the vitally important fields. John Mathai, the previous finance Minister also doubted the efficient running of the public enterprises. He said 'the real powers will be in the hands of the bureaucrats of the permanet civil service who are inexperienced in the art of industrial planning

and managemnt, too slow in their decisions too much governed by precedence, too legalistic. too fearfull of change and experimet".

The policy enunciated iu the Resolution of 1956, with certain modifications in 1973, 1977 and 1980 policy resolutions still governs the nature of industrial development in this country. In 1970, the licensing policy of the Government was elaborated. In the 1973 policy resolution, the scope of the core public sector was further extended. It was stated that in the core sector, the 17 industries mentioned in schedule 'A' of the 1956 resolution would continue but 9 more strategic industries would be included. The concept of the joint sector was introduced and it was mentioned that in the formulation and management of the sector, the Government would play an effective role.

In the 1977 policy statements, the Janata Government laid more emphasis on small, tiny and cottage industries whose list was considerably increased anp District Industry centres were created. It was envisaged that the public sector would not only be the producer of important and strategic goods of basic nature but it would also be used effectively as a stabilising force for maintaining essential supplies for consumers. It would encourage development of ancillary industries and contribute to the growth of decentralised production.

The 1980 resolution reaffirmed the basic policy laid dow in the 1956 pesolution. The faith in the pnblic sector was rehablitated and it was emphasized that the task of raising the pillars of economic infrastructure would be entrusted to the public sector for the reafons of greater reliability, very large inveustments required, and longer gestation periods of the projects. the contributions of the public sector forther growth of the economy in terms of surpluses generated and employment would be improved.

Under the guedelines laid down in the 1956 Resolution, as modified from time to time, industrial development and growth of the public fector have taken place under different plans during the last forty years. public enterprises are organised in three forms namely departmental organisation public corporations and publlc limited companies. Most of the public

industrial enterprises are organised in the form of public limited companies with 50% equity capital and 50 per cent loan mostly contributed by the Central Government. The Central non departmental industrial units were only 6 with an investment of Rs.29 crores at the beginning of the first Five Year plan in 1951. They have increased to 225 units with an investment of about rupees 50,341 crores by now. The extent of their increase under different plans were as follows:

Beginning of the plan or year.	Number of units	Investment in crores ot rupees
First Plan	5	29
Second Plan	21	81
Third Plan	48	953
Fourth Plan	85	3,902
1974-75	129	7,261
1978-79	159	15,602
1980-81	168	18,207
1985-86	211	43,096
1987-88	225	50 341

(a) Sources: collected from various sources.

The increase in the number of enterprises and amounts of investment have been very rapid from the Fourth Plan onwards. From 1980-81 to the present date the increase has been much more rapid.

Besides the Central non-departmental units, there are the Central departmental uudertakings like the Railways, posts and Telegraph, Defence production units etc. There are the industrial and commercial public enterprises of the State Governments. Further banks and Insurance concerns have been nationalised and large part of the international trade transactions is being conducted by the State Tradlng Corporation. So the aggregate transaction and investment in various types of publie enterprises

are very large now. It is reported that in 1985-86, the share of the public sector in the total domestic product was about 25. 5 per cent in 1985, in public sector major industries and services, employment was to the extent of 17. 6 millions of labourers while that in the private sector was 7.4 millions. This indicates the pivotal role the public sector is playing in the Indian economy at present.

The coverage of the public sector in the fields of industry, trade, transport and finance is vast and varied. In industry they cover mining and metallugy, most important of them being coal, coking and non-coking, steel Industries, Fertilizers, Chemicals and Pharmaceuticals, heavy, medium and light engineering manufacture of electrical goods, ship building, air-craft and locomotives building, construction work, oil exploration and refining, air, sea and road transport, financial and trading institutions etc. Maximum investments are on steel, coal, chemicals and pharmaceuticals, fertilizers, shipping and oil and natural gas etc. In the States the maximum investments are on Electricity Boards, Irrigation projects, Road transport and forests.

Prime Minister Nehru began the process of mixed economy and implementation of large public sector projects. But the maximum growth of the public sector enterprises took place during the regime of Mrs. Gandhi. Nationalisation of commercial banks, coking and non-coking coal mines and rapid expansion of public sector projects during her prime ministership is widely known.

From the enunciation of the 10 point programme in 1967 to the announcement of industrial policy Resolution in 1980, it is clear that her commitment to the public cector was total and her views on the subject were always clear and consistent.

In the begnning of her Prime Ministership, in June 1966, on the role of the public sector; she said the public sector in India to-day is a large and growing family. We have industrial units such as Hindustan steel, construction units like the National Projects, construction corpora-

tions, Design and Engineering units like the National Development corporation and Engineers India Ltd. Financial units like the State Bank of India and the L. I. C., trading units like the State trading corporation and service units like the shipping corporation and export credit guarantee corporation. We also have railways, Posts and Telegraph Department, ordinance factories, River vally projects Commodity Boards and National Laboratories. The State Governments have their own public sector undertakings. Together all these constitute a large and critical aggregate of investment spread over a wide field. The public sector however can claim no virtue unless it functions effectively as an instrument of production and development and a creator of new wealth."

In 1976, April in the middle of the emergency period she spoke at the national convention on public enterprises-'No country in to-day's world can progress or even effectively retain its freedom without a strong industrial base. And such a base cannot be built in a newly independent country without State initiative. Our public sector is an essential feature and a dynamic instrument of socialism. Earlier managerial failure made it an easy target but this fault is not confined to the public sector. Otherwise we would not have so many sick mills on our hands. I am glad some of your projects are disproving the false charge that the government is unimaginative compared to a private owner. Only a few years ago, we were told that a number of projects would have to be written off but our faith in our managers and our workers and the basic social and economic philosophy wlich has inspired the establishment of public enterprises has been vindicated."

In April 1983 about one year before her death in the conference of Public Enterprise Chief Executives she said "I do not have to emphasise to this audience the crucial place which the public sector occupies in our economic philosophy of securing growth, social justice and social accountability. Our scheme of development assigns it a special role, expecting it to do what the private sector is unable to do and to do better than the private sector in every possible way. So the public sector is not just industry but it is an article of our public faith".

Objectives and achievements :

The public sector has dual objectives-Economic and social. The public sector enterprises are required (a) to create the intrastructure and basic industries to accelerate economic , b) generate internal resources and provide commercial surplus for further economic development (c) provide enterpreneurship and initiative for beginning and sustaining development in the context of scarce capital and entrepreneurship (d) promote social juatice by reduction of concentration of economic power in private hands and monopolistic control by private business houses (e) reduce regional disparities by planned dispersal of new industries and balanced regional growth (f) plan maximum utilisation of resovrces and self-reliance and step in all such areas of economic activity which are neglected by the private enterprise. Private enterprise cannot be expected to enter into such fields of business activity where uncertainty exists about the success of adventure, where huge investment is needed, where gestation period is long and return on capital is not forth-coming quickly, (g) other inportant objectives like increase of employment, provision of model employment steady supply of essential articles, export promotion, research and development etc.

Mrs. Gandhi on many occasions emphasised three main objectives, namely (a) to gain control of the commanding heights of the economy, (b) to promote critical development in terms of special gain or strategic value rather than primarily on considerations of profit (c) to provide commercial surpluses with which to finance further economic development. She said, "from the very beginning it has been recognised that public sector would necessarily have to venture in to difficult and capital intensive fields of basic industry which the private sector has shunned so long. "

In light of these objectives it may be seen that during the last forty years, many of the social objectives have been achieved. An infrastructural base for a modern industrial economy has been created. The country has achieved a very large measure of self-sufficiency in the matters of industrial equipment and machinery, raw materials, technological capabilities like steel

making, petroleum technology, basic drugs and chemicals, aeronautics, electronics, fertilizers, industrial designing of power equipments and many other fields. The public sector has given an infrastructure to our country which has enabled us to defend ourselves. The country has been modernised and transformed into an industrial country. Credit institutions, transport and trade all have developed to accelerate economic growth. A highly experienced force of managers' engineers and technicians has been created. If the public sector had not been launched, industrial growth to this extent would not have been possible and the present progress towards self-sufficiency in many key industries like steel, petroleum chemicals, heavy and light engineering ship building and air-craft manufacturing would not have been possible. Thus the social objectives have been achieved to a great extent.

Commercial Performance :-

But in one vital respect the performance of the public sector has been far from satisfactory. A very large number of enterprises have remained behind the targets of capacity utilisation and production, They are continuously inncurring loss and the rates of profits which are being earned by some of them are very low. One of the most important objectives that bullic enterprises should generate surplus which could be ploughed back for expansion of industrial and economic activities and promotion of economic growth has not been realised. The taxpayers and the consumers are bearing the burden of the losses of the public sector for decades.

The former Prime Minister Morarji Desai said, "It is unfair to expect the people of India to continue to subsidise losses of most of these projects year after year or ask them to pay higher prices than landed cost of similar products if they had been allowed to be imported". The Committee on public enterprises agreed that though net profit should not be the sole criterion it should be given due weight Mrs.Gandhi also said,"The public sector can claim no virtue unless it functions effectively as an instrument of production and development and as a creator of new wealth. The final test lies in profitability, service and growth.', The entire countroversy on

the public sector at present is on the question of earning net profit and genration of surplus for further investment, that is the commercial return.

For a number of years after Independence, the theory of no profit and no loss was followed in pricing of public sector products. A.D.Gorwala suggested that fixation of prices of public sector products should be related to the break-even points. During the second Five Year plan, particularly in the Ooty seminar, Dr V.K.R.V.Rao, forcefully pleaded for generation of surplus. He pointed out that profits constitute the surplus available for saving and investment in one hand and contribute to national social welfare programmes on the other. If public enterprises do not make profits, the national surplus available for stepping up the rate of investment and increase in the social welfare will suffer a corresponding reduction.

In 1968, the government laid down the following guide lines regarding policy:

(i) For Enterprises which produce goods and services in competition with other domestic producers, the normal market prices of demand and supply will operate and these products will be governed by the prevailing market prices.

(ii) For enterprises under monopolistic and semi-monopolistic conditions, the landed cost of comparable imported goods would be the normal ceiling. In case of exceedingly low landed cost, special decisions have to be made.

(iii) For public utilities produced under monopoly conditions, The objective will be economic welfare and prices are to be kept low.

Up to 1974-75 most of the major enterprises had capacity utilisation of 50 per cent or less. The H. E. C. Ranchi and the allied group were utilising 25 per cent or less of the capacity. From 1960-61 to 1971-72, the Central Government non-departmental enterprises together were incurring heavy losses and net profits which are calculated on net worth after deduc-tion of interest and taxes were negative. From 1972-73 up to 1975-76

there were small net profits, the percentages being 1 to 3. In 1976-77 the net profit was 3.4 per cent. From 1977-78 to 1980-81 there was again loss to the extent of 1.4 per cent to 2.5 per cent. From 1981-82 to 1985-86 the net profits have been between 4.3 and 5.4 per cent except in 1983-84 when it was 1.6 per cent. Though the net profits of the aggregate group have been poor, many among them have earned reasonable profits while others have incurred losses. The recent additions of sick industries to the total group has made the position worse. The government has made it clear that these enterprises should make all efforts to give a return of 10 per cent on the effective capital employed and should export 10 to 12 per cent of their production. But net profits have not exceeded 5.4 per cent. Some scholars argue that for judging the performance of the public enterprises, gross profits which are computed before deduction of tax and interest should be a beteer criterion. The public enterprises are paying every year interest of about 7 percent. If gross profit is taken into consideration they are paying 12 to 13 per cent from 1981-82 to 1985-86 on the capital employed. It is suggested, if internal generation of resources, tax payment, interest payment and payment to the exchequer are taken into consideration, the public enterprises are releasing about 40% of the capital employed. But if net profits are taken in to consideration, the non-departmental government enterprises even with their present improved position are paying about 5 per cent or less.

The public under-takings of the State Governments are also incurring heavy losses for decades. The major undertakings of the State Governments are the Electricity Boards, Irrigation Projects, Transport Services, Forests etc. Except the forests, most of the major undertakings are incurring losses. Electricity Boards, Irrigation projects and Transport services in most of the States are running on loss. It is estimated that in the 7th plan, the combined losses of the Electricity Boards will exceed rupees 7000 croces and of transport services Rs. 1434 crores. In the Orissa Assembly it was reported this year that out of the 31 undertakings 16 were running on loss. In West Bengal, it was reported in the press yesterday, that the performance of the State public sector during 1987-88 was dismal. Barring the great Eastern

and the Housing Board, all other public sector units incurred huge losses during the year. The situation in most of the other States is no better.

Problems of the Public Undertakings :

The public enterprises face many problems which account for their poor performance.

(a) The most important difficulties have been the problems of management. There has been rigid control by government departments. Deputed I.A.S. Officers or Retired Army personnel have been the managers. Management have been bureaucratic as predicted by John Mathai. Management has not been professionalised.

(b) There is conflict between the principles of public accountablity and autonomy. So far there is less of autonomy and more of ministerial control. There are the Parliamentary Committee on public Enterprises and Bureau of Public Enterprises. The Bureau however is rendering useful service in co-ordinating and evaluating the activities of the enterprises.

(c) There are inefficient inventory and materials, management, inefficient project management, defective feasibility reports, delay in choice of technology, in clearance regarding collaboration arrangements and finalisation of orders for equipments.

(d) Inefficient financial managment, over capitalisation, low return on equity capital.

(e) Inspite of the guidelines of 1968, in actual pricing there are varieties of approach. Under a system of price control of petrol, cement, fertilizers etc. A common price for all units is enforced. The covering of costs often leads to covering of inefficiency.

In case of enterprises selling products mainly to the Central Govt. and public enterprises like B H E L and

Telephone Industries etc., prices are determined by negotiation between the producers' and consumers' departments. The surplus products are sold at competitive prices in the market. Enterprises selling pr ducts in the internationl market sell in international competitive conditions and others operating in open domestic market follow the market prices. There are also the systems of dual pricing in many products like steel, cement and others.

(f) There are also labour problems, delay in receipt of materials and components, non-availiability of power, normal break down, lack of demand and hundred and one other problems.

These problems have come to the notice of the Govrenment as early as the sixties Mrs. Gandhi mentioned in 1966 June in her inaugural address at the Round Table Discussion on the Role of the public seco r in New Delhi, "Many of the difficulties of the public sector belong to the gestation period, faulty planning with regard to the concept of size, location, raw materials design, choice of processes, equipment and personnel, contractual arrangements, supervision, co-ordination etc. have resulted in cost escalation and delay, Over capitalisation, over staffing, incidentally adding to the township costs, inadequate work study, lack of delegation of power, the application of Secretariat codes and procedures to commercial undertaking, faulty system of financial control and audit and the lack of well thought out personnel policy, constitute another set of problems. The poor programming of orders, pricing policies, quality and cost controls, research and design development and the structure of management are other factors which need looking into. Labour relations have not always been satisfactory. There is yet to be a satisfactoay reconciliation between autonomy and accountability."

These difficulties still continue. The Govt. are adding further problems by taking over sick industries due to political pressure. The pressure is still continuing to take over sick cotton, jute, sugar and paper mills

and pottery industries etc. It is a peculiar situation that there is pressure for taking over sick private industries by the government, while it is handing over sick public enterprises to private agencies. Taking over sick industries do not conform to the original objectives of public enterprises. Too much of expansion of the public sector particularly to consumers' industries without managerial capability is also unsound.

Secondly, Government is deviating from business principles and its own guide lines in appointments and transfers of managers and chief executives and in the formation of Boards of Directors. There is a lot of political patronage and interference in these things, Many top posts are being kept vacant for long periods. Monopoly products of public enterprises are being used for taxing the people and cover deficits in the budgets. Inefficiency, corruption, mismanagement and lack of co-ordination are escalating the costs which are being passed on to the consumers through pricing.

The government is still grouping for the policies to be followed about the public enterprises which would make them viable. The declaration of the Prime Minister in the N. D. C. meeting on 19th March that the public sector would make up for the short falls in the resources for the plan through improved efficiency, productivity and profitability does not seem to be warranted in light of the previous experience and present situation. The issue of the privatisation of the public enterprises for better and profitable management is being debated now. But the major part of the public enterprises both Central and State represents social and economic infrastructure. It is not possible to privatise them, Privatisation may be thought of in case of public enterprises which produce consumers' commodities. But management of private enterprises is not necessarily always efficient, otherwise there would not b hundreds of sick large industries. Many large private industries are also being sustaind by Government subsidies. Privatisation of public enterprises would lead to furrher concentration of economic power, the avoidance of which is one of the major objectives of expansion of the public secror. Privatisation is not a solution of the problem of mismanagement and loss of the public enter-

prises. Rationalisation and modernisation of thc public enterprises and rectification of the Government policies which are known to be causing difficulties in the public sector enterprises is more desirable. There is suspicion now in the minds of a section of the public that some big enterprises in the public sector might be handed over by the government to big business houses in India which are having collaborations with multinationals. Such suspicions in the minds of the public should be removed as quickly as possible. In the context of the Indian economy, the pivotal role of the public sector enterprises is inevitable. Efforts should be directed to make them more viable than to privatise them.

★

Administered Price And Its Problems

Dr. K. M. Patnaik

Gardner Ackley defines administered price as that set by a seller- or buyer-and maintained unchanged for a considerable period, rather than being determined like prices of wheat or cotton or General Motors shares by continuons bid and offer.* It refers to a price fixed unilaterally by a producer without immediate regard to the state of effective demand. In other words, it is a price set by the supplier, the demand side of the picture being given relatively little attention.

In its origin, administered pricing is closely related to a situation of oligopoly. Fewness of sellers in oligopoly leads to close interdependence, which makes the demand curve indeterminate. Consequently, the pattern of pricing followed in oligopoly becomes different from that found under conditions of competetition, monopoly and monopolistic competition. In this regard, empirical research, starting with the Oxford studies on the price Mechanism (Wilson and P. W. S. Andrews, ed. 1951), shows that **full cost** or **average cost pricing** represents how the typical businessman actually fixes the selling price of his product. Full cost or Average cost Pricing theory rests on statements made by businessman or on questionnaires filled up by tne latter The essential points and assumptions of this theory are as follows :

(i) "the price which a business will normally quote for a particular product will equal the estimated average direct costs of production plus a costing margin." Average direct costs here refer to what we generally call as **average variable costs** Costing margin refers to what in the literature of Economics is called as markup. Average direct costs will tend to be a horizontal straight line over a part of its length if the prices of the direct cost factors ara given.

---

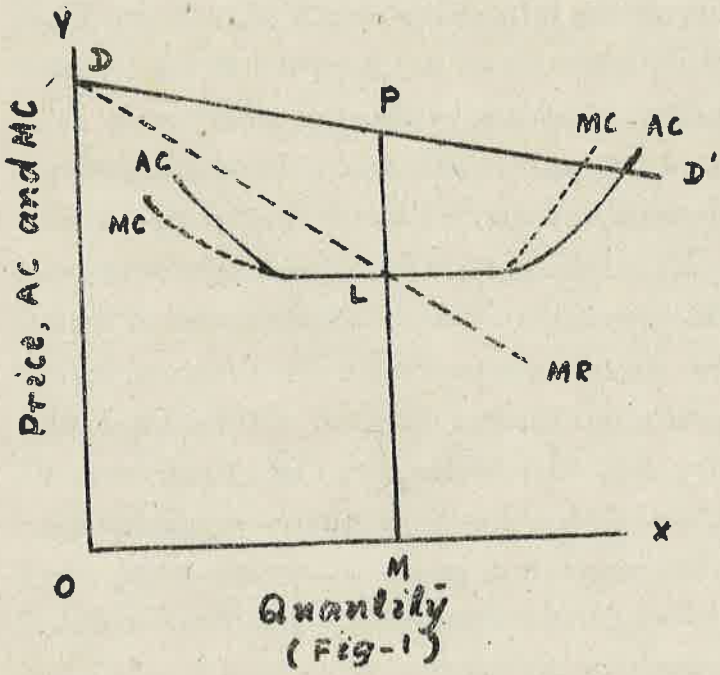
* Gardner Ackley, **Macroeconomic Theory**, p.440.

(ii) 'The costing-margin will normally tend to cover the costs of the indirect factors of production (inputs) and provide a normal level of net profit, lyyking at the industry as a whole". Once this costing-margin or mark-up is chosen, it will remain constant. given the organisation of the individual firm and its output. It will tend to vary, however, with any permanent changes in the prices of the indirect factors of production which refers to what is generally known as **fixed costs.**

(iii) "Given the prices of the direct factors of production price will tend to remain unchanged, whatever the level of outputs".

(iv) At that price, the business will have a more or less clearly defined market and will sell the amount which its customers demand from it".

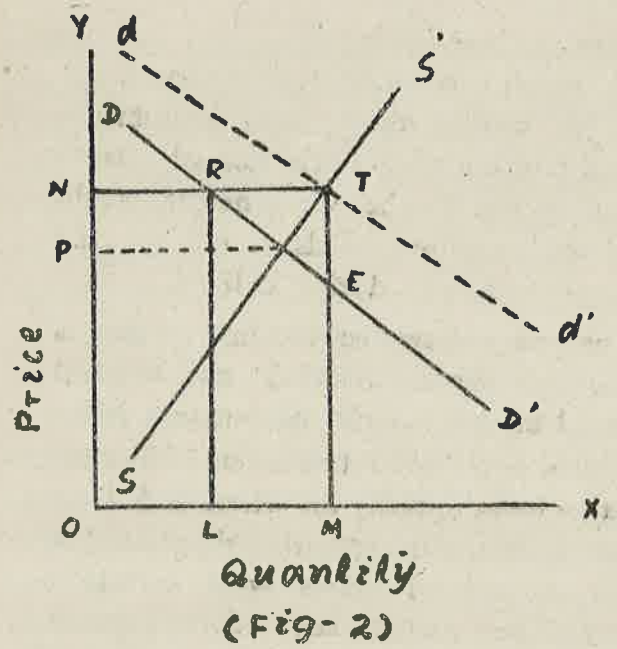
These features of full cost pricing constitute the basis of administered pricing which is the practice followed in a situation of oligopoly. Administered pricing method may be illustrated as in Fig. 1.



The method of pricing followed by all price makers has been illustrated in Fig. 1. On the basis of the first assumption of full cost pricing, explained above, the average direct cost curve (and the MC curve) would be a horizontal straight line over a part of its length. If indirect costs are taken as fixed costs, these along with the net profit which the firm hopes to get will amount to a fixed sum of

money. This sum divided by some output will give the absolute amount of the costing--margin or markup. This output might be either a percentage of capacity output or the output sold in the preceding production period or the average of realised sales over a number of past production periods, or the mean output that the firm expects to sell in a future period. It is assumed that the firm chooses the output OM. Its selling price per unit will therefore be equal to ML plus the markup LP, or MP.

Having explained the way in which administered prices are datermined in the case of industrial products, let us turn now to the same problem relating to agricultural commodites. The prices of major agricultural commodities in India like wheat, rice and cotton are fixed and maintained on a cost plus basis by price support operations of the government. The support levels below which farm prices are prevented from falling are determined by an elaborate formula which compares the prices of products which farmers sell with the prices that farmers must pay for products which they buy. The ratio of farm prices to the prices farmers must pay is related to the corresponding ratio prevailing during a given base period. The parity price for any commodity is that price which will provide a unit of tne commodity the same purchasing power in terms of things the former buys as that it had in the base period. On this basis, a floor is fixed below which the prices of agricultural products can fell only slightly. The Food Corporation of India can make direct purchases by entering the market for the particular agricultural product at the support price. The fact that food stocks were of the order of 23 million tons during 1987-88 in India shows that government is being forced to purchase stocks of food-grains on account of support prices being higher than the equilibrium market price. If the support price is set above the equilibrium level, the problem of surplus disposal tends to arise. This may be explained with the help of Fig.2.



(Fig- 2)

In Fig. 2. the curve DD' represents the total private demand for a particular agricultural commodity at all possible prices. SS' represents the short-run supply curve. Given the operation of the free market forces, the price of the commodity would be OP. This is the equilibrium or free market price. The support price is, however, ON. At this price, private buyers will demand only NR quantity. Farmers at this price will like to sell an amount NT in the market. The government will be required to purchase the amount of difference between the quantity people want to buy and the quantity farmers want to sell, i. e., RT. Therefore, government will incur a total cost equal to the area RLMT. The total income of the farmers is shown by the area ONTM in Fig. 2.

The Government faces problems to dispose off the surplus commodities purchased. Obviously, it cannot sell the surplus in competition with the farmers in the domestic market, for this would drive the price down to ME in Fig.2. It cannot give the surplus away to domestic consumers, as this would also tend to affect prices by shifting the market demand curve to the left. Therefore, in our country, a system of dual pricing remains in vogue –the free market price and the controlled price. The stock purchased by government is sold at a lower price than the market price to urban consumers on the basis of a system of rationing. This does not necessarily benefit only the poorer consumers; they share the benefit along with the affluent classes. The Central Government incurs an expenditure of roughly Rs 2 000 crores per year on this accounts, excluding

the interest charges payable for borrowing these funds.

Another way in which the surplus commodities purchased by government might be disposed off is by storing them until equilibrium prices rise above the support level and reselling them in the normal domestic market. Sh uld demand rise to dd' in Fig. 2 the Government would be able to sell the previously accumlated surpluses. This would be the case in a situation of drought, as experienced by us during 1987 88.

If surppo t prices are set permanently above equilibrium prices, as has happened in India, problems of surplus purchase, storage and disposal become acute, putting a great financial burden on the government. More over, as Prof. S. Chakravarty has pointed out. " the introduction of a price support policy on a fairly remunerative basis, initially for wheat and later for other crops, introduced a downward rigidity in agricultural prices : it was no longer possible to assert that agricultural prices were merely a matter of supply and demand, as they became part of the wider political process" (*) In other words, if pricing of agricultural commodities becomes administered, the same conforms to the oligopolistic pattern. Agricultural support prices also contributed to the inflationary race. In this connection G. Acklay mentions that, "if we have agricultural prices supported at some percentage of parity, this only adds to the inflationary race", parti -cularly because the parity index assumes that farmers should receive 100 per cent of the gains that occur in agricultural productivity. (†)

The relationship between the ability to administer prices, i.e. market power, and inflation may now be analysed. In India, there are four categories of goods and services, produced by both the public and private sectors, whose prices are fully or partially administerad by the Government of India. They ar material inputs such as steel, fertiliser, petroleum products cement, aluminum, paper etc. Infrastructurl services such as railway transport and communication; consumption goods such as rice, wheat, coarse grain, sugar, edible oils and essential drugs; and support prices for pulses, oilseeds,

---

* S. Chakravarty, "Development Planning: The Indian Experience", P.25-26

†. G. Ackley, Macroeconomic Theory, p.454

cotton, jute, sugarcane, rubber etc. A brochure published by the planning Department of the Government of Karnataka, mentions that the administered prices rose at an annual average rate of 12.4 per cent from 1970-71 to 1985-86, compared to 8.3 per cent for others. It also points out that the administered prices, instead of being an instrument to contain inflation and promote investment, have been utilised to raise resources for plan investment, instead of resorting to taxation. Therefore, the Karnatak Government considers that the increases in the administered prices have become the prime mover of inflation in India.

A lot of other studies have been made in India about the inflationary impact of administered price increases. Price response elasticities for changes in administered prices of some commodities have been analysed. A recent paper on this topic worth mentioning is 'inflationary Implications of Resource Mobilisation through Administered Price Increases", by Shikha Jha and Sudipto Mundle, published in "Economic and Political Weekly", August 15, 1987. This paper analyses the inflationary impact of the increase in the administered prices of nine selected commodity groups, i. e., crude oil and gas, petroleeum products, coal and lignite, electricity, fertilisers, cement, iron and steel, non-ferrous metals and rail transport services. The paper comes to the conclusion that for the period 1970-71 to 1983-84, the first round impact of these nine administered price increases accounted for around 50 per cent of the general inflation of this period, while the total impact of these administered price increases aecounted for around 61 %. The Finance Ministry has also made estimates of the inflationary impact of the hike in administered prices for the period 1970-71 to 1985-86 and it comes to the conclusion that it was around 24%. Thus, there is considerable diversity in the estimates made. But the general feeling these estimates have given rise to is that the villain of the piece is the increase in the administered prices. This point needs examination on the basis of the relevant theoretical framework particularly when the statistical estimates vary so widely.

The relevant theory of inflation in this context is the theory of "markup inflation", first advanced by F. D. Holzman and later expanded by Gardner Ackley. This theory explains the nature of the inflationary

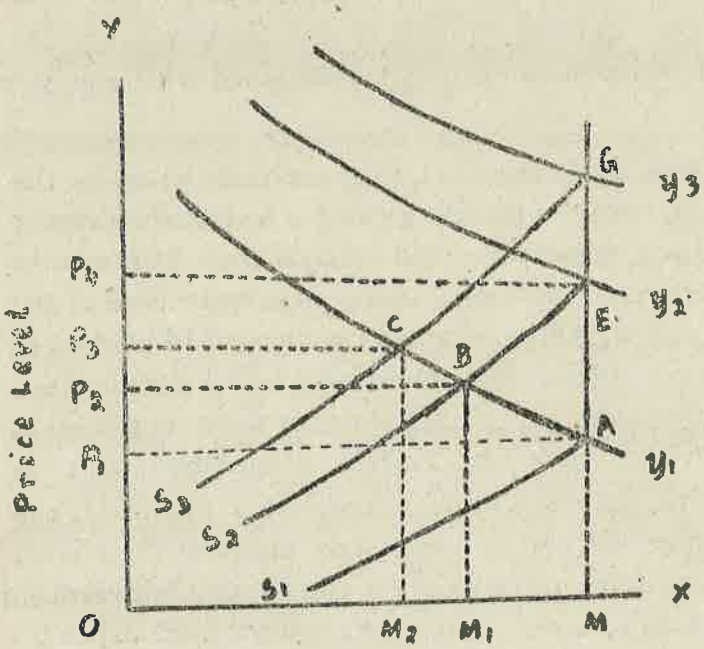
process in a situation of administered prices and wages.

The theory mentions that most sales by the average business firm are made to another business firm. If a firm pushes up its price in order to preserve its desired markup, this raises the costs of other firms, which, in turn, raise their prices. This increases the costs of other firms, including perhaps the initial firm and the chain reaction goes on. Some of the sales of these firms are also made to consumers. This raises the cost of living and causes wage costs to move up. The spiral is then intensified. Even if the markups applied by business and labour produce the inflationary spiral, a gradual improvement of efficiency and productivity might eventually bring the spiral to an end. For a rise in efficiency means that a rise in wage rates or prices of purchased products or materials produces a small rise in labour and material costs. Thus markup increases which were initially inconsistent with stable prices can become consistent with stability through the growth of productivity But this good result would be lost if each party to the game tried to appropriate the gains of rising productivity. through expansion of their markups. If labour and business collectively attempt to take more than 100 per cent of the productivity gain, the spiral would continue indefinitely. This is the crux of the matter.

So far it has been assumed that business firms apply a fixed markup to costs. But they do not really do so and this is precisely where total demand becomes relevant to an analysis of the prices level. At this point, Ackley advances two hypotheses that enrich his markup inflation theory. In the first place, he points out that the average level of markups used by business firms tends to rise as total demand increases and to fall as demand declines; Secondly, the markup that labour unions apply to the cost of living in setting their wage-rate demands also tends to rise and fall as the volume of employment rises and falls. These two assumptions injected into the theory make the latter a more fruitful tool. It indicates why inflationary difficulties become more intense as total demand increases. These two modifications also provide the theory elements both of the demand and cost inflation theories.

G. Ackly rightly points out that too much of our thinking about inflation has concentrated on how it starts rather than with how it

proceeds. Inflation might start with an initial autonomous increase either in business or labour markups. It might also start from an increase in aggregate demand which directly affected some of the flexible, market determined prices. Whatever the cause of its origin, the inflationary process involves the interaction of demand and markup elements. In other words, inflation may originate on the supply side, but it cannot be sustained unless demand and money income increase. Therefore, deficit financing leading to increased aggregate demand encourages the cost push factors to play havoc with the process. Pure cost-push factors cannot bring about a sustained inflationary process. This is illustrated in Fig. 3.



(Fig-3)

In Fig. 3, the economy is at its full employment output M with the corresponding price level at P1. This diagram illustrates that an inflationary process may begin on the supply side, but it will not persist unless there is increase in aggregate demand. Let us suppose a cost inflation is initiated, resulting in the supply function moving upward from S1 to S2. with no change in demand and no change in the money income level of Y1, output will decrease from M to M1 and the price level will go up from P1 to P2. Another upward movement in the supply function to S3 will cut output still further to M2 and raise the price level to P3. To the extent an inflationary rise in price level occurs in this way, the phenomenon may be described as cost-push inflation.

In the absence of an increase in demand and the level of income, cost inflation of this type would mean smaller production and greater unemployment. Sooner or later this must limit any inflationary process that depends on changes on the supply side alone. In view of this, a hike in administered prices cannot be the prime mover of inflation in India, as the brochure of the Karnataka Govt. would want us to believe.

The prime mover of inflation will always be an increase in aggregate demand. To understand this, let us assume that with output M (Fig. 3), there is increase in aggregate demand on accunt of a rise in the level of income from Y1 to Y2 when the aggregate supply curve moves from S1 to S2. The price level now goes up from *A* to E. It can be seen from the diagram that the process of inflation would become sustained with aggregate demand moving up.

The mere fact that both business and labour set their prices on the basis of a markup over costs, with the aim of getting a part of the gains of rising productivity, does not inevitably lead to inflation. It results in inflation only if the markups are inconsistent, i.e., if one or both of the markups is too high. How can we judge whether the element of markup in the administered prices is too high ? We would have had a standard for this judgement' as G. Acklay points out, if all industries were organised in accordance with the model of pure and perfect competition. But in actuality they are not so organised and even if they are so organised, the markups which purely competitive sellers are able to apply to their costs would provide profit margins quite insufficient for the massive reinvestment required which is so important to economic growth and the vast expenditures on research and development which are crucial to economic progress. But with all this, it cannot be taken for granted that business markups are necessarily correct and above examination.

It is in the light of these theoretical under pinnings that one has to judge the utility of the statistical findings, mentioned earlier, in explaining the inflationary process in India. One statistical finding is that the administered price hikes of nine commodity groups have accounted for nearly 61 per cent of the general inflation in India during the period

1970-71 to 1983-84, and the government claiming that all administered price increases have contributed only 24 per cent to total inflation over the period 1970-71 to 1985-86. These data do not indicate whether the rise in the administered prices of the products of public sector industries has been due to increased markups or entirely on account of increase in direct costs or variable costs. For, if the rise in these administered prices is not attributable to increased markups. In connection with the pre-budget increase in some administered prices with an expected annual flow of revenue of Rs. 2000 crores or more, the Minister of State for Finance, Sri B. K. Gadhvi pointed out on the 16th March, 1988 in the Parliament that this was necessary to meet the increased cost of production and to check the losses of public sector enterprises. The clarification made by the Hon' ble Minister is not helpful on account of two reasons. First, he did not clarify whether the hike was necessary to cover increased direct costs or increased indirect costs. Second, he did not clarify how the public sector industries would meet their obligation of additional resource mobilisation to finance the Seventh Plan if the hike was not intended to earn additional revenue but to avoid loss. Therefore his statement does not conform to the assumption of the theory of markup inflation that the average level of markups used by business firms tends to go up as total demand increases.

Let us now summarise how the inflationary process goes on in an environment of administered prices and wages, as explained by the theory of markup inflation. The engine of inflation as envisaged in this theory is a struggle between labour and business to preserve levels of return and obtain gains in return that cannot be acommodated out of the national income. It is as if the two parties are demanding shares of the national income that and up to more than 100 per cent of the total national income. The attempt of each party to get its desired "fair share" produces only an indefinite inflationary race. The goal of business is to have a "fair" markup over costs. When firms raise their prices, spokesman, in the case af public sector concerns being the minister of State for finance, points out very innocently that it only reflects a rise in their costs. The implication here is very clear, the passing on of cost increases to buyers, i.e.the preservation of a markup, is to be taken as the normal and obvious stadard

by which the propriety of a price change should be judged. Labour also doesthe same thing. When it demands higher wages, it points out that it is just a demand to protect its cost of living against erosion from higher prices, and get a far share of the gains of rising productivity. Thus the abil.ty of these groups to pass on cost increases including markups by corresponding price hikes even though the demand for their product or service does not change is the essence of administered-price theory whose other names are market power theory and markup inflation theory.*

*. C. E. Ferguson and Juanita M. Kreps, "Principles of Economics" Second Edition, p. 707

Administered Pricing: An inflation booster in India

Uttam Charan Nayak
Lecturer in Economics,
S.V. M. College, Jagatsinghpur, Cuttack.

I

The Americans launched their war of independence against Britain raising the slogan, "no taxation without representation". But in our country the elected representatives of the people are being ignored even when money matters are involved This action of the Govt. can only be interpreted as the continuation of the policy it has been pursuing since long for mopping up of additional resources through hike in administered and other prices, so that Parliament will have no opportunity to discuss the justification of the same. Even if there is a discussion Psrliament can do little since the hike in prices has been a fait accompli.

According to tne Seventh Plan estimates, public sector enterprises in manufacturing, frading, financing, power snd transport are to contribute Rs.59,000 crores to the financing of the Public Sector Plan outlay of Rs.180,000 crores (32.8% as against 16.8% in the VI Plan). Of this, Central Enterprises Share is placed at Rs.51,700 crores or 52.1%of Central Plan Outlay. There would be a substantial shortfall of say Rs.1,50 00 crores in this source of funding for the plan. The choice of instruments for financing a given step up in Plan investment boils down to raising the surpluses of the public enterprises or financing it through budgetary support which implies deficit financing. But a budget with a stiff dose of taxation could not have helped the Government to raise larger resources.

There are two ways of raising the surpluses of the public sector enterprises, i.e., improvements in operational efficiency and raising the administered prices of the products and services. Explicit choice of administered prices in this connection involves a further judgment regarding stringent limits on efficiency improvements. To quote Dr. Manmohan

Singh "there was no" Magic solution for increasing the efficiency of the public Sector enterprises and that it was not something that could be done overnight and was bound to be a gradual process. Cansequently, the Public Sector in india had no alternative but to pass on increases in costs of production to consumers through increases in admininistered prices,

II

Resource moblisation through administered pricing :

It is well established that intra-public sector purchases of products and services whose prices are administered are quite significant. For example, it is reported that 40% of the total petrol consumption takes place within the Public Sector. Consequently, if one administered price is reised, a part of the total revenue accruing from this measure would be coming from other users within the Public Sector. This may be illustrated by reference to the revenue implications of the hike in the prices of petroleum products which will raise some additional resources. Simultaneously, consequent upon the hike in the price of aviation fuel, the operating costs of the Indian Airlines would go up. Similarly, the operating costs of the Railways are expected to rise on account of diesel price hike and on account of the coal price hike. The hike in coal prices brings to the fore one facet of the Centre-State question as well. Thus an increase in coal prices by the Centre raises the operating costs of the State Electricity Boards (S.E. B S.) pushing them deeper in the red. In this case S. E. Bs have to raise electricity rates simply to cover the rise in costs occasioned by the hike in coal prices.

Thus if we consider the public Sector as a whole including the State-level public sector enterprises, the net revenue accruing to the public sector by an act of raising the administered prices of one public sector product or service will be lower than the additional revenue accruing to the particular Public Sector enterprise, the price of whose product or service had been raised in the first instance In a situation where the administerrd prices of several products are raised simultaneously, with the product of one enterprise entering as an input into another enterprise, a simple aggregation of revenue accruals to these enterprises each taken

separately would result in a substantial over-estimation of the net accrual of additional resources for the public sector as a whole.

In this case one can find two major complications.

First: One public sector enterprise raises its investment by a given nominal amount by increasing its administered price and other public sector enterprises adjust to this situation. In practice, several public sector enterprises may simultaneously or in a quick succession raise the administered prices of their products in order to finance a step up in their planned nominal investment outlays.

Secondly, There is the inter-industrial inter-dependence between the public and the private sector enterprises. This can introduce cost-push feed back links from the private sector enterprises (affected by the initial and consequent price hike) back into the public sector enterprises.

III

Price Impact :

Increases in administered prices transmit their impact through cost-push effects. In this context it is important to distinguish between initial effect or impact-effect and total impact which would emerge with a time lag.

The measurement of the impact effect is crucially governed by the choice of the price index and the weight of the commodities and services subject to administered prices in the chosen price index. Thus, for example, if the wholesale price index (W P I) is used to measure the price consequence hikes in railway fares and freight charges and in passenger fares in public sector road transport services, it will have a zero impact effect simply because these do not figure at all to W. P. I. Similarly, the impact effect of hikes in the controlled prices of rice, wheat, sugar etc. supplied through the public distribution system (P D S) on (W P I) would be zero since the issue prices operative in the (P D S) are treated as retail prices not entering the domain of (W P I). The hikes in the issue prices of rationed commodities sold through the (P D S) will, however be reflected in the consumer price indices (C P I)

From Table-I, it is evident that the increase in the index of essential wage goods was 8. 9% during 1984-85. The Industrial Raw materials group by recording a fall of 12.2% in contrast to an increase of 33.5% during 1975-76 brought down the severity of the inflationary pressures in the economy. Commodities subject to price control (administered price) rose by 10. 3% during 1984 85 compared to 8.8% only in 1975-76. This group consists of petroleum crude, coal mining. mineral oil, iron group and cement. Rising up of prices of mineral oils and iron and steel was mainly responsible for the above trend. In the other commodities group consisting of cotton textiles, there is a rise of 3 2% which seems to be very negligible. It is due to the decline in prices of jute textiles

The contribution of essential commodities and of administered price commodities to the general price index steadily increased from one decade to the next. The weighted contribution of essential commodities rose from 21% in 955-65 to 2.% in 1965-75 and then jumped to 36% in 1975-85.

The commodities whose prices are administererd have exerted a growing influence on the general price level. The contribution of this group rose from 9% in 1955 65 to 18% in 1965-75 and further sharply to 29% in 1975-85. Commodities which come under the group are coal, mine -ral oils, electricity, cement. fertilisers and non-ferrous metals. Except fertiliser all other commodities recorded almost a double digit growth rate during the decade

Normally, commodity prices are fixed by average cost and marginal cost concept being a micro-affair and as such are not very much actual cost oriented. On the other hand, administered prices are based on recommendations of tne Bureau of Industrial Costs and Prices (BICP), Agricultural Prices Commission (APC) and a few other statutory bodies. The working formula for the purpose is to consider acruai costs of production, remunerative rate of return on capital and some allowances or disallowances for such policy factors as inter-regional and inter-sectoral growth and parity. In practice, however, the BICP has to base its study on samples of cost return obtained from all types of units with appropriate weighting

structure, but in the absence of any statutory binding such data furnishing are not compulsory for all units and the tragedy is that hardly any return is obtained from the more efficient units. Thus cost is estimated on a simple avarage basis where the rule of thumb mostly prevails with an inherent upward bias. This over estimation again is easily reflected in a higher recommended price than what is warranted. This further precipitates a cascading effect on the cost structure through inter-unit and inter-industry interaction, since all the indices are not equally efficient. Two immediate adverse effects follow :

(a) First, profit margins of relatively effecient units are un-duly inflated.

(b) Secondly, inefficient units in the public sector secure a longer lease of life because of the protection given to them through steep irrational increases in administered prices.

Public sector industries enjoy both subsidies and Government protection which present a typical situation where short term benefit can be obtained through an increase in administered prices. But such inexpediencies have today generated a creeping inflationary trend which we are still battling against.

The result of the whole price is that it critically helps a mushroom breed of the most onefficient units which should be clased immedietely in the greater interest of the economy. And for subsidising all these loss making units, the non-plan expenditure is mounting.

IV

Summing up the whole issue it becomes evident that the need for raising resources remains an imperative one at any point of time. Two things have to be observed as ground rules.

(i) The first is the maintenance of a code, meaning thereby that there should be reasoned conduct in administering the causes and the course of price rise, the timing and an awareness on the part of the public as well as the concerned link with the user industries. In all fairness, budgeting by stages has to be avoided at all costs.

(ii) Secondly, as an interim solution to growing resource crunch particularly when heavy subsidies are being provided to least efficient units in the public sector and costly resources are being frittered away resulting a thinning of the over-all resource position in the economy.

In a speech at the forum of Financial Writers Seminar on Public Sector, Late Prof. L. K. Jha said, "I am wholly opposed to raising Public Sector Prices as a means of additional resources mobilisation. The better way to achieve the abjective would be to levy an excise."

TABLE I

Annual Variations in Wholesale Price Index

Percentage

	Weight	1975-76	1976-77	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83	1983-84	1984-85
All Commodities	1000-00	8.8	4.7	0.1	22.0	13.5	8.9	3.3	10.8	5.7	5.3
1. Essential Commodities	407.56	13.4	I.2	-6.6	23.9	15.8	5.4	-0.4	18.5	2.9	8.9
2. Industrial Raw materials	112.66	33.5	-3.0	0.3	14.6	13.1	6.6	5.2	19.5	7.2	-12.2
3.Administered Prices	156.67	8.8	1.4	6.5	29.0	18.1	18.7	5.0	2.9	6.0	10.3
4. Others	323.11	-4.4	15.0	4.0	17.8	7.7	6.5	5.6	5.9	8.4	3.2
(i) Petroleum Crude	6.02	N.A	9.1	N.A	107.2	23.8	4.1	-4.4	—11.1	-1.9	2.7
(ii) Coal mining	11.47	N.A	-0.2	7.1	54.9	0.4	29.1	16.5	2.6	24.8	0.2
(iii) Mineral Oil	49.12	0.3	N.A,	1.3	18.5	30.3	22.4	0.7	4.3	0.5	12.1
(iv) Iron Group	34.73	-0.4	0.6	16.1	19.7	1.8	33.0	10.4	7.0	11.6	15.4
(v) Cement	7.03	1.3	0.2	29.9	10.2	-0.2	19.3	31.1	18.3	8.7	4.8

Source : Lower Inflation Rate brings little relief to people by a Special Correspondence, EPW. Vol, XXI Nos. 10 & 11;March 8-15, 1986. P. 424.

TABLE II

Compound Annual Growth Rate of Wholesale Price Index. (Persent)

	Weight	1955-65	1965-75	1975-85
All Commodities	1000.00	6.1	8.6	8.1
(1) Essential Consumer arti.les	407.56	3.9	8.2	7.9
(2) Industrial Raw Materials	112.06	5.9	6.8	7.8
(3) Administered Prices	156.67	4.5	11.2	10.4
(4) Manufacturers	323.11	8.1	8.4	7.1

Source—Lower Inflation Rate Brings Little Relief to People—By a special correspondence. E.P.W-Vol.XXI, Nos. 10 & 11 March 8-15, 1986 p-424.

Administered Price Policy in the Indian Economy

SOME ISSUES

K. K. Sen,
Reader in Economics
M. P. C College, Baripada.

In India the level of prices does not always reflect the interaction of free market forces. A large part of the market is influenced and regulated by Government action. The State has a vast measure of control over the agricultural as well as industrial sectors. In both the sectors prices of a large number of products arc administered prices. These are controlled, regulated and determined by the Government. These prices again may be fully or partlally administered or may be subjected to different forms of voluntary and other measures of control.

In the agricultual sector, the Government manipulatd and make upward revisions in the minimum support prices and procurement prices of major agricujtural commodities such as, paddy, wheat, pulses, oil seeds, cotton, sugar cane for sugar mills, jute, cofee, rubber, cardamom and also coarse cereals likc jowar, bajra, maize, ragi etc. Such revisions are made on the recommendation of the Commission for Agricultural costs and prices (formerly designated as Agricultural Prices Commission). The administered price policy of agricultural products is guided by the objectives of providing remunerative prices to the farmers, to facilitate procurement, to bring about requisite inter crop parity While fixing such prices the changes in input costs, the terms of trade between agriculture and other sectors of the economy etc. are also taken into account.

Besides, prices of a number of other commodities and services such as petroleun products, coal, iron and steel, aluminnium, cement electricity and railways etc. are fixed by Government. Administered pricing policy is guided by wider social goals and not merely profit maximisation. The objective is to optimise allocation of resources. When the product is a public sector output, fixation of administered price becomes much more

complicated. While ensuring viability of the Public Sector Units, the issue would be how to reward efficiency and punish inefficiency. Similarly, in a mixed economy like ours, public sector products could neither be under-priced, providing unnecessary subsidy to the private sector nor be over-priced, inflicting hardship on the consumers.

OBJECTIVES OF ADMINISTERED PRICES

Some of the specific objectives of administered price policy are :

a) Raising resources for economic development;
b) Smooth supply of essential commodities to the poorer sections of society at affordable prices;
c) Contain inflation;
d) Stable pricing of industrial inputs;
e) Ensure remunerative prices for the cultivators;
f) Evolve an appropriate pricing strategy for the public sector enterprises, for making them self-reliant;
g) Control and regulate the consumption of specific commodities.

The Controversy :

In the recent years the issue of administered pricing has led to a great controversy. As a result, the former Union Finance Minister, Mr. V. P. Singh, presented a dicussion paper on administered price policy to Parliament in the Monsoon Session of 1986. This paper while excluding agricultural prices and railway freights and passenger fares, explains the impact of administered prices on inflation. It also analyses the policy issues involved in determining administered price policy.

In the Seventh Plan, the public sector was required to generate substantial resources for financing it. But there has occurred a severe set back in resource mobilisation from the public sector. As against 53 percent contribution of the public sector for Plan investment, the actual contribution so for has been 37 per cent. The long term Fiscal policy had projected that public sector saving was expected to go up from about 25 percent in 1985-86 to as much as 43 percent in 1989-90. Because of the huge growth of non-plan expenditure, almost this entire amount is to be financed from the surpluses of public sector undertakings (PSU). Two methods are

available for raising the surpluses of PSUs The Seventh Plan document refers to improvements in pr oductivity and reduction in costs as a crucial meth od for generating surpluses. But the authorities now admit that there are no "magic soulutions" to improve operational efficiency of PSUs oversight. Consequently, the only path open to the Government was to increase administered prices of Public Sector output.

EFFECTS OF ADMINISTERED PRICING :

The recent adhoc increases in administered prices of a wide range of commoditics such as edible oils, sugar, coal, steel, petrol etc. without any apparent princinciple, have led to far reaching consequences.

The most crucial effect of the hikes in admnistered prices has been the spiralling of the prices. The Public Sector plays a dominant role in the Indian Economy. It controls crucial sectors like infrastructure and energy etc. So the impact of it's pricing plicy is of great significance. Ofcours it may be argued that resource mobilisation through increase in administered prices would imply less of deficit financing and so less of inflationary impact on the econmy. However, the contribution of some spec fic administered price increases on the general price level is quite large. Commodities like steel, coal, etc are crucial inputs with high forward linkages. The industries which use these inputs will find their costs going up. If the higher costs are internally absorbed, the internal resources position of these industries will deteriorate. If this increased cost is passed on in the form of higher prices of their output, this would start a cost-price sprial.

An increase in administered prices will have both direct and indirect effects on the general level of prices. The effects again will not be limited to a single round, rather it will cause round by round effects.

Price situation at present remains serious. The wholesale price index (WPI) for January 1988 at 415. 0 has gone up by 9. 9. percent over the index for the corresponding month of 1987. The effects of the present hikes in administered prices are likely to put further pressure on the prices. Of course, according to the Hon' ble Minister of State for Finance, the contribution of the items whose prices have been recently raised such as

coal, steel, levy sugar and petroleum products-to the wholesale price index was just O 55 percent.

Several studies have been made in the recent years to measure the impact of administered prices on inflation. According to the Finance Minister Discussion paper on administered prices, the contributions of all administered increases to total inflation during the period 1970-71 to 1985-86 was about 24 percent. According to a RBI study during the 14 years period from 1970-71 to 1983-84, the administered prices contributed about 30 percent of increase in wholesale prices. According to another estimate the first round impact of only nine important price administered commodities to total inflation, during 1970-71 to 1985-86 was more than 50 percent. The total impact of all administered prices should be much larger.

Thus administered pricing appears to act at cross purposes with the cherished ideals of promoting monetary stability and pursuing anti-inflationary policies of growth.

In this connection. one may examine the effects of the recent hike of steel prices on the economy. After the recent hike in steel prices, steel is said to have become the costliest raw material in the world today. The increase in the prices of steel items will increase construction cost. Project costs will increase in all round. Because of an increase in the prices of steel rails, the Railways will also seek to cover the cost through freight adjustment. As correctives are made through increases in administered prices, a fresh round of cost increases will take place.

A rise in the price of steel is likely to aggravate the recessionary tendencies in certain industries. Particularly the engineering industry has been hit hard. Prices of essential raw materials like pig iron plates, billets, bars and rods, G.P.sheets, H. R. coils, C. R. coils and sheets used by every engineering unit in one form or the other have been increased, ranging from Rs.500 to Rs.1450 per ton. The market prices of these items will be still higher, when the corresponding increase in sales tax and octroi amounting to 5.5% is taken into account.

Virtually every sector of the economy depends directly or indirectly

on steel. Higher steel prices would inevitably have cascading effect on the various sectors of the economy.

3. An important aspect of the operation of administered price policy is that there is no definite pattern in the hike in such prices. The decisions of raising the prices particularly in respect of the extent of rise, frequency, timing etc, are not based on scientific principles. Such decisions are often adhoc and arbitrary in nature

This may be observed in many cases. In between 1976-86, the annual average increase in the price of cement was about 10. 3 percent. But in some particular years, the hike has been quite high, as in 1981-82, when the cement Prices were raised by 41 percent. Besides, up to 1983, very often several revisions have been brought about within a single year. Similarly, in case of certain items of iron and steel, in between 1975 and 1985, the annual average increase in the prices ranged between 13 to 18.5 percent. But in certain years, the hike was quite substantial. Thus during a single year-April 1979 to April 1980-the prices of structurals were raised by 75 percent, those of plates by 80 percent and bars and rods by 50 percent. in some years, there were 2 or 3 revisions in the prices of these items. During 1975-85, the prices of coal have been nearly trebled. The average annual rate of rise in coal price was 12%, but in certain years, the price rise has been quite steep. In between 1979-81, the price of coal increased by 100%. The same thing happened with reference to petroleum products, newsprint, aluminium and railway freight rates. Administered prices have rightly been criticised as "taxation by bits and pieces".

4. According to an estimate, the rate of increase in prices of administered commodities was about 50 percent higher than the general price level. As a result of this the State Governments had to bear the additional burden of the rise in administered prices, over and above the general price level. This imposes burden on them. According to a rough estimate in Karnataka, 5 selected Government Department Public Enter-Prises had to incur an additional burden of Rs 47 crores during 1985-86 on purchases of 7 selected inputs.

5. Administered prices are based on the recommendations of the Bureau of Industrial Costs and Prices. The Bureau takes into account actual costs of production. remunerative rate of return on capital etc. For that purpose the Bureau has to go through the cost return of all types of units. But in practice the cost is estimated in a haphazard manner, on a simple average bias.

6. Very often the objective of raising revenue through a hike in administered prices gets defeated The output of many public enterprises, constitute the input of others. A hike in administered prices of some commodities naturally leads to an increase in costs. Completion of many projects is delayed leading to further cost escalation. All this leads to a 'high cost" economy.

7. Public enterprises, which are perpetually inefficient should not be pampered by secured price rise at frequent intervals. An increase in administered prices leads to an increase in money profits of the losing public enterprises. This only covers their operatioual inefficiency. For instance, the profits of the Steel Authority of India Limited after touching Rs,159 crores in 1985-86, following the price hike of 1985, were stated to turn into a loss of Rs.348 crores in 1987-88 The price rise which will boost revenues for the last quarter of 1987, will reduce the loss for the year by Rs.120 crores to Rs.228 crores. In 1988-89 the new prices should yield the SAIL a surplus of Rs.139 crores or so. Administrative pricing policy aimed at protecting the inefficient units makes the environment least efficient and least competitive.

8. The budget making process would be ruined if resources are raised through non-budget mechanisms and the State would be robbed of their legitimate share in additional resources.

9. While discussing about the recent rise in administered prices in the Loksabha on March 8, 1988, many members were highly critical of the present policy. Prof. Madhu Dandavate held that administered prices were used to distort the budget making process. Giving figures, he said that during 1985-86 resource mobilisation through adminstered price

increases before the budget was to the tune of Rs.1125 crores, while the budget itself mobilised Rs. 431 crores only. The respective tigures for the subsequent years were Rs. 1800 crores and Rs.488 crores in 1986-87, Rs. 1718 crores and Rs. 514 crores in 1987-88 and Rs. 2769 crores and Rs.549 crores in 1988 89. All this makes a joke of the budgetary system that India has been following for so long. Budget has lost it's sanctity.

10. The extra budgetary impost, bypassing the Parliament, represents a threat to the democratic process of functioning of Government. The price hike of coal, steel and petrol etc. were announced when the Parliament was not in session. The parliament was thereby deprived of the right to discuss the various aspects of such price hikes. Before making policy announcemenets, the parliament was not taken into account despite as many as 10 rulings by different speakers, since 1953 in this regard.

11. The various arguments put forth by the Government for tne hikes in administered prices are not always convincing. The Government could not argue that the prices of petrol, sugar or edible oils were raised in 1987 because of an increase in thc cost of production. Petrol prices are said to have been raised to curb consumption of petrol. But we should not forget that the Government has been following a liberal policy towards passenger cars and two wheelers, which led to a sharp boom in petrol consumption during the last 3 years. So the present decision of the Government seems to be paradoxical and inconsistent.

CERTAIN SUGGESTIONS

The Planning Department of the Government of Karnataka conducted a study entitled, "Administered Prices-The Prime Mover ot inflation in India". The study has made certain recommendations which are worthnoting.

1. Efficiency levels in the Public Sector need to be improved to bring down the costs (1)

---

(1) Take the case of Public Sector Steel Industry. Steel prices in India are far in excess of international prices—the gap between 67% and 119%. The high cost of steel production in India is largely due to high level of energy consumption which is 30 to 100% more than inefficient

2. Primary objective of the Public Sector enterprises producing the basic inputs must be to ensure adequate and timely supply of these units at relatively low prices.

3 Administered prices of basic inputs should be used as an instrument to contain the inflationary pressures in the country.

4. Administered prices of all commodities should not be allowed to rise by more than the general price rise over a period of five to ten years. Costs must be determined based on detailed technical studies. It is imperative to outline a Long-term Price Policy for P.S Us.

Some other considerations may be taken into account in this respect.

5. The investment in Central Public Enterprises is about Rs.62,000 crores. The net profits which were the highest in 1986-87 was Rs.1769 crores or were 2.9 % of the investment. In the first half of 1987-88 the position deteriorated sharply as the net profit earned was only Rs.32 crores During 1987-88 there was a net increase in the loss of loss-making units from Rs 990 crores to Rs.1352 crores. Losses have increased in the steel and coal sectors. The National Textile Mills have made a cummulative loss of Rs.1265 crores up to January 1988. This is the rationale for the sharp hike and administered prices. The Prime Minister has rightly observed that administered price increases must be resorted to as a strategy to shelter the lapses of loss-making units. A time has come when the Govt. has to take a bold decision to privatise or even close down the inefficient, unproductive and sick Units, however unpalatable the decision might be. The pre-budget Economic Survey for 1987-83 rightly holds that one of the solutions to the current problems is to improve further the financial performance of the PSUs. (2)

---

steel producing countries. In the total cost of production, energy alone accounts for nearly 40% of our steel manufacturing cost, as against 20% in the U.S.A. Low capacity utilisation and low productivity are the major problems.

(2) Government has decided to close down perennial loss-making

6. For raising resources 3 Policy options are available These are taxation, deficit financing and administered price increase. These 3 methods are not mutually exclusive. In some proportion or other, it is possible to manipulate all these 3 measures. But the emphasis should always be on taxation. Taxation, particularly direct taxation, as an alternative policy option for raising resources is less inflationary and is free from the resultant adverse effects on the economy.

7. All the administered prices do not have the same inflationary potential. Petrolenm products, iron and steel and electricity etc. are high inflationary potential commodities. There are a wide range of other products of the Public Sector, with low inflationary potential whose prices could be duly manipulated. If we must raise resources through administered price increases a policy of judiciously selected administered price increases would promote resource mobilisation without generating very high rates of inflation.

REFERENCES :

1. Rajendra Prasad, S.L.. "Administered Prices and Policy in the Indian Economy : Some issues". Southern Economist, July 15, 1987.
2. Singh; Vinoy Shankar, "Administered Price and Inflation in India." Southern Economist, March, 1986.
3. Jha Sikha and Mundle, Subipto, "Inflationary implications of Resource Mobilisation through Administered Price Increases', Ecomomi and Political Weekly, Agu. 15,1987.
4. Gupta, S.P. and Srinivasan, T.G. "Inflation and the Role of Administered Prices", Economic and Political Weekly, Sept.8, 1984.

---

units. The National Bicycle Corporation of India and Cycle Corporation of India will be closed down. Scooters India Ltd. and Tannery and Footwear Corporation are to be privatised. The Associated Cement Company has already sold out 3 inefficient units. It will dispose of 3 more uneconomic units by the end of 1988. This will avoid a net loss of Rs.8 crores per annum.

5. Dutta, Amarnath, "Administered Pricing" "A Budgetary Instalment". Yojana,Sept 1-15.1986.

6. Editorial "Cost and Price Spiral" Economic and Political Weekly, Jan. 2-9, 1988.

7. Govt. of India: Administered Price Policy: A Discussion Paer, Ministry of Finance, 1986.

8 Govt of India: The Seventh Five Year Plan, 1985-90, Vol.I. Planning Commission

9. Govt. of India: "Long Term Fiscal Policy" 1985. Ministry of Finance.

10. Subramany, Manju: Administered Prices and Inflation: The Econoic Times, Calcutta, Jan. 18, 1988.

Administered Prices of Commodities Produced in Public Sector

Kishore Samal
Lecturer in Economics,
G. M. College, Sambalpur

Value of a product in free market economy, as usually believed, is equal to the payments made for purchasing and hiring the factors going into the production of the commodity. If the market price determined on the basis of intersection of demand and supply is higher than the value or cost of production, a manufacturing unit earns profit. It will incur loss if later is mere than the former.

When goods are produced in the public sector to satisfy the private wants, efficient pricing principle is to equal the price with marginal cost. But, on the basis of this principle, the decreasing cost industries will incur loss. Other principles of pricing of product produced in the public sector are : (i) 'no profit no loss", (ii) average cost principle, and (iii) principle of earning a surplus. It is to be noted that the system of pricing of finished products of public sector affects the profitability of public enterprises.

I

Pricing in India :

In the initial stage of the growth of the public sector in India, prices were fixed on the basis of the principle of "neither profit nor lasses". That is, the selling price was equal to actual cost of production. In the '50s, though the principle of earning profit by public sector units was accepted, the revision of price formulation was delayed due to the pressure of private sector which was deriving additional profit from the consumption of the subsidised products of the public sector.

In India, the administered prices are determined on the basis of recommendation of Bureau of Industrial Costs and Prices (B I C P). The formula for determining the price considers the producrion cost, remunerative rate of return on capital and some other policy considerations. But

actually the cost is estimated on an average basis with an upward bias. This, in turn, led to higher recommended price than what is really desired. Moreover, there has been no definite pattern or periodicity in raising the administered prices of public sector commodities. They are not also properly linked to cost. Most of the decisions for hike in administered prices are adhoc and arbitrary.

The discussion paper on administered prices presented to the parliament in 1986 states that the price of the product of an enterprise should be fixed in such a way as to cover long-run marginal cost of production. The basic principle is that price should cover capital and current costs of efficient production in a new plant.

II

An alternate view :

In a commodity, use value is the basis on which exchange is expressed. Exchange value consists in the ability of a commodity exchanged to get definite amounts of other commodities. According to Marx, value is determined by socially necessary expenditure of labour or socially necessary labour time. (1) Socially necessary labour time is the time required to manufacture a commodity under socially necessary production conditions and at the society's average level of efficiency and intensity of labour. The value of a unit of output is influenced by the productivity of socially necessary labour, which is measured by the output per unit of time.

So, the price of the product of public sector units should be in line with socially necessary labour.

But, in practice, even in U S S R, this principle is not followed. The administered price is besed on average cost principle in U S S R. The price of a product equals the average cost in the industry plus a certain amount of net income (2). Net income is the difference between price and cost.

---

(1). Karl Marx, Capital Vol.1 Progress, 1974

(2). See, M. N. Rydina etal, Fundamentals of Political Economy, Progress, 1980.

Net income appears in two forms; (i) profit of the enterprise, and (ii) turn over tax. Profit is obtained by the enterprise in amounts depending on the volume of output, prices and on efficiency. The turn over tax, like profit, is included as a certain percentage of the price of the commodity. The turn over tax goes to the State, after the sale of the products. So, it is a form of centralised income.

III

Re-allocations of Public Sector Profit :

Excise -Vs- Administered Prices

There is no harm in public sector earning profit. The public sector may be allowed to earn profits. But the practice of re-allocating the profit has a definite impact on the operation of public enterprise as well as on the federal-States relation. There are two principles in this respect.

The best principle is to leave the profit after tax at the enterprise level for re-investment at the discretion of management in which there should be workers' participation. The principle gives the necessary autonomy to the public sector enterprises and thereby stimulates their initiative for efficient working. Thus, if this principle is followed, some portion of the surplus will go to the Central Government as tax and the rest will remain with the enterprise. Hence the autonomy of the public sector enterprises will be maintained which will increase their efficiency and their profits At the same time, the Central Government can get its revenue through taxation measures. particularly by way of excise on these commodities and the States of their due share from it. As a result, there will be no need sor frequent hikes in administered prices to cover up the losses of inefficient units.

The other Principle is to hand over all the profits of enterprises to the Government. This principle is followed in India.

The second principle is followed intentionally to deprive the States of their due share from additional resource mobilisation by the Central Government of India. But the resource mobilisation turough increased administered price restricts the use of resources for specific enterprises.

In contrast, cross-financing is possible if resources are raised through the general tax revenue, more particularly excise.

It is to be mentioned that since the Seventh Finance Commission recommendation for raising the percentage from 20 to 40% (again 45% by 8th Finance Commission) of the yield of the union excise duties to be transferred to the States, the Centre has been raising resources for investment, particularly during the Seventh Plan Period, primarily through (i) frequent hikes in administered prices of public sector goods such as iron and steel, coal, petrol and petroleum products etc, and (ii) huge deficit financing, instead of adjusting the excise duties on these goods. (Table – I). The Centre wants to raise more resources and is not willing to share the investment resources with the State Governments.

TABLE I

Resource Mobilisation through Administered Prices and Taxation Measures by Central Government (Rs in crores)

Year	Budgetaty Deficit	Resources mobilised through Pre-Budget Hikes in Administered Prices	Additional Resources Mobilisation through Tax Measures in the Budget	Loss of States (State's share in Administered prices at the rate of 45 %)
1985-86	9437	1125	311	506 (23.69)
1986 87	8285	1800	488	810 (37.92)
1987-88	6080	1718	514	773 (36.19)
1988-89 (BE)	7484	2769	546	1246 (58.34)

N.B : Figures in brackets show the loss to Government of Orissa; since Orissa's share is 4.682 % of excise revenue transferred to States.

This is an important issue in our federal-State financial relations. Since a rise in administered prices of the commodities produced in the public sector is similar to an upward adjustment of excise duties on these commodities, the Eighth Finance Commission should have asked the Union

Gcvernment to share 45 per-cent of the extra resources raised through any type of increase in administered prices. (3) Taxation as an alternative policy option for raising resources for investment has not also been considered in the Discussion Paper on administered Prices. Thus this problem should be taken in to consideration by the 9th Finance Commission, since Sarkaria Commission has not favoured the issue of sharing of administered prices between Centre and State. This is a more urgent task before the 9th Finance Commission since the Central Government has been giving more importance to deficit financing and hike in administered prices to mobilise additional resources, after the 7th Finance Commission's recommendation. For example, out of the additional revenue of Rs. 546 crores raised through new taxes in 1988-89 budget, the State's share is only Rs. 122 crores. But if the States get 45 per cent of the share of the yield of Rs. 2769 crores from the pre-1988 budget hikes of administered prices, which is nothing but a hidden tax, their share would have been Rs. 1246 crores from it alone, which is more than 10 times of the State's share of additional revenue from excise duties and about one-seventh of the total resources of Rs.7889 crores transferred to States from excise in 1988-89. In this respect, the loss to Orissa alone is Rs. 58.34 crores in 1988-89 . This shows the dimension of deprivation of States from the additional resources mobilised by the Centre. Similarly the deficit in 1988-89 budget is around Rs. 7484 crores.

IV

Administered Price, Inflation & Federal Finance Relation :

There is also another aspect of federal financial relation of administered price rises. The frequent hikes in administered prices and resorting to heavy deficit financing, in order to avoid readjusting excise duties, to raise resources will push up the prices While hikes in administered prices will have a cost-push impact, the deficit financing transmit their impact on prices through demand-pull pressures. There are various studies to estimate the impact of administered prices on the general price level. Acco-

3 Kishor Samal, "8th Finance Commission : No new ground broken in tax-sharing, "Business Standard" 30. 8. 1984.

rding to one study (4), the prices of such commodities have risen at an annual average rate of 12.4 % during 1970-71 to 1985-86 compared to 8.3% for other commodities in the country, which is 49% higher compared to general price level as reflected in the wholesale price index during the period. According to another study (5) on the price rise of 21 identified items in the administered sector over the period 1970-82 almost nearly 60 per cent of the price rise can be attributed to hikes in admimistered prices.

But the Discussion Paper on Administered Prices (6) reports that the contribution of all administered price increase to total inflation from 1970-71 to 1985-86 was around 24 per cent which is not nearer to truth.One model (7) by developing a computable price formulation model based on 50 x 50 seventh plan input-output matrix derived the general price level with respect to price changes in nine major price-administered commodities. The model showed that the first round impact of nine administered price increase accounted for about 5. per cent of the general inflation during the period 1970-71 to 1983-84. When the feed back effects via money wage rate changes etc. were included, the total impact of these administered price hikes accounted for about 61 per cent. It is obvious that the total impact of all administered prices would be given higher.

Due to inflation consequent upon the hike in administered prices, a given "net" step-up in the central plan outlay, in part, substituted for the plan investment by the states and not a net step-up in total public sector

---

4. The study was done by Planning Department, Government of Kartataka -see "Administered Prices-the prime mover of intlation in India", The Economic Times, Calcutta 18 1. 88

5. S. P. Gupta and T. G. Srinivasan, "Inflation, the role of administered prices" Economic and Political Weekly, Sept., 8, 1984 PP 1570-83.

6. Ministry of Finance, Govt. of India, 1986.

7. Shikha Jha and Sudipto Mundle, "Inflationary implication of resource mobilisation through administered price increases", EPW, August 15, 1987, PP. 1394-1409.

(both Central and State) investment (8). Because when the public sector owned by the Central Government increases net central plan investment through increase in administered prices of their product, the State sector units will face difficulty to raise net investment due to inflation occasioned through a hike in adminisrered prices. For instance, increase in administered price of coal will increase the cost of operation of thermal plants of State Electricity Boards. Thus the S.E.Bs will raise the electricity rate to cover the rise in cost of operation due to rise in coal price. Similarly, rise in administered price in petrol and petroleum products will raise the resources of the public sector enterprises under the Ministry of Petroleum of the Central Government. (For instance, Petroleum Sector carried a profit of Rs.2142 crores in 1986-87) But it will raise the operating cost of State Transport Authority which, in turn, will be forced to raise the price of passenger fare.

Thus, the hike in administered prices help in raising the resources of the public sector units owned by the Central Government but reduces the net resources of the State sector units by raising their operating costs. For this, administered prices of basic inputs should be used to control the inflationary pressures and not to fuel the price spiral in the country. Hence the administered prices of all commodities should not be allowed to raise more than the general price level.

V

Summary :

To sum up the best principle is to fix the price of public sector goods in line with socially necessary labour. There is no harm in public sector earning profit. But, instead of handing over the whole profit to the Central Government, some portion of the profit should be left at the enterprise level for reinvestment and the rest be taken by the Central Government by way of revenue from excise duties only which is shared with the States. This will not only provide autonomy to public sector units increasing their efficiency and profits but also financial autonomy to the States

8. See. K. Sundaram and S D. Tendulkar, "Financing the step-up in plan investment; administered price hikes or increase deficit financing EPW, June 21-28 1986 pp. 1109-1113.

"Administered Prices : Issues and Implications"

Dr. B. Sahoo

Resort to administered prices and deficit financing apperas to have been the most important means of financing of public sector investment. The Long Term Fiseal Policy Document, the 7th Five Year Plan and the budget speeches of the Finance Minister emphasize (i) that the non-plan expenditure cannot be reduced, (ii) that borrowing more from abroad is not feasible and is undesirable, (iii) that domestic market borrowing cannot be expanded, (iv) that increases in tax-revenue are inadequate to entirely finance the contemplated step-up in plan investment and (v) that surplus from public enterprises is not adequate to meet the growing expenditure of the government. Therefore, administered prices and deficit financing become inevitable to raise resources. This paper makes an attempt to throw some light on some of the basic issues of administered prices.

With regard to the inflationary impact of administered prices, it is assumed that prices are fixed as a mark-up on prime costs and the market clears through quantity on the basis of fix-price. The margin may be fixed in absolute terms or as a proportion of costs. All input price increases are assumed to be passed on to the buyers.

During the one and half decades since 1970-71, the general price level increased by 2.16 times. M/s. Jha and Mundle have shown that the first round impact of 9 administered prices of coal and lights crude oil and gas, petroleum products, fertilizers, cement iron and steel. non-ferrous metals, rail transport service and electricity accounted for about 50% of the general inflation of this period while the total impact was around 61%. The first round and total effects for the shorter period, 1979-80 to 1985-86, were 39% and 48% respectively.

The Finance Ministry, in contrast, in its paper on adminisrered prices in 1986 estimated the contribution of all administered price increases

to total inflation during the period 1970-71 to 1985-86 at 24 per cent. According to the Govt. discussjon the rate of growth of administered prices between 1970-71 and 1985-86 was 9.07 percent per annum. Its direct impact is stated to be an increase in WPI at the rate of 2.16% per annum.

Gupta and Srinivasan's study in Perspective Planning Division in 1954 in static input-output frame work, revealed that the elasticity of change in the wholesale price following a change in the administered price sector of the economy is as high as 0. 98 and if the secondary effects are taken, the estimated elasticity of administered price may even go up to 1. 3 (E. P. W. May. 30. 1987, p. 854 . It is of course assumed that the cost increase in first and subsequent rounds is fully passed on to the users of the products.

The difference between 0. 24 and 1. 3 elasticities is too big to be explained.

Administered Prices Vs.Deficit Financing

Though both the methods have been adopted frequently to augment resources, controversy ranges around the relative merits of the two methods.

The preference for the hike in administered price could be established only on consideration of the difference between gross increase in revenue and the net increase in resources, its impact on different types of commodities, consumer goods, intermediate goods and capital goods, once-over hike as against repeated increase in deficit financing and effects on price expectation.

Price hike of a public sector output raises the cost of production of the product of other public sectors in which the former product is an input. The rise in cost in the latter reduces its revenue. Consequently the net revenue accruing to the public sector by an act of raising administered price of one public sector product will be lower than the additional revenue, accruing to the particular public sector enterprise whose price has been raised. Price hike of petroleum is a case in point. In practice several public sector enterprises may simultaneously or in quick succession raise the administered prices of their product or services in order to finalise a step up in

their planned nominal investment outlays. (1)

The relative price impact of deficit financing and administered price would depend on the sectors in which deficit financing is undertaken, the nature of price formation, competitive or cost plus pricing and the time lag involved.

According to V. Pandit, it takes more than a year for the price-consequences of deficit financing to attain their peak and that the primary impact is on the prices of consumer goods in general and those of food in particular. Further, the demand pull pressure of deficit financing can be moderated by supply management.

Increase in administered prices transmit their impact through cost-push effects. Expressed in terms of wholesale price index (WPI), the impact of administered prices of mostly universal intermediates excluding public sector transports and consumer goods distributed through public distribution system, would be very small as their weight in WPI is only 15. 66.

The cost-push impulses of administered prices depend on the inter-industrial linkages and the time-lag which again rests on the speed of adjustment. Very often hike in administered price occurs in case of the universal intermediates composed of coal, electricity, petroleum products, steel and transport services for goods. A raise in prices of any one of them would raise the costs of others producing cumulative effect.

General rise in cost of living in consequence of deficit financing can be moderated by consumers through their budget management. But price rise of food-grains, fuel, public transport due to a hike in administered prices offer little scope for choice. Further "any administered price hike carries with it an announcement effect while in the case of deficit financing such an effect is less obvious and less significant if at all present" (2)

The Economic Survey, 1985-86 favoured administered Price on the ground that this would raise revenue permanently and there by would

---

(1). K. Sundaram & S. D. Tendulkar - Financing the step-up in plan investment administered price hikes or increased deficit financing - EPW June 21-28, 1986.

(2). Ibid. P.1112.

reduce the size of year to year deficit financing. But considering the cost increase of other units and consequent reduction in revenue one would expect the administered price hike to be repetitive.

In practice there is no improvement in efficiency of public sector units. In this situation, raising the administered prices to cover increase in wages and raw material and capital costs amounts to freezing the level of inefficiency in public sector enterprises and does not provide any incentives for improving operational efficiency. In contrast, budgetary deficit has to be voted by the Parliament year after year and this would put pressure on public enterprises to improve their efficiency.

It may be stated that resource-mobilisation through administered prices restricts the use of resources to specific enterprises while cross financing is possible with deficit financing.

State Governments raising electricity charge and the like would face serious political problems.

Even if the centrally owned public enterprises raise sufficient revenue through administered prices to meet the nominal step-up in plan investment, the consequent cumulative price rise may make it difficult for State level public sector enterprises to do the same. Rise in issue price of food grains may force employees for pay revision resulting in diversion of resources to non-plan expenditure.

Further the cumulative price rise of capital goods due to administered price hike may discourage private investments making the net effect on investment unpredictable.

It may also be noted that there is a possibility of a hike in administered prices leading to additional deficit financing as a consequence of falling revenue of user enterprise. One could also visualise a reverse situation. Price increases triggered by a dose of deficit financing could result in cost escalasion due to higher wage demands which in turn could be met by a hike in administered prices. "It is plausible to postulate that a rise in administered prices has an immediate impact on intermediate and capital goods where-as a dose of deficit financing would have its first

impact on consumer goods and that too with a lag." (3)

The above discussion suggests that administered price is in no way better than deficit financing.

The public undertaking have been asked to lessen their dependence on budgetary support to zero level within a given time and adjust prices of their products according to cost increases. They are trying to do it without paying proper attention to the improvement of productivity.

The Union Government paper on administered prices presented to the Parliament in August, 1986 admitted that the Government control on prices of a large number of commodities influences the growth and development of economy and effects the welfare of the broad cross-section of consumers. There are 55 commodities out of 360 which are taken into account in wholesale price whose prices are fully or partially administered. Their weight in the computation of the index is 30.85 percent. According to the above paper, the yearly price rise was 7.89 percent during 15 years from 1971 in which the contribution of administered price was 2.16 percent and that of non- administered prices was 5.66 percent.

Leaving aside 10-15 profit making public enterprises, others go on incurring losses. To tone up the working of the public sector enterprises a committee set up under the Chairmanship of Dr. Arjun Sengupta made the following suggestions (i) The core sector i e. steel. coal, oil and energy should alone be in the public sector, (ii) the non-viable and non-profit making units should be closed, (iii) the other viable units should be privatised or held as joint ventures with the private sector and (iv) the management must be entrusted to Professionals with full autonomy and even Parliament should not interfere in its functioning.

These recommendations have raised serious controversy. The Government have shown a growing tendency towards privatisation of public sector units while it is lukewarm to other recommendations.

---

(3) K. Sundaram and Tendulkar 'Policy on Administered Prices and Deficit financing, EPW May, 30, 1987 P.854.

The low productivity of public enterprises is due to inefficient management underutilisation of capacity and lack of competition. Instead of linking wage to productivity, taking positive steps to eliminate waste and adopting marginal cost-pricing as done by private manufacturers, government is following permission policy of conceding to wage demand and raising administered prices to avoid loss or boost up profit. "Mere maximisation of surplus may lead these units to raise the prices of their products arbitrarily and provide an upward thrust to the price level." (4) In fact administered price has become a cover-up for inefficiency of public enterprises.

Wage differentials and administered prices.

Hike, in administered prices in some industries is causing cost rise in others and ultimately leading to wage rise which produces a cumulative effect on price rise. Firms seeking profit maximisation get stronger incentive for price adjustment from cost shift than demand shift, as costs are more knowable and predictable.

If the economy is a regimented one, price becomes unresponsive to demand changes but are quite responsive to changes in factor prices which are important. This responsiveness in prices is strengthend by the Government's support for farm prices at high parity level. (5) It is well-known that profit motivation coupled with the system of administered prices often provides a new spiral called profit-wage spiral that overtakes wage-price spiral. The organised workers fighting for higher wages have contributed to price rise and wage adjustment takes place quickly as it could be passed on easily to consumers. In the process not only inflationary price rise occurs, wide gap between incomes of organised and unorganised sectors emerges. For example, average annual earnings of employees in factories (employees earning less than Rs. 400/-per month) rose from Rs. 1540/- in 1961 to Rs. 2821/-in 1971 and that employees earning less than

---

(4). K. Vendantagiri Gowda Fiscal Revolution in India : 1987 P.372

(5) Edward Mason "Prices, Costs and Profits" in P. A. Samuelson and others (ed) Readings in Economics : 1952 P.156.

Rs. 1000/-per month rose from Rs. 5667/- in 1977 to Rs. 7149/- in 1981. Average weekly earning of miners in coal mines rose from Rs. 23.56 in 1961 to Rs. 56.25 in 1971 to Rs. 240,24 in 1981. Annual earning of plantation workers in Assam stood at Rs. 2863/-in 1980. Average daily earning of agricultural male worker was only Rs. 1,54 in 64-65, and Rs. 3.27 in 1974-75. (6)

Wage bill forms 15 to 16% of total value of production in factories. The degree of unionisation in the industries is not very high in the country. Hence wages may not be a very significant factor in influencing price rises, Rather the price rise is due to demand-pull. Profit-push pressure has often prompted wage rise in the organised sector accentuating the income gap between organised and unorganised sectors. Public sector units have taken the place of the monopolies of the West in raising prices through what is known as administered price hike and this has contributed to wage-differentials.

Administered Prices and Sectoral Price Differentials :

Prices of all commodities are rising, so also the administered prices. In January, 1988 price of steel was hiked by 15%, the price of coal was hiked by 15.26%, price of levy sugar was raised by 5% and edible oil price was raised by 22.5%, coal price was raised earlier in 1986 Last steel price was raised in February, 1985. Prices of pig lead non-ferrous metals and sugar was raised. Minimum statutory price of sugar was increased by Rs.1850/- per quintal.

Let us see the changes in the prices of administered vis-a-vis other prices.

---

(6). Labour Bureau's 1984 PP.191-228.

CHANGE IN PERCENTAGE

	March 79 June,80	31.3.79 30.3 85	End March-85 25.1.86,	End March-86 25.1.87	End March-87 23.1.88	Jan. 88
All commodities	19.73	7.0	3.38	5.46	9 84	
Administered items	31.49	11 6	3.73	-3.04	7.27	
Food Articles	10.88	—	6.15	5.49	8.93	
Petrolueum, Crude Natural Gas	120.29	0.7	0.0	-38.96	0.0	
Coal mining	54.80	0.3	13.16	-0.03	16.29	15.26
Iron. Steel & Ferrow Alloys	19.33	27.7	0.15	0.74	15.29	15.00
Non-ferrous Metals	20.83	7.00	3.92	2.40	9.33	
Manufactured Price	14.71	—	3.36	6 89	8.61	

Source : Economic Survey. 1985-86 and 1987-88, pp 40 and 45

The above table shows substantial price hike of administered prices at intervals.

The administered prices of items like coal, petroleum, iron and steel, fertilizers cement rose by 240.6%, 1941%, 172.4% and 133% respectively between 1970-71 and 1980-81. During this period, prices of foodgrains, manufactured products and all commodities rose by 116.7%, 157.3% and 153.3% respectively. Between 1970-71 and 85-86 prices of coal. petroleum, iron and steel, fertilisers and cement rose by 443%, 1652% 439%, 3%, 1669% and 393.8% respectively while those of foodgrains, manufactured ptoducts and all commodities rose by 195.8, 292.6, 257.6 % respectively.

The sharper rise in the prices of administered items obviously benefits the employers and employees of those industries compared with those associated with others.

The basic issue is, what is the best way to raising resources ? This question was raised in 1986 and since foreign resources are drying up and the country is falling into a debt-trap and deficit financing would lead

to "destruction of econon y". resort had to be made to administered price hikes as the lesser but the necessary evil.

Review of administered prices irrefutably proves that (a) it has substantially contributed to general price rise. (b) has whetted the desire for higher wages in organised sector (c) has moved the terms of trade against the non-administered commodities, and (d) finally has hit hard the common man.

The scenario of our public finance does not appear to justify all actions on administered prices. The share of direct tax in national income is falling. Indirect tax revenue is inelastic with respect to inflation not merely because of large number as specific taxes but also because many taxed products have administered prices that are adjusted discontinuously, non-tax revenues are making an inadequate contribution, subsidies have grown rapidly, (from 0.7% of GNP in 73-74 to 2% GDP in 84-85). Government interest payments have grown rapidly (from 1.7% of GDP in 75-76 to 3%) at present, internal public debt (net of burrowing from the RBI) rose from 19% of GNP in 74-75 to 40% in 84-85, with borrowing from the RBI) it was 57% of GNP in 84-85) against falling return.

More inflation seems to be tolerated and it is rising. deficit and borrowing are on the increase. Macoeconomic policy in the prevailing condition necessitates :

(a) broadening of tax base, particularly direct tax including tax on agriculture,
(b) improving financial performance of pub'ic enterprises,
(c) reduction in non-developmental expenditure,
(c) greater allocation of resources to wage-goods sector, and
(7) running down stocks of cereals and using reserves or borrowing to increase imports". (7

---

(7). Vijoy Joshi and I.M.D. Tittle : Indian Macroeconomic Policies, EWP, February, 28, 1987 : P.337.

Resource Mobilisation : Can Administered Price Hike do it ?

G. B. Nath
Teacher Fellow
Sambalpur University

The Seventh Five Year Plans financial scheme relies much upon resources generated by the Public Sector Undertakings (PSU) to finance as much as 52.1% of the central total plan outlay, compared to the 29.9% financed by these enterprises in the Sixth Plan. Therefore the need for creation of surpluses to enlarge the budgetary resources and to expand the internal resources of the PSU's has given rise to the problems of either to improve their operational efficiency or resort to Administered Price hike of their products and services. However, our experience is that the state has opted for the second.

In the context of a liberalisation drive in the current economic policy of the state, the present paper argues that the Administered Price Hike (APH) would accentuate the cost-push inflationary situation in the economy leading to further erosion of the standard of living of the marginalised section and consequently de-stabilise the economy. Considering the multi-dimentional adverse effects of the A.P.H., the paper suggests for a reconsideration of the Administered Price Policy, otherwise it would worsen the situation.

Since the launching of Five Year Plan in the country after transfer of power, the State has started massive investment in the basic and key industries like iron and steel, oil and gas, coal, fertilizer, railways and the like. These large variety of PSU's were, along with other objectives, expected to generate surpluses for further industrialization of the country. However, this expectation did not come true for the PSU's failed to generate the desired surpluses. It may be said that the general poor financial performance and low capacity utilisation in the PSU's were the consequences of a deep crisis in the economy manifested either in irrational pricing policy or bureaucratic management or old and debased plant and equipment. This continuous operational inefficiency and consequent loss

was responded by the State with increasing the prices of their products and services. Accordingly the prices of iron and steel, crude oil and petroleum, cement, fertilizer, coal and the services like railways have been raised from time to time.

Our past experience, however, shows that the hike in the administered prices as a strategy of mobilising resources for planned development meets with formidable problems in relation to cost-push inflation and consequent deterioration of the standard of living of the people along with constraint in surplus creation for public sector investment. It has falsified the claim of the discussion paper on administered prices that it is much less destabilising.

As has been reported "during 1981-82 to 1985-86 the share of the administered prices group in the average annul inflation rate of 6.84 percent was 32.02 percent which was marked by higher than groups weight of 25.24 percent in the wholesale price index "(See EPW editorial Aug- 16, 1986). Another study has also shown that "the elasticity of change in the,wholesale price following a change in the administered price sector of the economy is seen to be as high as 0 98." It should be noted that due to the inter-industrial linkages,the APH in one industry would raise the costs and price of other industries in so far as they are each others customers. Thus there would be a chain of price rise in a number of industries. public or private. For instance, engineering products, rail equipments, motor vehicles and other transport equipments are very much price sensitive to the hike of iron and steel prices. The instances can be multiplied for each of the products and services which are coming under APH.

Moreover, during the last twenty years or so due to Green Revolution technology the use of fertiliser, irrigation, water electricity has been increased to a considerable extent. However, these inputs used in agriculture are subject to administered price hike which has raised the cost of cultivation to a great extent. This higher cost of production of crops has led to the rich farmer lobby to demand increase in the procurement prices. The state also ensures remunerative prices to the agriculturists. Thus the higher procurement prices of food-grains means on the other hand, increasing in the issue prices of foodgrains released through the public distribution system.

The foregoing economic implication of APH show that industries in all the sectors would be subject to an accelerated inflationary situation and consequent deterioration in the level of living of the marginalised sections. This has also prompted the workers to protest erosion of their purchasing power through strikes. This is evident from some of the successful strikes launched by the railways, CIL, SAIL and many more public sector as well as innumerable private sector employees strikes. However, the State from time to time, in order to discipline' labour has applied moratorium on strikes and other repressive measures, which has hindred the working class to safeguard their own deteriorating economic position. This is more so since the State is lacking a national wage-price cost policy.

At a deeper level the crisis which the Indian economy is facing and the State's response to resolve the crisis can be explained through the liberalisation drive in the current economic policies. The liberalization drive has manifested in liberaiisation of industrial licensing, import policies with lowering import duties and promotion of foreign technical collaboration and a host of other things. Even capital from fhe foreign country is being utilised through private companies. At home the private companies are giving more importance to mobilise capital from outside the frame work of financial institutions. In short an industrial climate has been created to keep the multinational corporations and their agents in the country happy.

Last three and a half decades of planning in the country has shown that it is the industrialist who is at the commanding height of the economy. The Industrial Policy Resolution passed in 1940 and 1956 and in subsequent years are being changed to suit the needs of the party in power represented by these industrial magnets. This is the section which has also been benefited from the successive subsidies and tax concessions. Like-the Green Revolution drive has created a section of affluent landlords and peasants and this is the section which is the major beneficiary of the subsidies given to them in terms of water, fertilizer, pumpsets, pesticide, procurement prices etc.

Apart from the industrialists and rich peasants, the service sector, both private and public, has given rise to a section of traders, contractors,

high salaried Govt. employees, self-employed professionals etc. Govt. fiscal policy in the form of reduction in the tax rates, raising exemption limits, concessions in income tax for depositing in provident fund or NSC etc. are some of the measures taken by the State to encourage accumulation within this elite groups. Even the long-term Fiscal Policy has admitted that direct taxes that accounted for 27.2% of the total tax revenue of the central government in the early seventies had come down to 22.6% in the early eighties and that the share of income tax during the decade had come down from 14.2% to 9.1%.

In the context of such an enormous accumulation of surplus in the hands of the above classes, it is interesting to study the State's policy of helplessness in moppiog up these surpluses for investment. On the other hand, the liberalization strategy of development has encouraged the luxury based goods and services like motor cars, two-wheelers, T. V. sets, refrigerators, restaurants, hotels, motels, fashionabse houses, garments. electrical appliances and the like. This has consequently affected the economy in two ways : First, it has created new markets for these luxury prodncts, and second, it has facilitated the redistribution of incomes in favour of the upper crust of the society.

In view of the over-all economic crisis which has been crystalised in the Indian economy, a private sector oriented luxury consumption strategy with increasing reliance upon foreign capital is bound to lead towards the cost escalation and resultant cost push inflation and further worsening of the income distribution in the economy. The imperialist penetration and drain of country's resources in the name of modernization would not allow the Indian economy to operate freely. Therefore it is worthwhile to reconsider the role of P.S.U. along with the administered price policy for a more meaningful self-reliant growth strategy.

Problems of Energy Crisis in Orissa

PLACED AT
THE TWENTY FIRST ANNUAL CONFERENCE
OF
ORISSA ECONOMICS ASSOCIATION
HELD AT PURI
March 27 & 28, 1988

KEY NOTE ADDRESS
by
Sri S. Sundararajan, I.A.S.

Mr. President, Dr. Baidyanath Misra, Office bearers and Members of the Orissa Economics Association, and, Friends,

I feel honoured by having been called upon to deliver the key-note address of this Session of the 21st Annual Conference of the Orissa Economics Association. The subject for this session is "Problems of energy crisis in Orissa". I am not an economist by profession. But during my long career as a Planner, I have not only been confronted with a number of economic problems but have also had the good fortune of being closely associated with eminent economists of our country. Planning and Economics have an intricate inter relationship as both deal with allocation of resources. If to-day, we are facing an energy crisis in Orissa, it is not only an economic problem but also a problem of planning for energy. If there is a crisis, it is our duty to educate and enlighten the people about it. No crisis can be averted without the active and willing cooperation of the people, particularly in a democratic set up like ours. The Orissa Economics Association. which has taken the lead in selecting this as the topic for this Session, deserve to be congratulated.

2. The importance of energy to the very survival of life in the universe was well-known to our ancients. They knew that without the interaction of energy in one form or an other with matter, there can be no

life. Everything in this universe will be dead matter in the absence of energy. The Law of Conservation of Matter and the Law of Conservation of Energy, postulated by early scientists still hold good as working postulates though the present day scientists are convinced that the two are interchangeable. Modern physics has established that matter can be converted into energy and vice-versa. We are not concerned with this at the moment, though this points out to the possibility of our finding a bountiful source of energy through conversion of matter which takes place in a nuclear fission or nuclear fusion process. Such a source of energy may eventually solve the problem of energy. But nothing comes without a price There are difficulties in harmlessly harnessing such an energy. The accident, at the nuclear power plant in Chernobyl in USSR which caused extensive damage to human life and health due to radiation only a few years ago is still fresh in our memory. The lesson perhaps is that humankind should depend more on safer forms of energy which will not interfere with the ecology of this planet. Such sources should conform to the role of humankind as an integral part of the ecological system.

3. As I mentioned earlier, energy has been visualised by our ancients as the very manifestation of the Supreme Spirit. In this region of our country comprising of the States of Orissa, Bengal and Assam, Mother Goddess is considered as the Supreme Spirit. She is conceived as being synonymous with energy, i.e. Shakti. It is a pity that to-day we are facing a crisis of energy in the land which has been traditionally worshipping the Energy Goddess. Is this true ? If so, how has this come about ? Is it possible to find a solution to it within our means ? If a solution can be found, how it be applied systematically so that we safely emerge out from the crisis situation ? I would like to share my thoughts on this subject with you, in this perspective.

4. Energy has been broadly divided into two classes, viz, the commercial and the non- commercial. Most forms of energy which require to be paid for like coal, petroleum products and electricity are commercial. In the rural areas there are sources of energy like fire wood, which is collected from the village forests, cow dung which is used for dung cakes and draught animal energy which is used for ploughing and transportation.

These sources are free of cost or at least not monetised and the energy derived from them is non.commercial energy. To this c tegory we can add solar energy, wind energy, tidal energy and ge›-thermal energy. Some sources of non-commercial energy like fire wood have now dwindled with the result that this have become heavily priced. Firewood is therefore, fast becoming a commercial energy source. The non-commercial energy which is derived from conventional sources as mentioned above is generally replaced by commercial energy in the process of economic development. This happens because people find more and more engagement in other economical pursuits and find less and less time to go in search of a conventional energy source, which itself consumes a lot of family labour. The planners should study the trend of increase in the demand for commercial energy and plan for its production and distribution. This is part of the planning for infrastructural sector. Energy is required for various purposes like cooking and lighting, industrial production, transportation and for irrigation and use in power driven agricultural implements like tractor, harvesters etc. in the agricultural sector.

5. As for petroleum products, which is an important form of commercial energy, Orissa depends on imports. The annual consumption of petrol, diesel and kerosene in Orissa is at present as follows :

(1)	Petrol	38,224 MT.
(2)	Di sel	3,16,158 MT.
(3)	Kerosene	1,24,178 MT.

The consumption of petrol in the State is growing at the rate of 15% per year while that of diesel and kerosene is growing at 12% and 8% per year respectively. By 1991 the demand for petrol will go up to 66,851 MT., and that for diesel to 4,87,478 MT., while that for Kerosene will go up to 1,68,941 MT. In addition to the above the petroleum products, LPG. (Liquified Petroleum Gas) which is another Petroleum product is consumed as a domestic cooking fuel. The present consumption of L.P.G. in the State is 1200 MT. But only 26 out of 116 towns in Orissa have been covered by LPG supply. We have so far not found any commercial deposits of oil and natural gas in Orissa. May be we may strike oil and

natural gas in the near future as exploration work is still going on. Exploration in Kaveri Basin in Tamil Nadu has recently proved successful. Mahanadi basin is an equally a promising area for oil. Orissa will have a case for a coast based refinery very shortly when the total demand for POL products in and around the State goes up to 2 million tonnes or thereabouts. The State Government has been pressing its case for a port based refinery at Paradip with Govt. of India. But it is to be borne in mind that even if we have a refinery it will be based on imported crude and we have to spend valuable foreign exchange for import of crude. Such of the petroleum products which cannot be replaced by other forms of energy, like petrol and diesel which are required for transportation, can justifiably be imported. But boosting up the demand for kerosene or even LPG beyond the level of its availability as a by-product from the refineries will not be justified, as either import of these products as such or increasing the refinery capacity for meeting the demand of only these products will be adding to the energy crisis. So, it is desirable to build up the demand for Kerosene and LPG rather cautiously. The bulk of our kerosene consumption is for lighting in rural areas. One survey puts this demand at more than 75,000 MT. Energy experts hold the view that kerosene is a very inefficient lighting fuel. It is only 1/10th as efficient as electricity. From this point of view it would be better to go in for rural electrification than increase the use of kerosene for lighting. Perhaps even Solar Phcto voltaic Cells can be used for lighting in rural areas, if the extension of electric line is found uneconomical and not justified by low damand,as perceived by the Electricity Board.

6. As regard coal, Orissa is rather fortunately placed. We have a total reserve of 34.000 million tonnes of coal in Talcher and Ib valley areas. But unfortunaly, this coal is not the coking type and cannot be used for metallurgy. It connot also be used for soft coke manufacture. Its main use is in the boilers for generation of thermal power. But unfortunately we could not set up many thermal power units based on coal in our State. We have at present only a 470 MT. Thermal power Station in Talcher which consumes about 1.13 million of this coal to generate 1.3 billion units

of electricity. Its coal consumption is high. It has not been properly designed for using high ash content coal. There is a tremendous ash pollution problem in the area. The plant load factor of this unit which was as low as 32% as against the national average of 55% has just come up to 35%. It is proposed to set up a Super Thermal Power Plant in the Central Sector, based on Talcher coal with an installed capacity of 1000 M W. All going well, this plant ts expetced to be completed by the end of the 8th Plan. It can eventually be expanded tn a capacity of 2000 MW. Separately, the State Government is planning a 860 MW. Thermal Power Station near Brajarajanagar base on Ib valley coal deposits. This project would cost more than Rs.1000 crores. The responsibility for implementation of the project has been given to Orissa Power Generation Corporation. At the moment, the Corporation is tying up the credit requirement for this plant. All going well, this plant will also be ready by the end of 8th Plan.

7. In addition to the above, NALCO, which is a power intensive industrial undertaking of the Govt of India, has set up a 600 MW. Captive Power plant based on the Talcher coal deposits. In fact, part of this capacity has already been commissioned and the State Electricity Board has been buying power from NALCO to meet the increased power demand in the State. This power will however not be available to the State Electricity Board once NALCO commences production of aluminium. Their captive power will be fully required by them.

8. Let us now get a picture of the demand for electricity in the State, vis-a-vis the installed capacity of power generation. As mentioned earlier. we have an installed capacity of 470 M.W. of Thermal Power. In addition we have an installed hydel power capacity of 764 MW comprising of 190 MW of Hirakud, 72 MW of Chipilima, 360 MW of Balimela, 100 MW of Rengali and 34.4 MW of Machkund. To this, we have just added 89 MW of the 1st Unit of Upper Kolab. 2 more Units of Upper Kolab (160 MW) the 7th Unit of Hirakud (37 5 MW) and 4 Units to Upper Indravati (600 MW) are under construction. In Rengali Stage II, more Units (150 MW) and a 4th Unit of Upper Kolab with 80 MW an-

2 Micro Hydel of Potteru of 6 MW have also been planned. With all this the itstalled capacity for hydel power will go upto 1879 MW while thermal power will go upto 1310 MW. There is an imbalance in the hydel thermal mix of power in our State. Hydel power is meant for peaking load and experts feel thal the ideal mix of the two is 40% hydel and 60% thermal, whereas we have got just the reverse of it With the vast coal reserves, we should really have had more of thermal power in the State. Somehow in the initial stages, Orissa had been depicted as a State with enormous hydel potential and comparisions were drawn with Kerala. This, in my view; was not only detrimental to the State interest but also has led to a sense of complacency and wasteful investment in hydel judging from priority angle. In a year of drought, the reservoirs do not get filled up and in spite of our installed capacity for hydel power, we face power famine and have to resort to power cuts.

9. In some of the hydel units there is a competing demand for water for irrigation like Hirakud. When Hirakud dam was designed the irrigation system as well as power plant both had to draw water directly from the reservoir. This problem has now been done away with in subsequet dams, like Rengali, Upper Kolab and Upper Indravati. In these dams the water drawal for irrigation will not have any adverse impact on power generation as there is a separate storage of water after power generation to meet the needs of irrigation. Taking both hydel and thermal units together, the installed capacity for power in Orissa during 1986-87 was 1234 MW. The peak availability of power from this, was 814 MW as against the peak-demand of 1456 MW. There was a deficit of 641 MW at peak. As against the energy requirement of 8927 million units only 4993 million units could be made available. This includes nearly 1 billion units of imported power.

10. According to the 13th Power Survey, the peak availability of power in Orissa in 1994-95 will be 2596 MW as against the installed capacity of 3189 MW. The Peak demand will be 2283 MW showing a deficit of 687 MW. As against 19 27 billion units of power required, the availability

will be only 13.2 billion units. There will be a gap of more than 6 billion units. The all-India position is that the deficit will be only 2.9 billion units in the whole country by 1994-95. Thus there will be a greater shortage of power in Orissa than at the all-India level. Hydel units take nearly 10 to 15 years to implement. Even Thermal units will take more than 6 to 7 years for implementation. The present day cost of a project is more than Rs.1.5 crore for 1 MW. of installed capacity. It is necessary to plan for new starts from now on as recommended by the Committee on power. For this, we need more investment in the power sector. We have not planned for any new hydel plant in 8th plan. We should plan a new unit to be taken up during the 8th plan.

11. In this none too happy a situation of supply against demand of power, we also have the problem of a skewed, demand for power to reckon with. More than 25%of the power provided in the State is committed for power intensive units. At one stage in Orissa, the industrial consumption of power stood at more than 80%. To-day it is 73%. But the consumption in agriculture is hardly 2%, as against 10% in agriculturally advanced States like Punjab, Hariyana. This has adversely affected the plans for large scale use of underground water for drought proofing of our agriculture. Consumption by domestic consumer and commercial establishments, accounts for 25% of the power consumption of the State. The State Government has recently taken a decision not to encourage power intensive industries, Unless they set up their own captive power plants. This is a very good decision. At the same time, it is necessary to see that the existing power intensive units are progressively weaned away from the State grid. This will release more power for the agricultural sector and oeher consumers. The existing power intensive units can also have their captive power plants. Apart from the ongoing power points, we have to plan for more power projects to be taken up at the end of the 8th and during the 9th plan. Only then we can avert the crisis in the power sector. As it is to-day, we are allowing 25% of the plan funds for the power sector. For instance, in the Rs.835 crore Annual plan for 1988-89, power sector alone would account for Rs.254 croes. We would therefore face the problem of finding more resources for new power projects. May be we may have to look for externally assisted power projects,

12. Merely planning to generate more power without an efficient system of distribution would not do. The T & D loss in Orissa as worked by the planning Commission is more than 23%. But the actual losses may be even more. When power is going to be a scarcer and scarcer commodity, it is necessary ta revamp the distribution system by providing more and and mare of HT lines to evacuate power over long distances with step down facilities for localised supply. Pilferage of power has to be put down with an iron hand. The State Electricity Board is already on the job and we have only to hope that they will succeed very soon. For the present, we are tiding over the crisis year to year with import of power from Central projects outside the State as well as power purchased from the neighbouring States.

13. Incidentally there is a direct relationship between increase in energy consumption and the growth of the economy. Economists have found that if the economy has to grow at X% one has to plan for growth of energy at 1.6X% to 1 8 X% For instance, if the State economy is to grow at 6% then we have ta provide for growth in energy at the rate of 9.6 to 10.8%, The very fact that the energy demand in Orissa has been projected to grow at a faster rate than the all-India demand is an indication of the present under-developed State of the economy, its potential and the need to step up the growth of its economy. The key to Orissa's economic growth therefore lies in our ability to meet the increased demand for energy, as projected.

14. So much about commercial energy. Turning to non commercial energy, we have already seen how it has an inter-relationship with the demand for commercial energy. The process of development increases the switch over from non-commercial to commercial, energy. At the same time. when the traditional sources for non-commercial energy dwindle a chain reaction sets in. Demand for fire wood has caused devastation of forests which in turn has reduced the rain fall which in turn has affected irrigation, power production as well as agriculture. We shoulq therefore try to contain the rural energy demand and provide for it judiciously. Again our inability to meet the rural electricity demand for lighting has resulted in increase in demand for kerosene, which is an imported fuel. Any increase

in its demand has to be curbed. Unfortunately, we do not have a reliable survey of the consumption pattern, demand and the problem of energy supply in the rural areas of Orissa. In fact, even at the all-India level, a complete picture of energy demand was brought out for the first time only in 1965 with the report of Energy Survey Committee. It has projected the demand and supply of different forms of energy for a 16 year period from 1965 to 1981. The report has stressed the desirability of keeping the trends of energy consumption. constantly under review, for reformulating policies as and when circumstances changed. The Fuel Policy Committee in 1974 also reiterated this warning. The report of the Working Group on Energy Policy 1979 also stated that energy planning and policies required continuous attention. Recently. in 1984, the Advisory Board on Energy has brought out a report on energy demand and supply in India in 2004-05. Unfortunately. this report does not give State-wise projections. It divides India into four regions and has indicated the growth rates as projected by it region-wise. It states that during 1982-83, the eastern and north-eastern region consumed 23% of country's commercial energy as against 30% by western region, 25% by northen region and 22% by Southern region. If the average proportion of consumption between 1960-61 to 1982-83 is taken in to account the requirement of eastern region by 2004-05 will be higher than the projection based on the proportion of its consumption in 1982-83. This is obvious because eastern region started with a high energy demand, but has remained less developed compared to other regions of the country. To sustain a higher growth rate of this region the consumption of energy has to go up at a much higher rate. The conclusion reached by the Advisory Board on Energy is therefore not at all out of place. This projection is for overall consumption and not merely for rural areas.

15. Regarding energy consumption in rural Orissa, the Centre for Social and Technological Change, Bombay is said to have made a study on "Energy Use patterns in rural Orissa". Similarly, the Centre for Developmental studies. Saheed Nagar, Bhubaneswar has made a "study of problems of energy in rural Orissa". This study was undertaken at the instance of the State Department of Science, Technology & Environment and the Orissa Renewable Energy Development Agency. According to the methodo-

logy adopted for the study, six clusters were selected in three Blocks. On the basis of the energy consumption pattern found in these six clusters, the study concludes that the present annual consumption of energy in rural Orissa for cooking, lighting, commercial production and lift irrigation is 5.38 million tonnes of coal replacement (MTCR). Out of this, firewood leaves and twigs including charcoal constitute 2.75 MTCR, dung cakes 1.28 MTCR coal 0.2 MTCR and other cooking fuel 0.45 MTCR. Out of the energy required for lighting, electricity and Kerosene accounted for 0.5 MTCR each. Only 0.1 MTCR of electricity is used for lift irrigation. This means the consumption of energy in rural Orissa is much lower than the normative level, mentioned in the report of the Advisory Board on Energy. The norms for per capita consumption of energy worked out on the present level of urban consumption is 620 K. Calories for working per day. Similarly, 30 K. Calories of heat is required for heating per day. To get this amount of energy one would require normally 2 Kgs of fire wood as the appliance efficiency of fire wood is 8% while its calorific value is 4750 K Cal per Kg. Discounting 7 million people depending on Kerosene and LPG, the fire wood requirement of the other people of Orissa would be of the order of 1.8 million tonnes per year. The forest authorities assume that 1 hectare can produce 5 to 6 tonnes of bio-gas per year. At this rate, near about 3.5 lakh ha. of forest should be kept under fire wood for meeting the needs of the population. We are at present doing afforestation at the rate of about 50,000 hectares per year. Even with that, forests are bound to disappear at a fast pace. The National Remote Sensing Agency which has been scanning our forest cover at periodical intervals, has found that during 1971-81, Orissa has been losing more than 1.00 Sq Kms. of forest evry. year. As against 65,000 Sq. Kms. shown as forest in our records, hardly 37,000 ha. has at pressent any forest cover worth mentioning. At this rate, unless 1 lakh ha. is afforested every year, it may be difficult to maintain even the status quo. not to speak of increasing the forest cover. If we accept the survey done by the Centre for Developmental Studies, this figure may workut to be slightly lower. Anyway it is necessary to formulate a policy for meeting the rural energy demand in the State. In this regard, the recommendations given by the Centre for Developmental Studies could be

considered, though I am not, in full agreement with all of them. I would like to place them with my comments before you.

16. They have recommended that "it will not be possible to divert any more fuel, leaves, twigs, charcoal, agriculture residues and agro-industrial base from the existing uses. Rather the consumption of fire wood, leaves and twigs is to be contained. Significant reduction is to be attempted through provision of improved chulla, etc. for efficient burning". I am in full agreement with these recommendations. They feel that it is possible to take up energy plantation and instal about 8 lakh Gobar Gas plants during the next 12 to 13 years and introduce improved chulla to save one lakh tonnes of fire wood and distribute solar cookers to save energy equivalent to 40,000 tonnes of fire wood by 2003 AD., as mentioned in the report. In my view, it is worth attempting this though I am sceptical about the feasibility of such a large scale programme under biogas and chullas. We are hardly able to do 5,000 biogas plants per year.

17. The other recommendation of the Centre is that coal/coke may be the only dependable alternative for some years to come and attempt should be made to divert coal to rural areas to the tune of 7 lakh tonnes per year. In my view, unless soft coke can be produced from the coal available in Orissa, it is difficult to encourage its consumption. Import of soft coke from outside the State may make it a costly fuel for substitution.

18. Their other recommendation that LPG may be introduced in villages close to urban distribution centres is however welcome. As already mentioned by me the demand for LPG has to be contained within the level of supply possible from our refineries. The same observation holds good regarding yet another of their recommendation to ensure supply of 1.2 lakh KGs of kerosene to rural Orissa. Kerosene is a fuel for which we have to depend on imports. So its encouragement has to be only up to the level of its availability from our refineries. They have also stated that electricity availability for lift irrigation points in rural areas should be increased. They feel that it should be taken from the present level of 200 millon KW. up to 600 millon KW. This is a welcome suggestion, more from the agricultural development point of view then from the energy policy as such.

19. To conclude, I would say that the problems of energy crisis in Orissa, which should be clear from the account I have given. should be carefully and systematically tackled. I would suggest the following package of approaches for this.

1. To meet the demand for growing power, more power projects, should be taken up in the public sector and new starts for 9th plan must be thought of from now.
2. Power intensive industries should be discouraged unless they come up with a proposal to have their own captive power plants.
3. The existing power intensive industries should be progressively made less dependant on grid supply by encouraging them to set up their own captive power plants.
4. Use of LPG. and kerosene should be optimised so that their demand does not go beyond the level of their availability, in sight.
5. Fuel wood plantation must be taken up atleast in 1 lakh acres of degrated forest every year.
6. In the rural areas encouragement should be given for setting up more bio-gas plants and for tapping solar energy througn solar cookers and solar photo voltaic cells.
7. Wind energy should also be harnessed for wind pumps, and wind farms.
8. Improved chullas must be provided to save consumption of fire wood.

All this requires not only the efforts of a planner backed with resources but also conscientisation of our people about the crisis facing them and the need to take to alternative sources of energy, apart from saving the use of existing energy sources. In this direction, a lot is required of educated and enlightend people like us, who should increase the awareness of the society to the problem and its solution. I would like to conclude my talk on a note of hope that we would rise, one and all, to the occasion and contribute our mite not only in making people conscious of the problem but also in lending a helping hand for solving the problem.

REFERENCES

1. Seventh Five Year Plan, Planning Commission
2. Report of the Energy Survey Committee, 1965 Planning Commission.
3. Report of the Working Group on Energy Policy, 1979 Planning Commission.
4. Report of the Committee on Power, 1980, Ministry of Irrigation & Power.
5. "Towards a perspective on Energy Demand and Supply in India in 2004-05" by the Advisory Board on Energy.
6. "A study on problems of Energy in Rural Orissa" Centre for Developmental studies. 786, Sahidnager, Bhubaneswar, 751 007.
7. OSEB at a glance, Orissa State Electricity Board, Bhubaneswar.

Problems of Energy in Rural Orissa

Dr, Bidyadhar Mishra
&
Chandramoni Pradhan

1. Considering the need of a comprehensive study on the problems of energy in Orissa with reference to the rural areas, where the problem is becoming acute; the Centre for Developmental Studies, Bhubaneswar proposed an exploratory study in rural Orissa to the Govt. of Orissa, Department of Science, Technology and Environment towards the end of 1985. The Deptt. sanctioned the scheme and the study was undertaken during the period from Nov. 86 to Feb. 1987 in collaboration with the Orissa Renewable Energy Development Agency (OREDA). After discussion with OREDA, the final report was submitted in July 1987.

2. The design of the study was—

i) The whole State was divided into 3 significant energy zones keeping in view the natural resources available, the intensity of agriculture etc. and the socio-cultural habits of the people. Three zones are (i) the highly exploited and populated coastal zone (ii) the intermediate areas where the exploitation is reasonably high and the pressure of the coastal belt is felt, and (iii) the forested and tribal zone.

ii) From each zone, one typical Block, where OREDA had already initiated some developmental activity, was selected after consultation.

iii) In each selected Block, 2 clusters, one with a developmental parameter (such as electricity, gobar gas and/or improved chulah programmes) and another without any or all of them, were selected in a purposive manner. A cluster in this context meant a group of 3/4 continous villages with a population of 2000/number of households 400.

3. Two schedules, one a household schedule and the other for the village, were prescribed under the survey. The village schedule had provision for the village resources with special reference to energy sources,

collection of data on the consumption of energy in all the non-household establishment and marginal activities like entertainment, common village function and such other activities which would not be covered by household data. The houshold schedule was canvassed in 25% of the household classified according economic status and it contained details of household resources and consumption of energy in kitchen, lighting, entertainment, ceremonies and enterprises within the household premises. Attempt also made to get some data on the shifts from one source to the other, if any visible. The total annual consumption of energy was then pooled (estimated for household sector and actual for the non-household) to give the annual consumption of energy for the village/cluster. Data were also associated with the economic condition of the households

4. The Blocks selected for this purpose were Derabish in Cuttack district, Champua in Keonjhar and Kishorenagar in Dhenkanal district. In each Block, two clusters were selected in consultation with the Block Officials and other functionaries associated with implementation of energy programmes. In addition to the study some energy pamphlets were also given to the villagers and data were collected by discussion regarding the awareness of energy programmes and the willingness of the villagers to adopt the improved gadgets. Such imformation was passed on to OREDA for follow up action.

5. Some of the results of the study relevant to the discussion may be seen from the Tables below :

TABLE 1

Annual per household consumption of energy in the 6 (six) selected clusters in Kitchen/household enterprises in quintal Coal Replacement (QCR)

Source	Derabish		Champua		Kishorenagar	
	Cluster 1	Cluster 2	Cluster 1	Cluster 2	Cluster 1	Cluster 2
Fire wood	2.49	5.40	2.78	0.31	11.63	12.19
Leaves & twigs	2.13	1.88	5.03	7.38	....	....
Agril. residue and other waste	0.52	0.21	0.19	0.08	....	....
Dungcake	3.29	1.36	0.48	0.32	....	....
Kerosene	0.17	....	....	....	....	....
Electricity	0.32	....	0.04	....	....	....
Gobar gas & others	*	....	*	....	....	....
Total	8.92	8.85	8.52	8.09	11.63	12.19

* negligible.

TABLE 2

Annual per household energy used for lighting (in litre kerosene replacement)

Source	Derabish		Champua		Kishorenagar	
	Cluster 1	Cluster 2	Cluster 1	Cluster 2	Cluster 1	Cluster 2
Kerosene	37	39	22	27	34	31
Electricity	18	*	11	....	9	7
Other oils	*	*	....	....	....	....
Total	55	39	33	27	43	38

* negligible.

TABLE 3

Annual per household total consumption of energy in different clusters (all end uses) in QCR.

End uses,	Derabish		Champua		Kishorenagar	
	Cluster 1	Cluster 2	Cluster 1	Cluster 2	Cluster 1	Cluster 2
Kitchen & household Enterprises	8.92	8.85	8.52	8.09	11.63	12.19
Lighting	2.78	2.02	1.67	1.37	2.17	1.92
Total	11.70	10.87	10.19	9.46	13.80	14.11

TABLE 4

Annual consumption of energy in household and non-household sectors (in percentages) in the 6 (six) cluster in QCR.

Block/Cluster		Consumption of energy in QCR)		
		Household	Non-household	Total
1. Derabish	1.	394.2 (93)	28.5 (7)	422.7 (100)
	2.	431.8 (90)	48.0 (10)	479.8 (100)
2. Champua	1.	461.5 (97)	14.2 (3)	475.7 (100)
	2.	340.7 (98)	6.7 (2)	347.4 (100)
3. Kishorenagar	1.	508.7 (93)	37.3 (7)	546.0 (100)
	2.	439 5 (97)	15.5 (3)	455.0 (100)

Figures in brackets are percentage shares of the household and non-household sectors in the total consumption.

6. The figures in the above Tables are revealing.

(a) Table--1 shows that in coastal areas, the households have diverisified their energy use in kitchen into all possible sources except coal. At the other end,firewood is the only fuel in both the clusters of Kishorenagar. In between, the mining and deforested areas of Champua have shown a mixed picture. Further, there is a very high consumption of firewood in Kishorenagar Block and this is due to inefficient burning.

(b) Table--2 shows that Kerosene continues to be the major fuel for lighting in the villages. The least amount of energy was spent on lighting in the clusters of Champua with their tribal population and the highest consumption was in Derabish Block. Consumption of energy in lighting was observed to be more in Cluster--1 of Kishorenagar Block as the cluster contained a part of the Block colony.

(c) Table--3 shows the per household average total consumption of energy per year. The average is about 12 QCR (Quintal Coal Replacement) per year. The higher averages in Kishorenagar clusters is due to inefficient burning of firewood which is easily available from the forest around. They burn in logs not in split firewood pieces. A small part of the household consumption of energy in the coastal areas is shifted to non-household establishments, where people have started taking morning tea etc. In outside shops and 'dhabas'. This will be evident from the Table—4.

(d) Consumption of energy by non-household establishments as seen from Table-4 has been more in the coastal areas and least in the tribal areas of Champua. The energy sources used by the non-household establishment included coal, firewood, dungcake, kerosene and electricity.

7. Taking into consideration all types of energy consumption the clusters for all the end-uses such as kitchen/enterprise, and lighting in household and non-household sectors, agriculture and irrigation, the percentage shares of different sources worked out as in Table-5.

TABLE 5

Percentage shares of different sources of energy consumed in 6 [six] selected clusters.

Source	Derabish		Champua		Kishorenagar	
	Cluster 1	Cluster 2	Cluster 1	Cluster 2	Cluster 1	Cluster 2
1. Ccal	2	3	1	....	1	....
2. Firewood	23	50	28	7	83	86
3. Dungcake	27	11	5	3	....	....
4. Leaves and twigs Agril. residues and other waste	17	16	47	76	....	....
5. Kerosene	17	18	11	14	12	11
6 Electricity	12	2	7	....	4	3
7. Gobar gas & others	2	....	1	....	....	....
Total	100	100	100	100	100	100

The figures in the Table--5 are self explanatory. It may be marked that all the types of fuel are used in Derabish cluster-1 and only three types are used in Kishorenagar cluster-2. Leaves and twigs are consumed heavily in Champua Block. The range within which the use of firewood, dungcake and leaves/twigs vary are worth-noting. Kerosene is the main fuel for lighting and the consumption is more in coastal areas. Contribution of gobar gas is nominal.

8. An attempt was made to collect details of human and animal energy in terms of days spent in agriculture and allied operations. The total number of days spent on agriculture will add up to about 800 million man days and other allied work to about 400 million man days per year in rural Orissa. Machines have not yet taken over this exertion of the human body in this part of the country.

Besides, 500 million animal days are also put into service in agriculture, other activities allied to agriculture and transport in rural Orissa per year.

9. An account of the human and animal days spent in agriculture and other activities in the six selected clusters is given in Table--6

TABLE 6

Annual per household number of human and animal days used in agriculture and allied activities in the 6 [six] clusters.

Block/Cluster		Human days		Avg. No.	Animal days	
		Avg. per h. hold in Agril.	% of hired labour	of days spent per acre.	in agril. allied activities	Averg. no. of days per acre
Derabish	1.	196	42	60	75	22
	2.	58	35	62	23	24
Champua	1.	56	20	27	67*	20
	2.	54	15	27	77*	20
Kishrenagar	1.	179	42	56	176*	20
	2.	123	29	34	164*	20

* include days spent on bringing wood etc. from forests & other areas-transport included.

10. It can be seen that of the 6 clusters, three are more agricultural. One road side cluster in Derabish Block and both the clusters of Champua Block have less agricultural activities. Since per household averages may be misleading we have worked out per acre average human and animal days spent. It may be seen that human involvement in agriculture per acre of land cultivated with multiple crop is more in coastal areas and less in other Blocks, where intensified cultivation is not practised.

11. However, we have felt that relieving the human and animal exertion is not important in this part of the country,. In the action plans suggested by us, we have therefore confined to the energy used in kitchen/

enterprise and lighting in household sector and the non-household establishments in rural areas.

ACTION PLANS FOR MEETING ENERGY NEEDS

12. While suggesting the action plans for the selected clusters covered by the study, the broad frame-work and direction of the plan was discussed. In working out the projection of demand, the parameters which were taken into consideration were the present level of supply, the trend of shifts from one source to another, the likely speed with which one source may grow or get depleted, the expected growth in population, cultural change which moy induce growth in energy use and the likely speed of development in agriculture, industries etc.

13. As against the present level of annual consumption of 5.4 MTCR, the requirement of energy in rural Orissa by 2000 AD was projected as 7.1 MTCR (at the present level of efficiency). Every attempt is to be made to achieve this level of supply through conservation effecting efficiency in energy consumption, and creation of new sources. Besides,supporting actiocs are to be taken by OREDA and the Department concerned in opening dialogues with other departments, educating the people in the direction of energy consumption and effecting economy in the consumption. The following action plans have been suggested, at the Statte level and for the selected clusters.

14. At Macro-level (Rural Orissa):

i. Enough plantations through Social Forestry, Energy plantation and normal afforestation programmes are to be planned in the years ahead. The Department concerned is to enter into dialoguue with the respective Departments in this respect.

ii) A steady supply of 7 lakh tonnes of coal is to be maintained for the rural areas. Necessary distribution arrangements are also to be made. This will be the only dependable arrangement during the gestation period of the plantation growth.

iii) The provision of improved chulahs, solar cookers etc. where possible may be intensifid with supporting distributing arrangements in rural areas, to cover about 5 lakh families by 2000 AD. This should be an important programme in the forested and middle zone.

iv(Households should be encouraged and adequately subsidised for the

installation of gobar gas plants instead of burning dung cake directly. This programme should cover about 4 lakh individual plants and about 20 thousand community plans (in tribal areas), covering in all about 8 lakh rural families by 2000 AD.

v) A steady supply of 1.2 lakh kls. of kerosene should be maintained to rural Orissa with efficient distribution arrangement.

vi) The rural electricication programme should achieve a total supply of electricity to the tune of 600 million kwh (400 mkwh for commercial and domestic consumption and 200 mkwh for agriculture/irrigation). In the mean time, it should also be attempted for generation of electricity through Solar P.V., Mini-hydel and large wind Mill.

vii) L. P. Gas may be provided in semi-urban and sub-urban areas to cover at least one lakh rural families by 2000 AD.

15. With a multi-pronged attack, the problem of energy scarcity in rural areas can be solved. It may be possible to achieve a situation by 2000 AD, where the commercial sources will share higher proportion of energy needs in rural Orissa as suggested

Source-wise supply of energy as ac present and proposed by 2000 AD

Source.	Pereentage Share (as at present)	Percentage Share Proposed by 2000 AD
1. Firewood	35	25.5
2. Leaves, twigs & charcoal	16	12.0
3. Agril. residues & other waste	8	6.5
4. Dung-cake	24	13.5
5. Gobar gas	....	12.5
6. Savings achieved by improved gadgets	....	2.0
Non-commercial total	83	72.0
7. Coal	4	10.0
8. L. P. Gas	....	1 5
9. Kerosene	9	8.5
10. Electricity	4	8.5
Commercial Total	17	28.0

16. At the cluster levels, the recommendations are on the same lines with local variations depending on the status of the areas.

i) The afforestation, energy plantation and social forestry may have limited applicability in the coastal areas, but they should be intensifid in other clusters.

ii) Coal depots may be organised at central points in each cluster and people may be encouraged to use coal in road side dhabas' and tea stalls.

iii) Improved chulahs should be provided immediately in forested clusters, where consumption of firewood is very high.

v) Gobar gas seems to be the most practical solution for rural energy need. While the coastal areas will readily come forward for these plants, other areas, specially those not using dung cakes as fuel may be induced to install plants in as many numbers as possible. Community Gobar gas plants will be possible in tribal areas, where community spirit is high.

17. It may be attempted to reach a stage where meaningful shifts from one source to other can be indu ced in the clusters and also extend the attempt to cover whole of the Block areas, so that a revised energy structure is achieved as indicated.

Source-wise supply of energy as at present and as proposed by 2000 AD in 6 selected clusters with % share to be covered by each source.

	Cluster-1		Cluster-2	
	as at present	Proposed by 2000 AD,	As at present.	Proposed by 2000 AD
		Block-Derabish		
1. Coal	2	15	3	20
2. Firewood	23	15	50	20
3. Leaves, twigs & Agril. residues. etc.	17	10	16	10
4. Dung-cakes	27	15	11	10
5. Gobar gas	2	15	....	10
6. L. P. Gas	....	5	....	5
7. Kerosene	17	15	18	15
8. Electricity	12	10	2	10

Block-Champua

1. Coal	1	20	....	5
2. Firewood	28	20	7	5
3. Leaves & twigs Agril. residue etc.	47	20	76	55
4. Dung-cake	5	5	3	5
5. Gobar gas	1	10	....	10
6. Kerosene	11	10	14	10
7. Electricity	7	10	....	10

Block-Kishorenagar

1. Coal	1	5	....	5
2. Fire wood	83	50	86	60
3. Leaves, twigs Agril. residue etc.	....	7	....	7
4. Gobar gas*	....	20	....	10
5. Kerosene	12	8	11	8
6. Electricity	4	10	3	10

* No dung cake isused now, nor it is proposed in future.

18 As regards gadgets for augmenting irrigation such as wind-mill and sulabh pumps, there have been requests by the households, but it has been found that sources of water for lifting are limited in summer in coastal areas and almost nil in other areas. As has been observed earlier, these are not pressing needs in this part of the country. More attention need be paid on the other fronts rather than supplying irrigational gadgets.

CONCLUSION

19 Energy is the need of the day. Non-commercial renewable sources are quickly being depleted and unless they are conserved and augmented, the future may be very grim. On the commercial front much is being planned, but the fossil fuels may be exhausted soon. Hydel, mini-hydel and atomic power may be the only means at our disposal. It is not sure how much of these resources can be augmented. Non-conventional sources like wind, solar, geothermal and oceanic are to be harnessed for the use of the man-kind. Public awareness about the economy in energy use and their conservation is very much lacking and none of us is prepared to look at the problem in a collective manner. Therfore, the job of planning for energy and its implementation, becomes very challenging.

An Analysis of the Power-Crisis in Orissa

Ritanjali Dash
Regional College of Education.

India is passing through a phase of severe power crisis during the 80s. Orissa is no exception to it But the Power-Crisis in Orissa is some what different in the sense that it is due to human lapses which can be avoided with little effort and with some measures of reform. In Orissa the demand for power is nearly 20% less than the installed capacity of 1234 mw. Besides, the power available inside the state for purchase by OSEB is nearly 50 mw. But the crisis is due to the low production or generation of electricity which is only a little above 30% of the installed capacity.

A detailed analysis of the power position in Orissa is given in Table 1. It is seen from the Table that the maximum power generation capacity is only 33.81% of the total installed capacity. Present total demand is 1000 mw. There is a shortfall of about 580 mw, out of which the Orissa State Electricity Board (OSEB) has managed to provide power to the extent of 464 mw approximately by purchase from inside sources like NALCO, and import from outside sources like Farakka, Chuka, MPSEB, DVC, (Damodar Valley Corporation), Bihar State Electricity Board (BSEB), Eastern Regional Electricity Board (EREB) etc.

TABLE- 1

Name of Projects	Total Installed Capacity	Firm Generation in MW	Firm Generation as a percentage capacity
(1)	(2)	(3)	(4)
Machhkund	34 MW (Orissa's Share)	MW (Orissa's Share)	—
Hirakud			
Stage I (4x37.5) = 150 MW Stage II-(2x24MW) = 48MW	198 MW	125.91	46.63%
Chiplima—(3x24 MW =	72 MW		
Balimela-(6x60MW)	360 MW	118.94	33.03%

Rengali-Total installed capacity in hydel power	764 MW		
T T P S stage-I (2x50 = 100 (Talcher Thermal Power Station)	100 MW	65 52	65.52%
Stage I-(4x62.5 MW) - 250 MW Stage II-(2x110 MW) - 220 MW	470 MW	134 81 MW	28.68%
Total	1234 MW	417.23 MW	33.81%

The Central Electricity Authority's (CEA) demand survey report says that the power demand will increase to 1270 Mw (in 1990) and to 2200MW in 1895. The 13 th Energy Survery Report gives a much higher figure of the future power requirement in Orissa which will be 1584 MW in 1988-89 and 3283 MW in 1994-95. If we take the CEA demand survey as the correct estimate of the power situation in Orissa, then hopefully we can meet the power demand in coming years with the commissioning of the undernoted on going and upcoming projects.

Hydel-(On-going Projects)

Rengali Project :

Stage I--2 × 50 Mw = 100 Mw } Generation station Test
Stage II--2 × 50 Mw = 100 Mw } Running period
Stage III--1.×50MW = 50 MW -- not started

Upper Kolab :

Stage I-- 3 X 80 mw = 240 } Generation started only in
Stage II-- 1 X 80 = 80mw } one unit from August 1986.

Upper Indravati :

4 X 150 mw = 600 mw Japanese Technology.

Hirakud : One more unit at stage-III is installed with a capacity of 37. tmw. It shows that the total installed capacity from hydel projects will be around 2000 mw by 1995.

Ongoing Captive Power Plants :

Among the ongoing captive power plants we have installed capacity:

NALCO-- 5 x 120mw = 600 mw.

Presently 3 units are genearting totally 360 mw, out of which 320mw, of surplus power are available for sale. So far OSEB has purchased only 120mw, as the generation started late this year.

Rourkela Steel Plant (RSP) :

Installed capacity – 2 x 60 mw = 120 mw.

Besides the captive power plants we have two industrial thermo-generating sets one at Nalco/Damanjodi and another at Paradeep Phosphate which provide power occasionally when they have a low requirement.

Nalco/Damanjodi-- 3 x 18.5 mw = 55.5 mw

Boiler capacity--200 MT/hr. (MT metric tonnes)

Paradeep Phosphate : 2 x 16 MW = 32 MW.

Boiler capacity-- 110MT/hr.

Upcomming Thermal Projects :

Ib thermal- 4 x 210 mw = 840 mw.

undertaken by OPGC [Orissa Power Generating Corporation]

Talcher Super Thermal Power Plant : (TSTP) - Commissioned by (NTPC) (National Thermal Power Corporation). Installed

2 x 500 mw = 1000mw.

In the second phase, it may commission one more unit having an installtion capacity of 800 mw.

With all these ongoing and upcomming projects the power supply position in Orissa seems to be very smooth. However, Nalco will stop selling power to OSEB once its smeltered Plant starts functioning. By that time if all the on-going projects will generate at least half of their installed capacity the power situation can be faced with more confidence. But if the actual generation continues at the present rate of 33.18% of the installed capacity the situation will go out of control.

In the present circumstances, the shortfall is about 50% to 60% in case of bad monsoon. To avoid this shortfall in case of bad monsoon more generation is required from thermal power plants although the cost of generation of thermal power (i.e., per unit cost 90 paise to Rs, 1.00) is

higher than that of the hydel power (per unit cost 50 paise to 60 paise). However, thermal power plants in Orissa are generating proportionately less electricity than the hydel projects and are in a very bad shape. Poor quality of coal with an ash-content of 40 to 45%, inefficient management and maintenance, machinery defects in boilers and generators and labour problems are said to be the reasons affecting the normal functioning of TTPS in Orissa.

Besides the low-generation of electricity there are some other critical problems like the financial stringency in OSEB, presently acting as the sole power transmission and distribution body in Orissa. The total income of OSEB before the January 1988 tariff revision was Rs. 18 crores per month. The total expenditure was Rs. 25 crores per month. Hence a shortfall of Rs. 7 crores per month or Rs. 84 crores per year.

After January 1988 revision, the estimated total income of OSEB is 22 crores per month and total expenditure is 28 crores per month. Thus an annual shortfall of Rs.70 crores, A figure of the loan liabilities of OSEB from various sources is given below :

	Loans upto 1986 Rs. in crores	Loans in 1987-88 approximately.
Capital from Government	192	200
Capital from Bond	124	140
Capital from REC	102	132
Capital from LIC	59	75
Capital from others	31	60
	508 crores	607 crores

The total loan liabilities of Rs.607 crores, including other obligations, will be around 650 crore in 1987-88. A major portion of the capital mobilisation during a year goes to two heads, i.e., loan instalment payment (Rs.48 crores annually approximately) and interest payment [approximately Rs.50 crores annually].

Thus the income-expenditure gap of Rs.70 crores approximately along with the loan liability of around Rs.650 crores definitely poses a challenge to Orissa State Electricity Board. Government's aid to Orissa State

Electricity Board is meagre. It is even less than Rs.1 crore [66 lakh]. So far as subsidy is concerned, the Govt. of Orissa has stopped paying subsidy for rural electrif cation since 1977-78. The actual loss up to March 1986 on account of rural electrification is Rs.80.40 crores and the claim has been made by rissa State Electricity Board for Rs.60 43 crores. But not a single pie has been paid as subsidy. If the interest payment will be added, it will be a much high figure. A detail figure of the actual loss and loss claimed is given below over the period 1976 77 to 1985-86 :

Year	Actual loss Rs. in crores	Subsidy claimed Rs. in ctores.	Subsidy paid in Rs. crores.
1976-77	24.60	24.60	24.60
1977-78	3.40	3.40	
1978-79	4.60	4.60	
1979-80	6.20	6.20	
1980-81	5.80	5.80	
1981-82	8 20	5.80	
1982 83	12.10	8 80	
1983-84	11.00	7.50	
1984-85	13.80	11.61	
1985-86	15.30	12.52	
Total loss	80-40	60.43	

Out of 46,992 villages in Orissa, a total of 24 903 villages have been electrified till March 1987 which is 53% against the all India average of 68%. Despite this expansion, Orissa has remained 4th in list from bottom in percentage-wise electrification but 5th from top in number of villages to be electrified. Besides rural electrification, Orissa Electricity Board provides electricities at a subsidised rate to various other sections like :

Section	Total Number	Number in 1986-87
Hamlets	2387	55
L. I. pumps	32617	2615
Tribal villages	6596	293
Harijan Basti	2424	455

The tariff rate in case of Lift irrigation Schemes is highly subsidised [22 paise per unit whereas for commercial sector it is Re.1/- per unit]. Besides, 50% of the cost of transmission lines which is to be borne by Orissa State Electricity Board is not paid up by Orissa Lift Irrigation Corporation (OLIC) in due time. The arrear bills are also heavy.

Diversion of electricity from industries fo domestic sector results in loss of revenue. Industries consume 73.07% of the total electricity, domestic sector 10.10%agriculte 2.26% and others like commercial and bulk purchase consumption is 14.57% The sale prices of electricity to various sectors are as follows:

Industry	Small Scale	53 paise pet unit
	Medium	54 paise per unit
	Large	60 paise per unit
	Heavy	65 paise per unit
Domestic		44 paise per unit
Commercial		92 paise per unit
Irrigation		22.6 paise per unit
Bulk supply		Rs. 1.00 paise per unit
Railway Traction		Rs. 1.00 paise per unit

The revenue income from :

Industries	70.49%
Agriculture	1%
Domestic	8.2%
Others	20.31%

As industrial tariff rate is higher than domestic tariff, diversion of power from industries to domestic sector to avoid public discontentmen leads to loss of revenue. It is a popular measure and government shoul adequately compensate the loss by providing aid.

The cost of power purchased from outside is much higher than the consumer price in the domestic and other priority sectors including industries.

Cost of power purchased

Nalco	....	80 paise (1st 300 mu* at the rate of 50 paise per unit.
Farakka	....	72 paise next 150 mu at the rate of 75 paise per unit.
Chuka	....	51 paise next units at the rate of 85 paise per unit.
MPSEB	....	85 paise per unit
EREB	....	58 paise per unit (supply is much less)

* 1 MW = 8.76 mu million units)

The price at which electricity is sold to various sectors except in bulk supply and raiway traction is less compared to the purchase price of electricity. In this way Orissa State Electricity Board also suffers from losses. The causes of Orissa State Electricity Board's losses are mainly due to the heavy power wastage which accounts for 43% of the generation capacity, out of which 23% of loss is suffered from Transmission and distribution losses (T & D losseses) against the all-India average of 21% and 20% of loss is suffered from pilferage. The figures for T & D losses are given below.

Year	T & D losses as a percentage of actual generation
1974-75	11.7
1975-76	14.6
1976-77	13.4
1977-78	14,2
1978-79	18.3
1979-80	18.3
1980 81	18.5
1981-82	18.3
1982-83	17.96
1983-84	17.49
1984-85	17.97
1985-86	23.3

The above table shows that the T & D losses have more than d ubled in 10 years time. According to technical experts, the ideal loss of transmission is 2% and at the worst case it can go up t› 40%. Some believe that a portion of unaccounted power has been attributed to the system loss and the rest is attributted to pilferage.

When the loss due to pilferage is said to be as high as 32% of the total available elecricity, no sensible person can totally blame the domestic consumer or commercial customers on charges of pilferage and theft of electricity because the total consumption in both the sector is less than the total loss. So, there must be some amount of pilferage in other sectors including industrial sector. It has been reported that 500 meters are not functioning in industrial units and in many more cases complaint has been made against the faulty meter-reading. Revenue amounting to Rs.40 crores has been locked up in dispute (litigation, pilferage etc.)

What is to be done at this juncture is a joint effort by the Governmet and all those involved in power generation and transmission and consumption. Some suggestive measures are given below for adoption to overcome the p›wer crisis in Orissa. These are :

(1) More and more projects can be undertaken in proportion to demand which seems to be an impossible task in the present financial situation of the Orissa State Electricity Board.

Mini, micro generating sets should be set up although it has a high errecting and commissioning cost by the use of water previously used at one point of the river.

(2) Urgent efforts to be made to raise the actual generation to the level of 50% of the installed capacity. This can be done by :

i) decentralising all the generating projects under separate authorities and creating a sense of competitiveness among themselves by awarding incentive awards, trophies, recognition etc. to the higher generating units.

ii) Maintenance and service contracts to be made in case of existing projects.

iii) For new projects contracts to be made on a turnkey basis and after that service, maintenance contract also to be made for longer periods.

3) To enforce strict supervision against pilferage and theft of electricity, electricity supplied to different divisions and sub-divisions are to be metered and accountability is to be fixed in case of large gap between supply of electricity and collection of revenue. This can check the pilferage upto 90%.

4) Amendments are to be made in the Eleetricity Supply Act to avoid litigations in payment of tariff. Payment of tariff should be made at the first hand. After that any complaint regarding meter reading etc. can be enquired. Responsibility of installation of meters is to be bestowed upon the consumers.

5) Power to be provided on a flat rate basis in case of domestic and commercirl consumers and billing system to be made computerised. This system has proved to be a success in some State Electricity Boards.

6) Flat rate should be fixed taking into consideration one's consumption potential of electricity. For each household (a declaration to be made by the houseowner regarding the use of electric gadgets along with simultaneous survey and inspection) to know the consumption potential.

7) Short-term loans with high interest rates to be discouraged. Long-term soft loans to be arranged for modernisation, expansion, maintenance etc. Revenue loss due to government legislation should be adequately subsidised every year.

8) Privatisation with limited government control over some important areas like distribution of power ro different sectors could have been a better solution but it cannot be implemented because of political interest. So at least some autonomy can be given in administrative field. Implementation of a system similar to MOU (Memorandum of understanding) which has been recently implemented in two major public sector undertakings one of which is SAIL can also yield better results.

9) Last of all, efforts should be made to reach each and every consumer

through consumer education programme. Domestic consumers can be advised to use low energy consuming devices. This can be achieved by publicity through newspapers, audio, visual media etc. Industrial consumers should be educated through training, seminar and workshops, on conservation of energy.

We have di cussed different aspects of the power crisis in Orissa like the present situation, its causes and some suggested remedial measures. Experts must have given their opinion or advice to tackle the situation. If the suggested measures are taken into consideration seriously for implementation, some of the present crisis can be avoided and Orissa can be a surplus State in power generation by 1995.

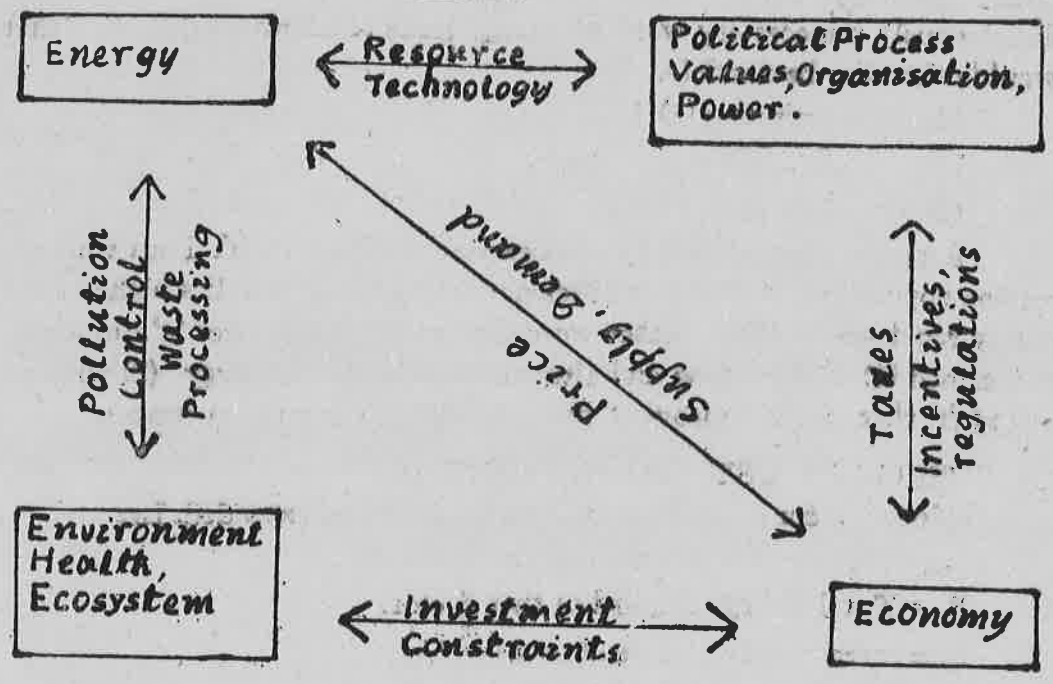
Strategy for the Development of Renewable Energy

Dr. Kumar Das
Reader in Economics
Utkal university

1.1 Energy is the basic natural input without which the existence of mankind is quite impossible To a common man it is a commodity like, gasoline, gas or electricity to an industrialist, it is the heat required to power his gigantic machinery; to an economist it is the key ingredient for economic prosperity. It lights up the right with the splendour of the day, it extends the range of human vision, it multiplies the power of human and animal muscles it accelerates motion, it annihilates distance, and facilitates human interaction. In short, it has played a key role in the evolution of modern day civilisation We are all dependent on energy of one kind or another. It is quite clear that energy in one form or another enters practically every economic activity and its availability and cost determines the economic future and prosperity of a country as well as the quality of life of its people. To-day a country is considered rich not by the amonnt of mineral or industrial resources it posseses but by the technological ability it has acquired, and the scientific progress it is making, which depends ultimately in the supply of energy, pattern and extent of its energy consumption.

1.2 Energy consumption is an unavoidable thing of any activity. The process of production and development can not proceed without the consumption of some form of energy. Energy and economy of a country are highly intertwined into a complex system comprising m ny compartments, which are inter-connected. (Shown in Fig -1). The Figure below illustrates the interaction and inter-depehdence between the energy sector with environment, Ecology and the economy. Energy plays that role in an economy, which 'food' plays in the biological survival of a living being. It is the back-bone of every nation and life-blood of every economic activity.

Fig. 1.



1.3 ENERGY IN A REGIONAL CONTEXT :

Here let us look into a very simple model. wich describes the need for the development of the, energy sector for accelrating regional development. Let total energy requirement of the Region per annum be denoted by 'E.' The per capita energy cons umption (e) averaged over one year related closely to provision of food and manufactured goods.

The total energy requirement of the Region is :

(1) $$E = e.\ N.$$

Where N represents population of the region.

Gross Regional Product measures the level of development. Per capita Gross Regional Product denoted as 'g' being a crude measure of standard of living of the region depends upon the energy efficiency parameter (t).

(2) $$g = e.t$$

Where t, the efficiency parameter is a complex and non- linear coefficient itself being a function of many factors. It represents the effi-

ciency of energy transformation into wealth. It should be as large as possible, obviously unnecessary waste of energy leads to a lower value of 't' than would otherwise be possible.

Hence substituting (2) in (1)

(3) $E = (gN/t)$

(4) $Et = gN$

Regional development implies exponential rise in 'g'. Thus with the soaring population, at constant efficiency 't' higher 'g' implies higher total energy requirement (E). In other words, given growth rate of 'g' cannot be maintained (1) without new and alternative supplies of energy (2) without raising 't' that means improving the energy transformation process.

1.4 ENERGY IN A SECTORAL CONTEXT :

Analogously for a given sector, the logic may be extended. Let

X_A = volume of production of the Sector A.

R_A = Total Energy requird in that Sector.

e_A = energy used per unit of A's Product.

(5) $R_A = e_A . X_A$

Value added per unit of product, which measures the profitability and economic viability of the sector, depends upon the efficiency parameter 't'. Thus

(6) $q = e_A \cdot t_A$

$\therefore e = q/t_A$

Substituting (6) in (5) we obtain

(7) $R_A = q . X_A / t_A$

$\therefore R_A \cdot t_A = q.X_A$

The last equation implies that if the volume of production is to be raised, or if value added per unit of product is to be stepped up or both then we are required to (I) develop new alternative sources of energy (II) and improve efficiency in energy use.

Hence the critical relationship between energy input-and economic development needs no explanation. The low level of energy input, and

inefficiency in its use in both agriculture and household industry in Orissa for example has resulted in low productivity, leading to low income and pervasive poverty. If its economic growth is to be accelerated and if quality of life of people is to be improved by reducing unproductive human and animal drudgery, an increase in the level of energy consumption and efficiency in energy-use system is urgently necessary.

1.5 SOURCES OF ENERGY :

There are five ultimate sources of energy ;

(1) The sun.
(2) The motion and gravitational potential of : Sun, Moon and Earth,
(3) Geothermal energy from : Cooling Chemical reactions and Radioactive decay in the Earth.
(4) Nuclear reactions on the Earth.
(5) Chemical reaction from mineral sources.

1.6 TYPES OF ENERGY :

There are two types of energy classified on the basis of their source of flow ;

(1) Renewable Energy.
(2) Non-renewable energy.

The Renewable energy is derived predominantly from first three sources cited above, whereas the non-renewable energy is obtained mainly from last two sources.

1.6.1 RENEWABLE ENERGY :

Renewable energy is a type of non replenshible energy obtained from the continuous or repetitive currents of energy occuring in the natural environment. It passes through the environment as a current or flow, irrespective of their being a man made device to intercept and harness this power. It is also called as 'infinite' or non-conventional energy. The examples are ;

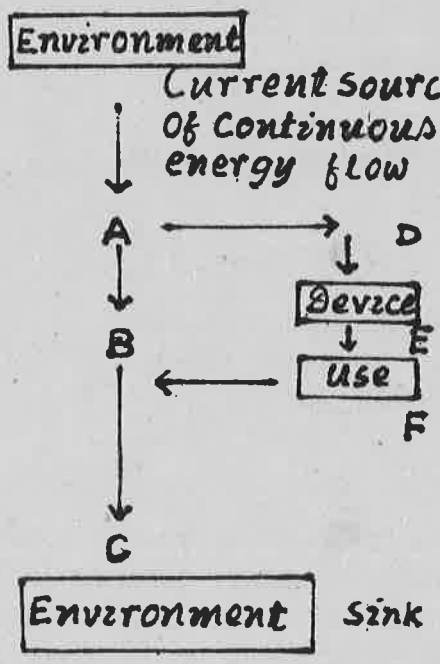
i) Solar
ii) Geothermal
iii) Wind
iv) Tidal
v) Wave
vi) Fire wood (Bio-mass)
vii) Vegetable waste
viii) Cow-dung, night soil & animal waste
ix) Bio-gas.

1.6 2 Non-Renewable Energy:

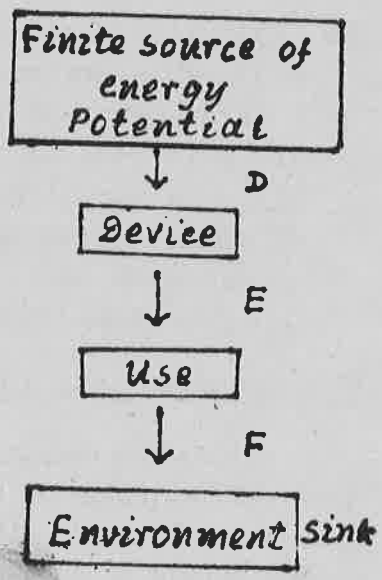
It is a type of depletable energy obtained from static stores of energy that remains bound unless released by human interactions It refers to isolated energy potential and external action is required to initiate the supply of energy for practical purposes. It is also called 'finite' or conventional energy being commercialised. For example –

i) Coal
ii) Nuclear fuel
iii) Oil
iv) Natural gas
v) Hydro-electricity

Fig. 2.



Renewable Energy



Non-Renewable Energy

1.6. 3 These two definitions are portrayed in Fig. 2 above, where a comparision can be made.

Renewable energy refers to environmental energy flow A--B--C, where as Non-Renewable energy refers to the harnessed energy flow D-E-F. The former is always extracted from the flow of energy already occuring in the environment. This energy is then returned to the environment, having lesser environmental impact.

1.6.2 COMPARISON BETWEEN RENEWABLE ENERGY AND CONVENTIONAL ENFRGY SYSTEM :

	Basis	Renewable Energy	Non-Renewable Energy
1.	Example	Wind, Solar, Biomas, Tidal, Wave etc.	Coal, Oil, Gas etc.
2.	Source	Natural Local Environment.	Concentrated stock.
3.	Normal State	A curtent of energy an income.	Static store of energy : a capital.
4-	Life time supply	Infinite	Finite
5.	Cost at source	Free	Increasingly expensive.
6.	Cost of equipment	High	Moderate
7.	Variation in supply	Fluctuating	Steady
8.	Supply Cost.	Low	High
9.	Control	Feed forward	Feed back
10.	Scale	Small	Large
11.	Intencity	Low	High
12.	Safety	Mild local hazards possible in operation.	Most dangerous when faulty.

13.	Pollution	Little environmental impacts confining the region.	Massive environmental pollution : air, water, common and wide spread.
14.	Dependence	Encourages Self-sufficient system	Encourages a system dependent on out-side input.
15.	Context	Rural, Decentralised system.	Urban, concentrated system.

It is essential that sufficient renewable current is already present in the local enevironment. It is not good practice to try to create this energy current especially for a particular system. It is obvious that bio-gas production should only be contemplated as a by-product of an animal indusry already established, and not vice-versa. The practical implication of this principle is that the local enevironment has to be monitored and analysed over a long period to establish precisely what energy flows are present. In Fig.2 A,B,C must be assessed before the diverted flow through D,E,F is established.

The end-use requirement of energy vary with time. If power is provied from a finite (non renewable) source, such as oil, the input can be adjusted in response to the demand. Unused energy is not wasted, but remains with the source. However, with renewable energy system not only the end-use vary uncontrollably with time but so too does the natural supply in the environment. The conventional energy is most easily harnessed centrally and is very expensive to distribute. On the contrary, renewable energy is most easily harnessed in dispersed locations and is expensive to concentrate

1.7 STRATEGY FOR RENEWABLE RURAL ENERGY:

The ability of the local, regional environment to supply the energyflow and the suitability of the community to accept the energy very greatly. So no one renewable energy system is universally applicable. Therefore, making simplistic international, national or state plans for renewable energy is quite an irrelevant exercise. Renewable energy is a very flexible system. Unfortunately, large urban and industrial societies are not well suited for such intensity, flexibility and fluctuation. Fortunately, however, renewable

energy sources are available in remote and less privileged regions of the rural economy. So one can safely deduce that renewable energy supplies can provide a satisfactory living standard (but only if appropriate devices exist to harness such energy satisfactorily at lower cost). Hence the use of renewable energy favours rural development not urban growth.

Renewable energy planning should constitute an integral part of regional planning. and environmental potential energy with space. The means to bridge the gap between energy requirement and its availability are 'area specific'. So the strategy of energy development has to be related to regional problems and priorities. Hence instead of exercises at the macro-level, regional planning should have regional energy planning as a vital component. It has to include two vital factors for improving or at least. maintaining the social benefit from the energy-use. These are:

1) Harnessing of renewable sources of energy, and

2) The increase in the efficiency of this energy-use. While framing policies for proper and efficient utilisation of available sourees of energy, the region requires a long-term strategy and for solving the energy problem a change in the composition of energy sources is essential. The long-term needs of the region require the rational use of existing sources of energy and proper dovelopment of the potential source. The long-term solution to the energy crisis, therefore, lies in developing alternative viable sources of renewable energy, What is needed is to evolve regional policies and measures so that energy conservation and substitution becomes economically sound both from regional. sectoral as well as consumers' points of view.

The present energy crisis has underlined the need for reorentiation of the existing development strategies and for changing the life-style particularly of the affluent elite class. We need nothing less than a radical restructuring of the energy base of the region. Conservation must be assigned a central place in the whole of energy strategy of the region. Even at this stage there is the need for devotailing the new energy policy with industrial policy, agricultural policy, and regional policies to ensure optimal utilisation of the energy base.

In the context of increasing depletion of conventional energy sources, renewable sources of energy are better viable alternatives The resource base of renewable energy is extremely large. So the exploitation of the renewable sources should be the kingpin of our regional energy strategy for the future. Most of the Governments including thereof Orissa have substantial plans directed towards the propagation and commercialisation of renewable energy. Although the scale of application widely varies, 3 basic questions have to be posed when plans are directed towards the propagation and commercialisation of renewable energy. Although the scale of application widely varies, 3 basic questions have to be posed when one goes to consider any practical application or renewal energy. These are :

(1) How much energy flow is available in the local environment ?
(2) For what purposes can the harnessed energy be used ?
(3) What is the cost of the energy developed ? It is relatively cheap or not ?

The first two questions mainly concern to the engineers, environmentalists and the technocrats, but the third one understandably dominates the mind of the energy consumers and should always become the final question for policy decisions. Renewable energy is likely to be economical only when these two conditions are satisfied :

(1) Distinctive scientific principles of renewable energy have been properly understood and applied.
(2) Each stage of the energy harnessing process is made efficient in terms of both minimising losses and maximising economic and social benefits.

When these conditions have been met, it is possible to estimate the costs and benefit of a particular scheme and compare these with alternatives for an economic assessment. Failure to understand the distinctive scientific principles for harnessing renewable energy will almost certainly lead to poor engineering and uneconomic operations. Every generation process should aways follow quantitative and comprehensive assessment of energy-end-use requirement. System efficiency calculation is most revealing and should pinpoint unnecessary losses.

Economics of Electricity in Orissa

Lakshmi Narayan Dash
Research Scholar
Department of Economics
Berhampur University

Electricity is a critical input for economic development and social progress, This paper examines supply of and demand for electricity in the State of Orissa over the last three decades. It also tries to spell out future prospects regarding generation and consumption of electricity.

Supply Side :

Table-I gives a picture of sources and quantities of electricity generation. There are basically three sources of supply : thermal, diesel, and hydro-Generation from diesel has dried up. Hydro electricity is the major source of supply followed by thermal power. Thermal energy produced in 1970-71 was 522 million K. W. H. As against this, hydro-electricity went up by 19 times from 125 to 2391 million K. W. H. Total supply of electricity went up by 450 tin es between 1953 to 1985.

Orissa ranked very low in the country in regard to generation of power at the dawn of the planning era. In 1950 the installed capacity was only 4.6 M. W. in public utility power stations and 5 M. W. in industry-owned power stations. The First Five-Year Plan allotted Rs, 514.49 lakh for expenditure on the schemes of Machkund Hydroelectric Scheme, Duduma Transmission Scheme, Small town and Rural Electrification Scheme, Cuttack Thermal Scheme, and Hirakud Power utilisation, The installed capacity in public utility power stations rose to 20.50 M. W. and in industry-owned power stations to 11 47 M. W. giving rise to a total capacity of 32 M. W. The Second Plan witnessed an increase in the installed capacity to 260 M. W. Orissa's share in the country's installed capacity and generation rose from 0.27 per cent in 1950 to about 3.6 per cent in 1960-61. The Third Plan target was to increase the generating capacity of public utility plants to 570 M.W. This, in turn, led orissa to

account for 4.6 per cent of the country's capacity, The provision for power in the Third plan was originally Rs. 44.62 crores. This later on increased to 56.73 crores due to increase io expenditure in the Talcher Thermal Scheme laying the transmission lines to connect Balimela Project with other electricity systems, inclusion of the Hirakud Stage III and addition of some new items in the "Transmission and Distribution" Scheme. The generation from hydroplants shot up from less than 0.1 per cent to 98.4 % in 1960. This was mainly due to the commissioning of the Hirakud and Machkund hydroelectric projects. At the end of the 3rd Plan the installed capacity increased to 310 M·W. Rural electrification received little attention during the First and the Second Five-Year Plan periods. The Third Plan extended its attention to rural electrification programme and provided for an outlay of Rs.1.4 crore for electrifying 165 villages. The Fourth Plan was expected to generate 920 M.W. of installed capacity and electrify 750 more villages so that the total number of electrified villages would be 1571. The Plan provided for an outlay of Rs.66.57 crores for power section. It proposed to complete the continuing schemes and to start the preliminary work af two major projects like Upper Kolab and Upper Indravati. During this period it was estimated that at the end of the-Fourth Plan the peak load would be 627 leaving a surplus of 11.75 M.W. However, it was also calculated that there would be shortage of power by the year 1975-76. Keeping this in view the Upper Kolab (160 M.W.) and Upper Indravati (600 M.W.) hydroelectric projects were proposed to be taken up towards the later part of the Fourth Plan. This Plan under its Rural Electrification Programme gave priority to Lift Irrigation points and made a provision of Rs 2 crores for the energisation of 2,000 Lift Irrigation points.

Demand Side: Electricity in the state is broadly demanded for domestic, commercial, industrial, street lighting, public water works and pumping and irrigation uses. The total demand for electricity in 1954 was 4.08 million K.W. H. This increased to 317 million K.W. H. in 1960. The per capita consumption of electricity in the state increased from 14 to 25 units during the First Plan-period. Industries always have a lion's share in the consumption of electricity. Industrial consumption in 1950 was 62.6

lakh crore K.W. This increased to 4. 6 lakh crore in 1935. In 1960 industrial consumption went up to 307 million K W. H. It was 96. 6 % of the total electricity consumption in the state. Consumption for irrigation accounted the lowest (0.04 million K.W.H.) in the same year. The total demand for electricity was increasing at a rate of 30% per year before the Third Plan.

The per capita consumption has become almost 3 times from 1960-61 to 1983-84 The demand rose to 380 M.W. in October 1980. Rapid industrialisation and rural electrification escalated the demand to 680 M.W. in October 1983 while the supply growth rate was between 18 to 20%. This rate of growth has taken place inspite of the load restrictions and power cuts. Notwithstanding the severe power shortages, bulk industrial loads have been committed in order to maintain the tempo of industrialisation. Futher, the national objective of 100 per cent rural electrification during the Seventh Plan period is most likely to increase the growth rate much higher than the rate suggested by the power survey conducted by the Central Electricity Authority. The plan, on the other hand, envisages 9 per cent growth rate as suggested by the twelfth power survey.

Conclusion :

[i] In the 1950s and early 60s and in the late 60s and early 70s, supply and demand sides matched. From 1962 to 1967 consumption of electricity fell below generation. From 1968 to 1972 there was excess of electricity generation. Acute shortage was felt between 1974 to 78. Despite these imbalances there has been a secular rise both in generation and consumption of electricity.

[ii] Large-scale industrialisation and provision for rural electrification together have caused acute shortage in power. The present supply capacity does not cope with the rise in demand. The crisis has crippling effect on industries for want of power supply. The present need of the state is to diversify sources of power, develop substitutes for domestic use of power and divert electricity to the much needed industrial growth.

[iii] Management of supply and demand is a perpetual adjustment affair. Location of power plants, grid facilities and zoning patterns will

ensure equitable distribution according to use. The present load shedding practice is discriminated in favour of the privileged groups, injurious to the interests of the basic industries and rural communities. The necessary compromise amongst the users has not been struck.

References :

Government of Orissa, planning and Co-ordination Department, Plan Documents.

TABLE - 1

Electricity Generated [Million K.W.H.]

Year	Thermal	Diesel	Hydro	Total
1953	....	....	....	8.04
1960	....	....	....	328.63
1965	....	....	....	995.919
1970-71	522.986	0.728	125.496	1778.210
1975-76	716.301	0.061	850.019	1566.381
1980-81	744.003	....	2391.400	3135.403

Sources : [1[Bureau of Statistics and Economics, Orissa - Statistical Outlines of Orissa 1962, 1971, 1980.
[2] Five-Year Plans of Orissa.

TABLE 2

Cansumption of Electricity in Orissa (Million K.W.H.)

Year	Domestic	Commercial	Industrial	Street Lighting	Public water Works & Swearage Pumping	Irrigation	Other	Total
1954	....	....	....	....	....	....	....	4.08
1960	4.80	1.96	307.00	0.66	0.24	0.04	2.93	317.63
	(1 5)	(-61)	(96.6)	(.20)	(.07)	(.01)	(-92)	(100.00)
1965	39.72	18.71	702.00	3.52	11.69	3.51	....	779.15
	(5.09)	(2.4)	(90,09)	(.45)	(1.5)	(.45)		(100.00)
1970-71	37.433	35.080	1405.379	5.250	18.016	4.855	109.490	1615.503
	(2.31)	(2.17)	(86.99)	(.32)	(1.11)	(0.3)	(6.77)	(100.00)
1975-76	61.914	46.863	1843.493	7.816	26,360	9.016	522.098	2517.560
	(2.45)	(1.86)	(73.22)	(.31)	(1.04)	(.35)	(20.73)	100.09)
1980-81	112.073	64.029	2094.300	9,031	33.500	15.894	115.676	2444.503
	(4 58)	(2.61)	(85.67)	(0.36)	(1.37)	(.65)	(4.73)	(100.00)

Source : Bureau of Statistics and Economics, Orissa : Statistical Outline of Orissa, 1962, 1971, 1981.

Note : The Figures in the brackets denote percentage of power consumption.

Position of Power in Orissa

Dr. Manoranjan Das
Lecturer in Economics,
Khallikote Colleg,e
Berhampur.

One of the basic infrastructures of development is Power or Energy. Without adequate provision of power, no country can achieve rapid industrialisation which is the means to step up the process of growth. The use of electricity is also gradually increasing in agriculture due to more use of pumpsets and other equipments. Due to urbanisation the demand for electricity has been increasing. The policy of rural electricication has created even more demand for electricity. In this context, the paper aims to study the position of power in Orissa. In this study, only the conventional source of energy (i. e., electricity) has been taken up.

Power Projects :

The power system in Orissa is pre-dominantly hydro-electric It constitutes about sixty percent of the total power production. The different main power projects sponsored by the Government in Orissa are : Hirakud Hydro-Electric Project, Stage-I & II with installed capacity of 270 M.W., Machkund hydro-electric project (Orissa share) with installed capacity of 34 M.W., Balimela hydro-electric project with installed capacity of 360 M.W. and Talcher Thermal Power Station with installed capacity of 470 M.W. The recent Multipurpose power projects are, Rengali Project with installed capacity of 100 M W., Upper Kolab with installed capacity of 240 M.W. and Upper Indravati with installed capacity of 600 M.W. Basides these, there is a small thermal plant at Choudwar. (1) Some large industries in the State have their own power plants about which data could not be provided.

1. Economic Survey of Orissa, 1983-84 (B. S. & E, Orissa) P, 41.

Plan Expenditures :

To meet the growing demand for electricity, government have been spending more and more on power during different plans. While the expenditure on power in First Plan was only Rs. 481.55 Lakhs, it rose to Rs. 18,336.29 lakhs in Fifth Plan and the anticipated expenditure during Sixth plan was Rs. 32435.11 Lakhs. Other details can be seen in Table-1.

Pattern of Consumption :

The pattern of consumption of electricity in the State has been presented in Table-II. This Table reveals that during the period 1973-74 to 1982-83, the consumption in the industrial sector was the highest. The percentage of consumption in this sector varied between 71.53 to 82.43. Out of the total consumption in the industrial sector, the bulk was by the large industries while the small and medium industries consumed roughly from two to maximum five percent. The consumption in the agricultural sector remained the lowest. The percentage of consumption in this sector remained lower than one percent up to 1977-78 and thereafter it increased but remained below three percent. The percentage of consumption for domestic purposes varied between 2.46 percent to 5,35 percent, For more details Table-II may be referred

Rural Electrification

The total number of villages in the state is 46992. prior to 1950, not a single village was electrified. During the First plan only twenty five villages were electrified. It rose to ninety three during the Second plan. During the Third plan 416 villages were electrified. During the Three Annual plans (1965-67 to 1968-69) 287 villages were electrified. During the Fourth and Fifth plan 7,912 and 5,428 villages were electrified respectively. The proposal under the sixth plan was to electrify 6400 villages. The percentage og villages electrified during the First plan was only 0.05 and during the Second plan 0.25. Thereafter it steadily increased. In 1983-84, the percentage of villages electrified stood at 47.92. Thus, by this date less than half of the villages were electrified. Table III may be referred to for details.

However, it may be noted that power supply to rural areas is restricted when there is shortage of power during the periods of drought, as water levele falls below normal in reservoirs. During such situations, lift Irrigation points and agricultural pump-sets remain idle for most of the time. Rice hullers and agrobased cottage industries also remain unproductive for numbe of days. (2)

Generation and Consumption:

The data on Generation and Consumpiion of electricity presented in Table-IV reveals that even though there has been increase in the generation of electricity over the years, still the State has been making purchases from other states to meet the cotsumer demands. The data indicate thet over the years 1961-52 to 1983-84, the generati on of electricity has increased from 628 million killowatts to 4032 Milion Killowatts. The consumption over the same period has increased from 556 Millien Killowatts to 3223 million Killowatts. The data further indicate that from 1961-62 to 1972-73 and again from 1979-89 to 1983-84, the cansumption was below the generation of electricity, from 1973-74 to 1978-76 consumption was higher than the generateon of electricity. In various years purchases of electricity have been made from different states. The necessity of purchase of electricity in the years in which the consumption of electricity was less than what was generated in the state is diffiicult to explain. It seems, proper essessment could not be done regarding the extent of generation and consumption during different years for which the purchases made from other states could not be utilised. It may be noted that even though the figures of consumption are below the figures of generation, it does not suggest that the State has surplus electricity. Due to improper planning and compulsory reduction in consumption such a situation has definitely arisen. For full details regarding generation, consumption and Purchase of electricity in differenec years Table-IV may be referred to.

---

2. Ibid. P. 52.

Conclusion :

The above study reveals that even though Government have been increasing expenditure on Power Projects in different Plans, yet the State has not achieved self-sufficiency in electricity. It has been purchasing electricity from other States. It is a known fact that due to want of electricity, particularly during Summer, industries and agriculture have not been able to work to the optimum capacity. There is also 'power cuts' for domestic consumption. Even though it is difficult to quantify the loss of production in different sectors due to want of power, all would agree that it is remarkably high. To overcome this, Government must take steps to utilise the Thermal units to the full capacity. The effective water level in hydro-electric projects like Hirakud must be raised by taking steps to remove the silt deposit. All mechanical breakdowns must be avoided. As long-run measures, more projects are to be taken up to meet the growing needs of electricity. Without electricity, our attempt to turn the wheels of industries will be futile.

TABLE I

Expenditure on Power Projects in Different Plans

Plan	Expenditure (Rs. in Lakhs
First Plan (1951-56)	481.55
Second Plan (1956-61)	1202.38
Third Plan (1961-66)	5171.00
Three Annual Plans (1966-69)	3316.82
Fourth Plan (1969-74)	8815.81
Fifth Plan (1974-78)	18336.29
Two Annual Plans (1978-80)	120.83
*Sixth Plan	32435.11

* Provisional (data of first four years)

Source : Economic Survey of Orissa. 1983-84 (B. S. & E., Orissa) pp. 267 & 268.

TABLE—II

Pattern of Consumption of Electricity in Orissa

(in percentage)

Sector	73-74	80-81	82-83
Domestic	2.55	4.24	5.35
Commercial	2.22	2.42	2.96
Small and Medium Industries	2.39	3.18	4.79
Large Industries	71.21	76.14	74.66
Industries (Total)	73.60	79.32	79.45
Public Lighting	0.38	0.34	0.37
Agriculture	0.43	2.24	2.77
Public Works	1.14	1.29	1.54
Others	19.68	I0.15	7,56
Total	100 00	100.00	100.00

Source : Economic Survey of Orissa, 1983-84 (B. S. & E. Orissa) pp. 54 and 230.

TABLE III

Number of Villages electrified in Orissa

Year	Number of Villages Electrified	Cumulative Total	Percentage of Villages Electrified
Before 1950	Nil	Nil	Nil
1961-65	416	534	1.15
1900-81	1573	18804	40.02
1983-84	1240	22520	47.92

Source : Economic Survey of Orissa, 1983-84 (B.S. & E., Orissa) p. 232.

TABLE IV

Generation, Consumption and Purchase of Electricity in Orissa
(In million Killowatts)

Year	Generation of Electricity	Purchase of Electricity from other States	Total (2+3)	Consumption of Electricity
1	2	3	4	5
1961-62	628	Nil	628	556
1970-71	1778	3	1781	1615
1980-81	3135	148	3283	2640
1983-84	4032	64	4096	3223

Source : Economic Survey of Orissa, 1983-84 (B. S. & E.. Orissa) p.229

Problems and Prospect of Electrical Energy in Orissa A Critical Appraisal.

Sri Surendranath Behera
Sri Ramesh Chandra Sarangi
P. G. Deptt. of Economics,
Ravenshaw College.

Introduction :

A well developed system of energy supply constitutes one of the basic infrastructures of economic development. Though Orissa is rich in mineral resources it stands at the bottom of the economic spectrum in view of the inadequacy of power supply the mineral resources are not exploited to the optimum extent for the purpose of rapid industrial expansion. The sources of energy supply can be broadly classified into two categories, viz, commercial and non-commercial. The commercial sources consist of energy obtained from the consumption of minerals and fosil fuels like Coal, Oil, Uranium and electric power obtained through thermal or nuclear generation or through hydroelectric process primarily. These sources account for 60 percent of the total energy consumption in the country. Non-commercial energy covers energy derived from human or animal efforts, biomass which includes fuel wood, cow dung, solar thermal devices, solar photo voltaics, wind mills and geo-thermal process. They are new, renewable and non-conventional sources of energy. However, the supply of electricity is the most convenient form of energy for domestic and industrial consumption. It is the viable form of energy which helps automation. The power system in Orissa is predominantly hydroelectric, constituting about 60% of the total power generation in the State. The purpose of the paper is to highlight the energy requirement in Orissa with particular reference to electrical energy and to find out ways and means to solve the problem.

The Nature of the Electrical Energy Problem in Orissa :

Power generation in Orissa has been considerably stepped up during the plan periods. Before the beginning of the First Plan, the total

installed capacity was 9.6 M W which increased to 32 M W at the end of First Plan. Consequent upon the commissioning of Hirakud Hydro-electric Project, it considerably increased to 260 M W at the end of the Second Plan and 316 MW at the end of the Third plan. With the installation of Talcher Thermal Plant, the corresponding figure was 563 M W at the end of Fourth Plan. In the Fifth Plan period it increased to 923 MW due to com n issioning of Balimela Hydro-electricity Projcct. The existing installed capacity of the completed projects by the end of 1982-83 is 1134 MW as detailed below :—

TABLE 1

Installed capacity of the completed Power Projects in Orissa by the end of 1982-83,

Project,	Installed capacity (in M W)	Energy capability in 1982-83 (In M W)	Actual generation 1982-83 (In M W)
1	2	3	4
Hirakud Stage I & II (H)	270	129	103
Machhkund (Orissa share) (H)	34	40	36.5
Thermal Power Station Talcher (T)	470	269	117
Balimela (H)	360	135	122
Total :-	1134	573	378.5

Source : Economic Survey of Orissa--1983-84.

Besides this, Orissa, gets 20 M.W. of power from Machhkund Power Project as its share from Andhra Pradesh on payment.

The power potential of Orissa has further expanded by the Rengali Project with the installed capacity of 240 M. W. and the Upper Indravati with the installed capacity of 600 M.W. In addition to this, the State Government has taken up installation of an additional generating set with a capacity of 37. 5 M.W. A detailed study and investigation has been taken

up for execution of a number of projects such as Lodani, Middle Kolab. Lower Machhkund, Budhabalanga, Lower Chipilima and Ib Valley thermal station. Two important power projects are expected to come up in the central sector schemes : (1) The super-Thermal Project at Talcher with the installed capacity of 1000 M. W., with expansion facilities for 2000 M. W is planned and (2) in Bhimkund multi-purpose project there is provision for installation of 500 M. W.

At the time of inception of planning in Orissa only 25 villages had been supplied with electricity. The programme of Rural Electrification gathered its momentum in the Fourth Plan as 7,912 villages were electrified till 1984. This is below the All India averge of 60%. It is worthwhile to mention here that Punjab, Haryana and Kerala have achieved 100% electrification of villages and the corresponding figures for Tamilnadu, Maharastra and Andhra Pradesh are 99%, 88% and 78% respectively. It is obvious that Orissa is lagging far behind the other States. The poulation served in Orissa so far is 66.35%.

Table No. II indicates a district-wise achievement of Rural Electrification in Orissa by 1983 84.

TABLE II

Sl. No.	Districts	Percentage of villages electrified including hamlets.
1	2	3
1.	Balasore	63.06
2	Bolangir	54.57
3.	Cuttack	70.10
4.	Dhenkanal	52.95
5;	Ganjam	46.19
6.	Kalahandi	29·73
7.	Keonjhar	52·81
8.	Koraput	27·20
9.	Mayurbhanj	42.64
10.	Phulbani	17.03
11.	Puri	61.53
12.	Sambalpur	52.38
13.	Sundargarh	62.36
	ORISSA	47.92

Source : Economic Survey of Orissa, 1981-84.

The district of Cuttack has the highest percentage of villages electrified, i. e. 70%, while Phulbani district has the lowest of 17% only. By applying x^2 - test to the above data, it is observed that the calculated value of x^2 is greater than the table value of x^2. Hence it is concluded that there is wider inter-district disparities in relation to the distribution of electricity. Power supply in rural areas was restricted due to power shortage during the period of drought, as water level fell below the normal level in the reservoits. Lift irrigation points and agricultural pump sets (12,958 energised at the end of March, 1980) remaind idle due to power shortage. Rice hullers and agro-based industries remained unprodutive during such periods.

The pattern of electricity consumption in Orissa

With the increase in power generation and supply of electricity the per capita consumption of electricity has increased. This is evident from Table III.

TABLE III

Generation and Consumption of Electricity in Orissa

Year	Electricity grnerated and purchased (in million KWH)	Electricity consumed (in million KWH)	Per capita consumption (in KWH)
1	2	3	4
1974-75	2335	1995	86.14
1980-81	3283	2640	101.03
1983-84	4096	3223	115.67

Source : Orissa State Electricity Board.

Thus the electricity generated and purchased has doubled whithin a span of 10 years. The per capita consumition of electricity is showing an increasing trend over the decade.

The pattern of sector-wise consumption of electricity is indicated in Table – IV.

TABLE IV (in Percentage)

Sector	1973-74	1978-79	1982-83
1	2	3	4
1. Domestic	2.55	3.48	5.05
2. Commercial	12.22	4.14	2.96
3. Industries	73.60	71.53	79.45
4. Public Lighting	0.38	9.29	0.37
5. Agriculture	0.43	1.23	2.77
6. Public waterworks	1.14	0.94	1,54
7. Others	19.68	18.33	7.54
Total	100.00	100.00	100.00

Source : Economic Survey of Orissa, 1983-84.

It is evident from Table IV that the consumption was highest in the industrial sector (about 80%) followed by domestic and commercial sectors. In the field of agriculture, the consumption was less than 1% before 1978-79, but it shows a slow upward trend to the tune of 2.77 in 1982-83.

Inspite of the perpetual effort on the part of the government to increase the power generation, the energy crisis has raised its ugly head leading to multi-dimensional problems. It upsets the vital sectors of the economy. The irregular monsoon and untimely rain are the regular features in our country. As a result of this the water level of the reservoirs is reduced. The capacity utilisation in the power plants has seldom exceeded 50% of the installed capacity. The total electric power availability lags far behind the total demand in the country. The deficit is growing at the rate of 8% per year. The problem of power generation has become so acute that frequent load shedding, power cuts, tripping and even power holidays have become regular features.

The problems in Transmission and Distribution of electricity:

The following problems are faced in the process of transmission and distribution of electricity.

1) The task of transmission and distribution is entrusted to the Orissa State Electricity Board. The transmission and distribution net-work of the Board has gone up to 59.096 circuit Kms. by the end of 1980. The funds available for the purpose may be considered as inadequate due to escalation of cost and revised scope of work of many lines such as Talcher-Jeypore SC line. Most of the villages are sparsely located in remote places. There is scattered habitation in tribal and back-ward areas. Consequently, the cost of electrification per village is higher due to Low density.

2) The programme of rural electrification involves forest clearance which is a destruction of a non-conventional source of energy and puts a heavy toll on environment, soil conservation and ecological balance leading to disastrous consequences.

3) Even in areas where electrification of the villages has resulted in substantial load materialisation, the concept of street lighting has not been widely accepted. Some of the house-holds are not willing to take service connections. This has reduced the revenue collection.

4) As regards irrigation the power supply has been so irregular that sometimes the crops fail due to the lack of water supply. In the event of use of diesel pumps, the expenses become fairly high.

5) There ample instances of wasteful use of electricity in rural and urban areas due to the carelessness on the part of the people. On the other hand, the loss of OSEB can be attributed to the undue exemptions or concessions extended to bing industrial undertakings like E.P.Steel.

Summary and Conclusion

In view of the multi-farious problems the following steps should be taken for the conservation of energy. This moy ensure efficient, optimum and economical use of the available energy resources.

1) The measure of price rise in the sector of elcctrical energy distribution may not provide a healthy solution to the energy crisis. It will

rather create a chaos in energy planning. It may adversely affect industrial production and retaro economic growth. However, there is a need for reform in energy pricing. The underpricing will not only lead to the loss of revenue, but it may also encourage wasteful consumption. Hence a careful policv of price fixation may be deemed necessary. On the other hand, it is not also possible to step up energy production significantly due to physical, technical and financial constraints. Hence the key to the solution of this problem lies in healthy and determined effort in respect of energy conservation and efficient usage,

2) In the conference on Energy Development held in New Delhi, it was strongly recommended to establish Integrated Rural Energy Centre, at least one village of every Development Block. There must be greater decentralisation of renewable and non-conventional or non-commercial sources of energy to these centres with an integrated net-work of biogas plants, solar thermal device. wind mills, tidal power and etc., making the villages self-sufficient in their energy needs. The non-conventional sources of energy are still in their infancy. The development of alternative sources of energy will reduce excessive dependence on hydro-electricity whose supply is neither unlimited nor ever lasting.

3) Keeping in view the limited stock of coal for generation of thermal power and the scarcity of water level of the hydro-electric projects of the State, there must be the introduction of solar photo-voltaic power plants for the supply of power, even though there is a high investment involved in transmission. The primary component of any solar photovoltaic device is the solar cell which facilitates the conversion of solar energy directly into electricity. Among the well known advantages of the photovoltaic power system, are the absence of moving parts facilitating early installation and maintennace, no noise or environmental pollution, no recurring fuel costs, reliability and long life. This system, is most suitable for installation in remote and isolated areas, forest and hilly areas. The fields of application of this source of energy are water pumping for irrigation, drinking water supply, community and street lighting, community T.V. and radio receivers, power supplies to mi r.wave repeater

stations. railway signalling, battery charging and etc. Salojiapally, an unelectrified village in Medak district of Andhra Pradesh was the first village in India to be electrificd by solar photovoltaics.

4) The National Power and Fuel Sub-committee under the Chairmanship of Dr. Meghnad Saha in 1940 reported that the backwardness in power is due to the absence of a definite National Power Policy of the State and there is need for amending Indian Electricity Act. The recommendation has immense significance in the present context.

5) New power station and/or extension of existing stations and new loads have to be planned together. The new loads would constitute the power demands of the heavy chemical, engineering and manufacturing industries making electric power available to the smaller towns and the countryside for small industries, lift irrigation and etc These demands are particularly pressing needs in the interest of the economic well being of the bulk of the rural population living away from urban areas.

6) The schemes are to be planned in relation to the conservation of fuel resources and joint use of river flow for irrigation and power. Since water used for generation of electricity is closely linked up with flood control, drainage of marshes soil conservation, navigation, irrigation, afforstation or even recreation of hydro-electric survey, there should be an integrated approach in consultation with bodies like National Water Power Resources Commission dealing with these problems.

7) An Electrical Utilities Control Committee should be formed to exercise a rigid control on the supply of electricity to industrial undertakings. The financial as well as technical working of every electrical undertaking should be under the knowledge of the appropriate authorities of the State. In respect of generation and distribution, the existing pattern of distribution of areas should be reorganised or re-modelled to realise higher standards of efficiency. There must be facilities for hire purchase of apparatus and assisted wiring on easy terms as people cannot afford heavy initial expenditure at one stroke.

8) The considerable conservation of energy can be achived through wide spread education and austerity such as putting off light, fans and other electrical appliances when not needed. Illegal use of electricity should be seriously viewed. These activities include consuming electricity directly from over head lines by hooks by the non-customers and making the metre out of order by customers, both in rural and urban areas. To check such illegal activities penalty provisions have been incorporated by amendment of Section 39 and Section 44 of Indian Electricity Act. Drastic actions are yet to bo taken by the Orissa State Electricity Board.

9) Rural electrification cannot be a solution to the rural energy problem. A larger section of the rural masses cannot afford electrification of their houses.

10) The conservation of energy can be secured by regulation of energy efficiency of major energy using appliances and rationing. There should be provision for extending subsides to consumers using energy saving equipments. However, precaution must be taken to see that gains in energy conservation are not swallowed by expanding bureaucratic machinery. There must be reguar periodical testing of meter for customers. The regular payment of electric bill should be insisted upon with fine on the defaulters.

Thus electric power is a very convenient, prospective and versatile form of energy for making a major contribution to economic development. But new and renewable sources of energy can go a long way in adding a new dimension to economic activities intended for up-lifting the standard of living of the people. However, the effective functioning of Talcher Thermal Plant may solve the power crisis of the State to a great extent during the period of fall in the water levels in the reservoirs of the three hydro-stations at Hirakud, Balimela and Machhkund. Besides the on-going hydro-electric projects, the early execution of Super Thermal power station at Talcher and Ib valley Thermal project will stabilise the power generation and supply and would restore confidence in the minds of the industrialists and entrepreneurs. The programme of utilisation of energy

has to be fully supported by a conscious policy of conservation which would ensure the avoidance of waste. The constant appraisal of resources, processes, techniques and choices in different sectors of the economy would be necessary so as to provide a healthy solution to the acute energy crisis. A conscious, rationalised and patriotic feeling to the part of the domestic consumers and entrepreneurs will go a long way in achieving the desired goal. An energy policy in tune with the industrial and economic development of the State is the need of the hour. To save power is to save money and to save money is to save the State.

Energy For Rural And Urban Hearths

Naba Krushna Sahu, I.E.S.
Project Evaluation Officer, Sambalpur,

Introduction :

Expenditure on fuel and light is a major item in the consumption basket of poorer people. From the 32nd and 38th round of N S. S. it is found that people having per capita consumption expenditure up to 50 rupees per month spend about eight to ten percent of the total expenditure on fuel and light in Orissa. (see Table-I). People of all expenditure class spend about six to seven per cent in both the rural and urban areas. Another interesting finding of these N. S. S. rounds is that, in spite of downward movement in purchasing power of all expenditure groups, they are spending proportionately more on fuel and light in 1983 (38th round) than they were doing in 1977-78 (32nd round). All these implys that, any adverse movement either in the availability of or price of fuels used by the poor would lead to increased misery for millions of people. Both rural and urban poor use non-commercial energy like firewood, animal dung, vegetable w ste, etc, to meet their energy demand for household purpose. Thus, their living standard depends on these above energy sources, besides basic necessities like food and cl th. A study of the demand and supply pattern of the firewood would throw more light on the energy problem faced by the mass of poor people in Orissa. The objectives of this paper are, (i) to analyse the domestic consumption pattern of both commercial and non-commercial energy, (ii) to estimate the demand and supply of fuel wood for both rural and urban population in different districts, and (iii) to suggest some methods to bridge the gap, if any, in the availability of fuel wood in Orissa.

Data base and Methodology:

The study is based on secondary information. The domestic consumption pattern of energy at all India level is estimated by the Fuel Policy Committee and we have arrived at distric and Orissa level figures by taking population as weights. It is assumed that the population growth rates of

70' swould continue in 80's. Again, the demand distribution between urban and rural populat on is done by taking into account the Seventh Five Year Plan's observation that "the pattern of rural energy consumption is dominated by non-commercial energy sources..... which form 90 per cent of the total energy consumed in the rural areas' and 'urban areas use around 80 per cent of commercial energy..... "(Govt. of India, 1985, page 65, 128). This is done at one point of time, viz., 1990-91. Supply of fire-wood from forest sources is worked out by taking the yield rate given by Fuel wood Committee Report (Govt. of India, 1985 page 127). Lack of precision is the main limitation of this sort of empirical work. Applying all India yield ratios, demand structure for fuel etc., to State and district level calculations mean acceptance of rough estimates. But the main purpose is not to calculate the exact quantities but to judge the tendencies and problems.

Fuel consumption pattern in Domestic Sector :

The fuel consumption for domestic purpose is dominated by non-commercial energy. And the most important item within the non-commercial energy is fire wood. At all Orissa level 80.31 per cent of total energy consumption in domestic sector comes from non-commercial source in 1978-79 and it would fall to about 60 per cent in 1990-91 (See table-II). 51.60 per cent of the total energy consumption comes from fire wood and wood for charcoal in 1978-79 and this would come down 38 per cent in 1990-91, This woul take place only when people substitute commercial energy for non-commercial as assumed by the Fuel Policy Committee. Again, in case of Orissa 94.83 per cent of total domestic consumption of energy in the rural areas comprise of non-commercial energy in 1978-79. For domestic eonsumption purpose, rural people rely mostly on fire-wood (60.95% in 1978-79). In 1990-91 they would still get about 56 per cent of their domestic energy demand from fire wood. On the other hand. urban people mostly depend on commercial encrgy. Their reliance on this type of energy would go up from 66.24 per cent in 1978-79 to 81 29 per cent in 1990-91, But one should remember that poor people of urban areas consume mostly non-commercial fuel in general and firewood in particular.

Demand and Supply of Fuel-wood :

District-wise demand for fuel wood in the year 1990-91 is calculated according to population share of different districts in Orissa, both for urban and rural areas (See Trble-III). It is found that at State level the demand for fire-wood and wood for charcoal would be 4490 thousand tonnes. Out of this, 4041 thousand tonnes would be demanded by rural people and the rest 449 thousand tonnes would be consumed by urban people. As the population of Cuttack district is comparatively high, the demand for fire-wood would be higher in magnitude. The lower magnitude of demand would come from the people of Phulbani and Keonjhar.

Supply of fire-wood originating from forest * is calculated in column 5 of Table-III. The total supply would be 4430 thousand tonnes at all Orissa level. The supply would be as low as 25 thousand tonnos in Balasore and as high as 655 thousand tonnes in Phulbani district. The gap between the availability and demand for firewood is given in column six. The surplus districts are Dhenkanal, Kalahandi, Keonjhar, Koraput, Mayurbhanj, Phulbani and Sundargarh. The rest of the districts would face deficit. Thus the problem districts are Balasore, Balangir, Cuttaek, Ganjam, and Puri. Though district level self-sufficiency is not feasible, one should remember that, as fire wood is locally collected and consumed, any shortage in its availability would affect the living standard of the rural poor first. Assuming that no fire-wood is exported out of Orissa, State level gap between demand for firewood and supply from forest would be about 60 thousand tonnes.

---

* Forest area is the reported area according to village papers for land utilisation purpose. As percentage of forest area to total area grow from 23.05 per cent in 1963-64 to as high as 43.00 per cent in 1980-81, the scope for its growth in 1980's is limited. Thus we assume that the present quantity of forest land would remain unchanged till 1990-91.

The problem :

The above mentioned calculation of gap between demand and supply of fire wood for domestic consuption purpose is mechanical. The gravity of the problem would only be realised when we analyse the alternatives available to meet the energy demand of rural and urban hearths. The fuel that is made available to the rural and urban population should be cheap and should be available easily.

Though the use of dung cake is common in rural and urban areas, its social cost is high. According to Seventh Five Year Plan Report, "Out of total estimated production of 324 million tonnes of animal dung (air dry), about 73 millions tonnes have been estimated to be burnt for energy purpose which is more than the total fertiliser consumed in agricultural production in India. If this animal dung was used as fertiliser food production would have been augmented substantially "(Govt. of India, 1985, page 127). According to another estimate, "a rupee spent in replacement of cow dung on farm wastes means an indirect earning of Rs 5/- to Rs. 10/- by way of production of additional food crops. "(Srivastava & Pant, 1979, page page 19). Thus deduction in the consumption of dung cake for domestic purpose would be economicl. Another alternative is bio-gas. But it is a well known fact that very few people could afford to instal bio-gas plant. Even community bio-gas plants are not well accepted. Though it is estimated by the Fuel Policy Committee that in 1990-91, electricity would provide about 8 per cent of domestic energy demand, its utility would be limited to only the richer section of the population. According to Programme Evaluation Organisation's survey, it is found that only 9.3 per cent of total rural electricity beneficiaries in Orissa fall in annual income group below 2500 rupees (Gyvt. of India, 1983). It is also found from the 31st round of N.S.S. that the share of domestic consumption of electricity by the lower 10 per cent of house-holds and persons in electrified village of Orisss were respectively 9.78 per cent and 9.13 per cent (Gill, Kumar & Giri. 1986). Again, according to Programme Evaluaion Organisation's study 71 per cent of people do not switch over to electricity due to lack of finance and according to 31st round of N.S.S , 76 74 per cent 'Can not afford' electricity in rural Orissa.

Soft coke, Kerosene and L. P. G. are other alternatives, but these are mostly used by urban rich consumer. At the present stage of scientific and technological development, non-conventional energy sources like solar and wind, also do not provide solution to energy problems of poor consumers. Thus we can conclude that fuel wood would be of over-whelming importance for people in future. Sufficient production of fire wood and the protection of forest should be the prime objective to meet rural energy problem. This would help in protecting the environment also.

Conclusion :

From the above discussion it is clear that there would be short-fall on availability of fire-wood in Orissa. This short-fall combined with the increasing commercialisation of fuel wood transaction would affect the living standard of rural and urban poor the most. This problem can be tackled from two fronts. First, by producing more fuel wood through farm forestry and community forestry by using idle land resources. Second, by energy conservation though the introduction of improved chullha and scientific food prepartion methods. For the success of these above methods, institutional, legal, attitudinal change is required.

Reference

Gill, B.S; Kumar, A and Giri, B.K. (1986) "A Study on Inequality in the consumption of electricity for domestic use in rural sector of States of India," Sarveeshana, Vol. IX-No 4.

Government of India (1985) Seventh Five Year Plan 1915-90 Vol II. Planning Commission, New Delhi. Government of India (1993) Evaluation of Rural Electrification Programme, Vol. II,, Programme Evaluation Organisation, Planuing Commission, New Delhi.

Srivastava, B P. and Pant, M.M. (1979) "Social Forestry in India" "Yojana," Vol. XXIII, No. 12.

TABLE–I

Share of Per Capita Fuel and Light Consumption Expenditure in Total Per Capita Consumption Expenditure in Orissa.

Per capita expenditure class.	N.S.S. 32nd Round		N.S.S. 38th Round	
	Rural	Urban	Rural	Urban
0-10	18.08	....	....	....
10-15	11.59	12.99	....	....
15-20	11 25	8.22	....	....
20-30	9.45	10.72	....	....
0-30	....	....	13.05	7.35
30-35	8.88	9.34	....	....
35-40	8.34	9.34	....	....
30-40	--	--	12.44	13.88
40-50	7.88	8.91	10.32	12.90
50-60	6.91	7.83	8.91	9.47
60-70	6.72	7.22	8.51	9.55
70-80	6.39	7.35	....	....
70-85	....	....	8.19	8.98
80-100	5.74	6.44	....	....
85-100	....	....	7.83	9.29
100-125	....	....	7.46	8.45
100-150	5.36	6.13	....	....
125-150	....	....	6.80	7.83
150-200	4.76	4.53	6.39	6.64
200-250	....	....	6.85	6.03
200-300	....	4.28	--	--
250-300	....	--	5.77	5.58
200 & above	1.74	--	--	--
300 & above	--	3.54	4.71	6.90
All expenditure	6.90	6.36	7.47	6.90

TABLE-II

Estimated consumption of Fuels for Domestic Sector in Orissa 1978-79 and 1990-91.

(Electricity in b. Kwh., rest is in 000' tonnes)

Fuel	1978-79			1990-91		
	Rural	Urban	Total	Rural	Urban	Total
Commercial :						
1. Soft coke	386	1544	1930	1472	5838	7360
	(0.80)	(10.36)	(3.08)	(3.20)	(20.83)	(9.92)
2. Kerosene	272	1088	1360	442	1768	2210
	(3.14)	(40.20)	(11.95)	(5.32)	(34.58)	(16.47)
3. L. P. G.	30	120	150	148	592	740
	(0.36)	(4 59)	(1.36)	(1.77)	(11.53)	(5.49)
4. Electricity	0 062	0.247	0.309	0.184	0 736	0.92
	(0.86)(	11.08)	(3.29)	(2,67)	(17.36)	(8.26)
	(5.17)	(66.24)	(19.69)	(12.97)	(84.29)	(40 14)
Non-commercial :						
5. Firewood & wood for char coal	4586	509	5095	4041	449	4490
	(60.95)	(21.70)	(51.60)	(55.71)	(10.06)	(38.32)
6. Dung cake (drv)	2258	251	2509	1755	195	1950
	(12.64)	(4 50)	[10.70]	[10.19]	[1.84]	[7.01]
7. Vegetable waste	1598	178	1776	1524	169	1693
	[2124)	[7.56]	[17.99]	[21.13]	[3.81]	[14.54]
	(94.83]	[33.76]	[80 31]	[87.03]	[15.71	[49.86]

Note : Estimates for Orissa is calculated from estimates worked out by the Fuel Policy Committee's All India estimates (Yojan, Vol. XXII/12, 1 July 1979, Page 23) by taking population shares as weights. 90 per cent of non-commercial energy and 20 percent of commercial engery is consumed in rural areas (Seventh Five Year Plan 1985-90, Vol. II, Page 65 & 128). Figures inside the brackets are percentage share of different fuels when they are converted in coal replacement.

TABLE III

Estimate of Demand and Supply of firewood and wood for char-col in the year 1990-91, District-wise and Orissa.

(in 000' tonnes)

Name of the districts	Demand			Supply total	Gap between demand and supply (5—4)
	Rural	Urban	Total		
1	2	3	4	5	6
Balasore	373	28	401	28	(—) 376
Balangir	223	21	244	134	(—) 110
Cuttack	736	66	802	90	(—) 712
Dhenkanal	256	20	276	317	40
Ganjam	384	50	434	387	(—) 47
Kalahandi	213	10	223	347	124
Keonjhar	165	19	184	271	87
Koraput	386	40	426	960	534
Mayurbhanj	238	14	252	313	61
Phulbani	114	6	120	553	433
Puri	444	66	510	229	(—) 281
Sambalpur	343	50	393	441	48
Sundargarh	165	60	225	365	140
Orissa	4041	449	4490	4430	(---) 60

Note . The estimated total demand for firewood and wood for char-coal of 4490 thousand tonnes for Orissa is distributed among the districts according to their population share. The supply of firewood is calculated by taking the yield rate of firewood from forest (1 tonne of firewood from 1.5 hectares of forest) as estimated from the report of the Fuel Wood Committee (1982).

Energy Problem in Orissa

Bimal Kishore Dash
Lecturer in Economics
Dhenkanal College, Dhenkanal

ENERGY is at the root of civilisation. We can not live without energy. We need it to cook our food, to light our homes and to run pumps and tractors in the fields. All forms of transport cars, scooters, buses, trucks, trains and aeroplanes need energy to run or fly. Industrial units need power to produce goods. There is also a direct co-relation between the level of economic development and energy consumption. More than 80% of the total world consumption of energy is by developed world which accounts for only 30% of the world population. On the other hand, 20% of energy is consumed by 70% of the world population in developing and socialist countries. (1) India has a very low per capita consumption of energy about one tenth of the world average.

There are many sources of energy. They can be grouped under two heads :

(i) Non-renewable or exhaustible, (ii) Renewable.

Non-renewable sources include coal, oil and gas which are exhaustible. We get energy by burning them. These are called fossil fuels. Experts feel that at the current rate of consumption, our oil reserves can last for just a couple of decades and our coal reserves at the most for 12 to 13 decades if no major finds are made. Hence there is every need to conserve these resources. Yet another source is nuclear energy. Here heat produced by the splitting of uranium atoms is used to produce steam from water and can run turbine generators. It requires high-cost sophisticated technology. All the non-renewable sources create pollution problems because of their waste products. The renewable sources of energy are : (i) Solar Energy (ii) Tidal energy (iii) Geo-Thermal (iv)Wind (v) Water (vi) Bio-Energy.

(1) E. L. Hinnawi and Biswas, 1981.

Energy from the sun and wind can be harnessed to do useful work such as heat water, cook food, produce electricity or pump water. Water can be a source of energy when it flows down the river or falls from a hight. The energy of falling water stored behind dams is used in producing hydro-electricity. There are other fuels like fire-wood, agricultural wastes such as straw. husk and animal dung which can be burnt to produce energy. Animal dung can be converted into bio-gas which can be used as fuel. These are inexhaustible sources of energy. Trees can be grown as long as land is available and animals will also produce dung. But the rate at which trees are cut is far more than the rate at which trees are being planted Besides it takes quite a lot of time for trees to grow. 93% of our village people use firewood for cooking. Indiscriminate cutting of trees creates ecological problem, land slides and flood. It has been estimated that India loses hundreds of crores of rupees annually by the wasting of top soil nutrients like potassium, phosphorous etc.

In the above theoretical background, the Energy problem of Orissa should be analysed and strategy should be formulated. The Government of Orissa recently published the Economic Report for the year 1987-88. It points out that the power situation in Orissa is characterised by shortages as in the previous two years. Hydel generation was severely impaired in 1985-86 due to inadequacy of rainfall and the modest improvement achieved in 1986-87 has suffered a set back due to the dry spell in 1987-88. Hydel projects account for 62% of the installed capacity in the State. Rationing of power became unavoidable and restrictions were imposed on the supply to industrial consumers having a constant demand of 1.5 M.W. or more. Even domestic power cuts are imposed.

The following table illustrates the installed capacity of power projects of Orissa and actual power generated.

Power Projects	Installed capacity (MW) 1987-88	Power generated (Million units) 1986-87	1987-88 upto 1/88
Hirakud	270	1108	889
Balimela	360	1052	530
Rengali	100	577	543
Upper Kolab	160 (Expected by 3/88)		
Machhkund (Orissa share)	34	329	265
Total H. E. Project	924	3066	2227
Talcher Thermal Power Project	470	1307	1124
Total	1394	4373	3351
Less Auxiliary consumption (In million units in the projects themselves)		143	124
Energy imported		774	1462
			Including 878 from NALCO Farakka, Chukha, APSEB, MPEB
Total availability of energy		5004	4689
Energy requirement (unrestricted)		7507	9022
Energy deficit (in percentage)		33.93%	More than 40 %

SOURCE : O. S. E. B.

It has been projected by 13th Load Survey that in Orissa the unrestricted demand for power would be 1584 MW in 1988-89 and 3283 MW in 1994-95. The installed capacity is 1394 MW. This speaks of the magnitude of energy problem in Orissa.

According to the optimisation studies on Long-Term Power Planning, adequate hydel generation in a total mix is essential for keeping the cost of power supply within reasonable limits. More of thermal electricity generation creates environmental problems and depletes coal reserved. Proper hydel Thermal balance should be maintained. The Industrial Policy Resolution of 1986 very rightly enunciates the incentives for setting up of captive power plants in Power Intensive Industries and

for introducing innovative measures for regulating energy consumption in the industrial sector. To ease the power situation new projects should be taken up and implemented on a priority basis.

	Installed Capacity (in M.W.)
Upper Kolab (3x80 MW)	240
Rengali Stage II (3x50 M W)	150
Hirakud (1x37.5 M W)	37.5
Upper Kolab Fourth Unit (1x80 M.W)	80
Potteru (2x3 M.W)	6
Upper Indravati (4x150 M.W)	600
Ib Thermal Power Station	840

Ib valley and Talcher area have got great potentiality, having coal reserves of 165 Million Tonnes and 951 M. tonnes respectively. These should be exploited. The State would get a share from the Central sector Super Thermal Power Plant at Talcher Stage I (2x500 MW) and assistance from the neighbouring systems as at present.

Besides the higher generation of power it is necessary to improve the plant load factor PLF)) of the thermal units to sustain the growing demand. The P.L.F. (2) of TTPS which was 31.77 % at the beginning of the sixth plan has gone upto 33.11 % during 1987. To improve the operational efficiency of the project renovation and modernisation sehemes should be initiated such that the P.L.F. goes upto about 45%.

Orissa is a State where the percentage of electrified villages is about 50 at the end of 1987-88. About 83 % of the people in Orissa live in villages, 80.34% of the total work force rely upon agriculture, and 28.3% of the cultivated land are irrigated. Consumption of electricity for irrigation and agricultural purposes is only 2.27% commpared to 19.10% at the national level. Electricity which is supplied to the rural areas is also not available always. Rural areas are in the dark most of the time. Under such circumstances it is highly necessary that non-conventional renewable

---

(2) P.L.F. in% = $\frac{\text{Units generated x 100 (CONTD).}}{\text{Installed Capacity in M.W. x 1000 x 365 x 24}}$

energy sources should be tapped. With this end in view, an agency called the Orissa Renewabe Energy Development Agency (OREDA) has been set up under the Department of Science, Technology and Environment in 1984. It receives grants-in-aid from State Govt. and Central Govt. Deptt. of Non-conventional Energy Sources (D.N,E.S.)

The following programmes are taken up by this department in the State.

1. **Bio-Gas Development:**

It is a combustible mixture of methane and carbon-dioxide. It is obtained when we allow any organic matter (bio-mass),animal dropping, human excreta, weeds to decompose anaerobically, i.e., in the absence of oxygen; methane accounts for the fuel portion of the gas. It can be used for cooking or lighting and when available in large quantities for power generation. The digested slurry is a nitrogen-rich organic manure. Being produced from locally available resources bio-mass energy would be cheaper and appropriate to local needs.

A case study was conducted in Heifer Rearing Farm at Bhogra near Athgarh. This is run by Utkal Gomangal Samiti.

There are 50 cows in that. They produce approximately 5 quintals of dung. A Gobar Gas Plant of 25 cubic meter size has been installed there. The dung is utilised for producing methane gas which is used for cooking purpose of the staff without any cost. The installation charge is very low as it is highly subsidised. This gas is also used for generating electricity equivalent to 3.5 KW. The generator producing electricity is run by 20% diesel and 80% gas. For 12 Hrs, 2.1/2 Ltrs. of petrol are necessary. Roughly, the cost on this head is Rs.10x30 = 300/- per month. If electricity would have been purchased it wonld have cost Rs.600/ .ISo it is economic and also a regular flow of electricity is guaranteed.

Besides, the slurry after production of electricity is used for producing NB 21, Hybrid Napier, Para Types of grass which are used as feed for cows. Other chemical fertilisers are not applied for grass cultivation. There has been a luxuriant growth of grass. There is a wind mill there which, if it rotates at 9 KM speed per hour, can lift 5000 Ltr.

of water from a depth of seven to eight metres. In a day it can lift 50,000 litres of water. Water lifting is no problem there and the entire grass field and cows are supplied water from there. The institution is a model one which has hygienic conditions, based on renewable energy and is making profit since its inception.

A plant size of 4 cubic meter requires dung of 5 to 7 cattle [50 to 60 Kg.]. It can provide gas for cooking for 12 to 15 persons. It saves 30 quintals of fuel wood and deforestation of 2.5 Hectares. It provides 30 tonnes of slurry having nitrogen content of 2%. There are different models caterings to the needs of differet persons. Big-sized gobar gas plants can electrify some villages and can provide irrigation facilities by energising pump sets. The National Programme for Bio-Gas Development has been launched since 1981-82.

In 1985-86, 9347 units were constructed against planning commission's target of 2500 and State Govt.'s target of 5000. Community Gas plants are operating at Village Janhitala in Dhenkanal and at Tundapalli in Koraput of 6 K.W. capacity. 80 families are provided electrcity there. One such C.G.P. is exclusively running on night soil in the scavengers' colony at PURI. Institutional Bio-Gas plants are running at Bhabindh in Dhenkanal District (10 cum). Bhogra (25 cum), Cuttack, Nandan Kanan (10 cum) running on animal waste from the zoo etc.

Under the National Programme for Demonstration of Improved chullahs which started in 1984-85 OREDA is popularising portable and fixed chullahs. Their efficiency is about 20% more than traditional chullahs and save 30% to 50% fuel. By using one improved chullah we can save 20 trees from cutting and the environment is congenial because of less smoke.

Solar cooker programme has been in existence for a number of years. Its sale, however, has not picked up due to lack of effective repair and maintainance back-up.

The department proposes to use Solar Dryers for drying agricultural products like chilly and tobacco.

Besides Solar water heating system and distilled water systems are provided by OREDA.

Micro Irrigition :

i) Wind Mills for water pumping is one of the most successful programmes in our State.

ii) Solar Energy for water pumping is exorbitantly costly. Researches are made to bring down costs.

iii) In the manual/animal operated pump 3 progtommes have been launched. One is improved tendas, hand operated reciprocating rower pump and the third is a bullock operated diaphragm pump. There is a huge demand for rower pump.

Aerogeneration

One of the promising projects implemented in this state is installation of a 500 K. W wind farm in the Puri sea coast. Electricity is generated from 10 turbines of each 50 K. W. capacity and is supplied to the State grid.

Hydel :

Hydel projects upto 1 MW capacity are taken by OREDA. At Badghagra near Keonjhar 40 K. W. micro hydel project has been installed.

Solar photo Voltaic power.

This power although costly is likely to be viable in areas where cost of taking conventional electricity is prohibitive and loads are very low. Ten such schemes have been implemented by 20.6.86.

Potentiality of harnessing energy also exists in tidal water and springs

In short, OREDA offers enough vistas for transmission from conventional, exhaustible and polluting sources to non-conventional renewable non-polluting and perennial energy so as to ensure sustained growth and economic development. Steps should be taken to minimise cost of production of such energies, improve aften sales repair services and to provide etension services in the rural areas. Energy plantation should be undertaken on a large scale, particularly trees which can be grown in a short time. Non-conventional energy sources should be popularised and be

made a mass movement, particularly in the context of a situation where 41% of villages are not still electrified and where people are steeped in abysmal poverty not being able to afford conventional electricity. OREDA should be activised and organised more effectively to solve the energy crisis in Orissa having no adverse environmental impact.

However, the fact remains that for manufacturing and for urban areas conventional electricity is a necessity.

Operational efficiency should be improved and hydel projects should be taken up in more number. One important point in this context is not only more generation of energy but conservation of energy Consciousness should be developed to save energy by switching over to tube lights wherever possible by using appliances of standard quality, switching off fans when not required, avoiding electricity during day time as far as possible. We should remember that one unit of power saved is equal to 1.25 units of power generated. The solution of energy crisis does not lay either in development of conventional or non-conventional energy alone but in an Integrated Energy Approach which includes afgorestation programmes and creation of consciousness for minimising misuse of energy.

REFERENCES :

1. Environmental priorities in India
   and sustainable development - By T. N. Khoshoo
2. Presidential address By Archana Shrama
   in the 1987 Bangalore
   Session of India Science Congress
3. 'O. S. E. B. at glance '- May 1987 Published by O. S. E. B.
4. Economic Report of Government of Orissa (87-88)
5. OREDA Bulletins.

Electrifying Rural Areas of Koraput District : An Assessment

Dr. **P. C. Mohapatra**
Lecturer in Economics
V. D. College, Jeypore
Dist : Koraput.

Power is acknowledged as a measuring rod to gauge the tempo of economic development of a region. With a majority of the people living in the rural areas, a region cannot be said to be developed until the conditions of these areas are developed. Supply of energy to rural areas helps to bring about technological revolution in agriculture, aids to develop and expand rural industrialisation and effects significant changes in the social and cultural life of the rural people in the direction of modernisation. Thus, the spread of electrification to villages is an important element in the process of rural development.

This paper attempts to discuss about the progress, problems and future prospects of rural electrification in Koraput District. The study is mainly based upon an analysis of secondary data made available from the District Statistical Hand Books and planning documents of the Orissa State.

Like in other areas of the country, initially the use of electricity in the Orissa State was restricted to urban areas for domestic lighting and industries. Only a few villages adjacent to urban areas were electrified. With a view to increasing food production, generating more employment opportunities and providing better living conditions in rural Orissa a rural electrification programme was initiated in the State during the First Plan period. However, this programme did not reeeive much importance during the first two plan periods. Only 25 villages were electrified during the First Plan and 93 villages in the Second Plan in the State. During the Third Plan as well as the annual plans also the progress in the field was slow as only 416 and 287 villages were electrified during these

periods respectively. The programme gained momentum during the second and third Year of the Fourth Plan Period. 907 and 2010 villages were electrified in the State in 1970-71 and 1971-72 respectively and by the end of the Fourth Plan 7912 villages were electrified in the State. During the Fifth Plan the achievement was 5438 villages. 6514 villages were electrified during the Sixth Plan Period. By the end of the Sixth Plan 23,745 census villages were electrified in the State and the percentage of villages electrified went up to 50.28. The Seventh Plan aims at achieving electrification for all villages of the State (1)

The rural electrification programme was launched in the Koraput district during the second year of the Fourth Plan Period. Table-I indicates the progress made in the rural electrification programme in the district since the year 1972-73.

TABLE-I

NUMBER OF VILLAGE ELECTRIFIED IN KORAPUT DISTRICT

Period	Total census villages in the Dist.	No. of villages electrified during the year.	No. of villages electrified up to the end of the year.	Percentage of villages electrified
(1)	(2)	(3)	(4)	(5)
1972-73	5683	137	195	3.4%
1980-81	5683	194	1188	20.9%
1981-82 to 1986-87	6393	903	2091	32.7%

Table-I, reveals that by the end of March, 1972, only 58 villages were electrified in the district. The percentage of villages electrified in the district was negligible as it was only 1.2% which is much below than the corresponding percentage of 8·2% for the State. By the end of March, 1987, 2081 villages were. electrified . There has been tremendous improvement

1. Government of Orissa, Bureau of Statistics and Economics, Orissa, Bhubeneswar : Economic Survey of Orissa-1983-84, Orissa Governmemt Press, June, 1985, p-52.

in rural electrification during the last sixteen years. However, the percentage of villages electrified in the district was only 32.7% by March, 1987. This is far below than the corresponding figure 51% for the State in the year 1984-85.

TABLE-II

NUMBER OF LIFT IRRIGATION POINTS ENERGISED IN KORAPUT DIST.

Period	No. of Lift Irrigation points energised.			Total No. of Lift irrigation points energised up to the end of the year.	State figure
	Govt.	Private.	Total		
(1)	(2)	(3)	(4)	(5)	(6)
1972-73	89	12	101	162	1710
1980-81	69	157	226	1028	15266
1981-82 & (Upto-Sept.)	....	....	1017	2045	....

Table-II reveals the progress with regard to energisation of lift irrigation points in the district. The number of lift irrigation points energised increased from 162 in 1972-73 to 1028 in 1980-81 and further to 2045 by Sept. 1982. However, it is noted in the study area that the working of L.I. Points is being hampered by acute and continuous power shortages causing enormous financial and production losses to agriculturists.

The establishment of Rural Electrification Corporation (R.E C.) in 1969 gave a boost to rural electrification in Orissa. The REC provides finance for rural electrification schemes in the country either by subscribing to special rural electrification bonds or by promoting rural electric co-operatives. It also provides finance to rural electrification schemes in the country

In Koraput district the rural electrification programme has been promoted to a large extent by the REC. Besides the normal development programmes of the State encouragement under the minimum needs pro-

gramme has also been responsible for the expansion of the scheme. The entire block of Chandahandi and Chandrapur as well as most of the Kashipur Block could find a place in the electric map of Orissa because of the assistance of R.E.C. authorities.

Problems of Spread of Rural Electrification to Rural Areas

The main obstacle to the spread of rural electrification programme lies in its unremunerative character. Of the various activities of Electricity Boards, this programme is the least remunerative one. In a capital scarce economy like Orissa, financing any unremunerative programme needs critical review.

Policy makers have shown their concern about the financial difficulties of the programme. A few of them have gone to the extent of suggesting upward revision of tariffs to solve the problem. However, this aspect has become a subject of controversy and a viable strategy is yet to emerge. A number of factors are responsible for the uneconomic working of the rural electrification programme.

High cost of production and distribution, transmission and distribution losses, pilferege of energy, low load factor and seasonal fluctuations have been identified as the main problems of the rural electrification programme-(2)

Campared to the urban areas, the initial cost of electrification in the rural areas is substantially higher. The cost of generarion, transmission ard distribution of electrical energy to rural areas is much higher than the paying capacity of rural farmers.

The unsatisfactory performance of the rural electricity programme is also due to heavy losses faced in transmission and distribution system. Transmission and distribution losses as a percentage of net generation by State Electricity Boards are as high as 22%. (3) It is true that certain amount of losses are inevitable in the system. But it has been pointed out

---

2. E.M.Naidu & M.Gowri Devi : Problems of Rural Electrifcation, Southern Economist, Vol 24, No.3, June-1, 1985 PP-13-15.

3. Vijay M. Deshpande : Rural electrification-problems and prospects, Economic Times, Sept. 29, 1981.

by the Rajadhyaksha Committee that the loss can be reduced to 15 percent by 2000 A.D.

Pilferege of energy is another main factor responsible for unaccounted loss of electricity in the course of its distribution. Unmetered and unauthorised use of electricity, theft of energy by customers by putting hooks on line, use of electricity by some of the staff of electricity department without metering it, less recording of unit consumption due to wrong metering, defective meters and wrong meter reading etc. are some of the reasons for shortfall of tariffs in relation to the quantum of electricity generated.

It has been indicated by a finding of a World Bank paper that the load factor is very low, i.e., even below 20% in rural areas compared to more than 50% in urban areas. (4) As demand for energy will increas for same power requirement if the load factor is high, it will yield more revenue and help to reduce the average cost per unit of electricity production.

Besides, the seasonal fluctuations in the demend for power creates a problem for power generation. The power generation plants have to be built to meet the peak demand during a busy agricultural season. This increases the cost of rural electrification. Sometimes when the demand for power is above the available margin of generating capacity, the motor coils are burnt due to low voltage and the small farmers face great difficulties during the period.

Scarcity of iron and steel and aluminium condutors and lack of efficient number of departmental vehicles to transport the material, has also been found as obstacles to the progrcss of rural electrification in the study area.

In addition to all these, the rural electrification and distribution programme in our state is mostly carried out departmentally. It has been the experience of the State Electricity Board that there were uncertainties in

---

4. A. World Bank paper, "Rural Electrification", World Bank, Washington, U.S.A., 1975, p-24.

the availability of funds due to frequent revisions of financial provisions of the State Government and other financial institutions. Besides, due to the paucity of trained technical hands and lack of materials like plants, generators, conductors, insulators, transformers etc., it is not possible for the electricity boards to generate enough power needed for extensive rural electrification in our State.

Suggested Measures :

An essential thing needed to improve the rural electrification programme is that development programmes both in agriculture and industries together with rural electrification should be effectively planned, managed and executed.

With a view to improving the load factor in electrified villages, it is necessary that different types of economic activities in different fields of development such as minor irrigation, credit and service facilities for equipment, improved seeds, availability of fertilisers in each area requiring power should be developed in a co-ordinated manner.

As regards energisation of the tube wells, a certain amount of infrastructure has to be laid out before the sets can be energised. Pumpsets in most of the cases operate at 40 to 50 percent efficiency. This problem must be looked into by the concerned department.

Electrification of the rural areas cannot simply change the situation. The government should awaken energy conciousness in the minds of the rural population. The Government itself must take the responsibility of educating the rural people on the selection of power machines and installation of power equipment. The idea of organisation of electric co-operatives for wider programme of rural electrification has to be given due recognition The R. E. C. should make the cooperatives work for developing rural distribution techniques and construction practices.

Future Prospects :

It has been held that mini, micro and small hydel plants have exceptional suitability for rural electrification in view of heavy cost of transportion and the attendant losses. China's experience in the field may

offer some lessons for framing energy policy in our country. It has in operation about 80,000 small hydel plants (50% of them providing less than one-half of a megawatt) accounting for a third of its total power generating capacity of 90 000 MW. (5)

In a backward district like Koraput, there are specific advantages of encouraging mini, micro and small hydel plants. The district is rich in hydel power. Studies made in the line indicate that these projects, cost less and do not require deforestation and acquisition of private lands. These also do not cause displacement and rehabilitation programmes. On the other hand, these plants will meet the difficulties of extending power supply to inaccessible areas, reduce the generation cost, meet the local needs, act as alternative to the frequent power failure system and reduce the cost of transmission to the minimum.

Investigations undertaken by the Government of Orissa in the recent past reveal that Badanala Project of Badanala river in Gunupur Sub-Division can generate 815 KW of power @ 6 paise per unit and is sufficient to meet the local requirement. Similarly, Lilahandi Project near Bisam Cuttack can generate 31 KW at a cost of 15 paise per unit. Investigations have also been made in respect of Banguru Jhola Project near Gunupur and Nagavali Project near Rayagada which reveal that 210 KW and 36 MW can be generated respectively from these prolects at a cost of 7 paisa to 20 paisa per Unit. (6)

Biogas is another line of renewable energy which can be developed in the district profitably. The largest concentration of biogas plants is found in Gujarat, Maharastra, Punjab, Hariyana and Utter Pradesh. Biogas technology has been now developed to perfection in the country and it has earned international acclaim. Rural households

---

5. K. K. U ADHYAYA : Energy polcy for India in 1980's Southern Economist Silver Jubilee November, Vol. 25 No. 9, Sept. 1, 1986, P-8.

(6) N. N. Panigrahi : Future energy problems of Orissa and Role of Koraput District, Paper presented in the Seminar on "Prospects of Development of Koraput Region", 1983.

having at least 3 to 4 cattle can instal a biogas plant with the subsidy and technical help made available by the Government. It has been projected that with full scale adoption of biogas technology by 2000 A. D., 45% of the total energy consumption in India could be met. (7) Wind power which is a cheap and non-conventional energy resource in rural India can also be developed in Koraput district.

It is hoped that Koraput District, which plays an important place in generating 36 per cent of hydel power of the state at present, will still play a greater role in the years to come, in generating energy, from both conventional and non-conventional sources.

---

7. Balagopalan Unni : Energy crisis and the way out. Yojana, Vol. 30, No. 20, Nov-1-15, 1986, P-8.

Bio-gas As a Source of Energy in Orissa.

Dr. K. Nana Buchi
Lecturer in Economics,
Khallikote Evening College,

Biogas as a Source of Energy and its Cost.

The State of Orissa having a large cattle population offers a tremendous potential for the development of Bio-gas, which is an important source of renewable energy. It can make a significant dent in solving the fuel crisis in the rural areas. It provides cheaper and better fuel both for cooking and lighting. It can be used for running diesel and petrol engine. It being a clean fuel does not cause air pollution. It is a better fuel than natural gas and liquified petroleum gas, because it has no sulpher contents, which is harmful to human being. Biogas plant is an important source of organic manure for a farmer. It illuminatas better than kerosene. Table-I indicates the use of biogas as a source of energy and quantity of diesel oil saved by running a 5 H. P. engine.

T A B L E-I

Quantity of Diesel Oil Saved by Biogas

Sl. No.	Size of biogas unit in CUMTR	No. of hours a 5 H. P. engine runs twice a day	Quantity of diesel oil saved (litres/ day).
1.	8	4	3.6
2.	15	6.5	5.8
3.	25	12	10.8

Source : Biogas Technology : A Pratical Hand Book. Tata Mc Crow-Hill Publishing Campany Ltd., New Delhi, P. 55

Biogas can also replace the use of electricity for domestic purposes. Table-II shows the use of bio-gas for the purpose of cooking and lighting.

TABLE-II

Use of Biogas in Cooking and Lighting.

Sl. No.	Size in CUMTR	Cooking (No. of persons)	Lighting (No. of 100 Candle Power gas lamps for 4 hours)
1.	2	5-8	4
2.	3	8-12	6
3.	4	12-16	8
4.	6	16-20	10
5.	8	22-26	12
6.	10	28-32	14

Source : Biogas Programme 1985-86, OREDA, P. 2

Table-III gives an idea about the size of the plant, the requirement of cattle, and the cost f r the construction of the plant. It shows that the Fixed Deme Model (Janata Biogas plant) is cheaper than the Floating Dome Model or the KVIC Model.

TABLE-III

Size of The Plant aud its Cost.

Sl. No.	Size in CUMTR	No. of cattle required.	Requirement of dung per day (in Kgs.)	Approximate cost cf the plant (in' 000 Rs)	
				Fixed Dome.	Floating Dome.
1.	2	3-5	40	4.9	6.2
2.	3	6-8	60	6.3	7,2
3.	4	8-12	80	7.8	8.5
4.	5	12-16	120	9.4	10.4
5.	8	16-20	160	13.1	12.8
6.	10	20-24	200	15.2	15-2

Source : Biogas Programme, 1985-86, OREDA, P. 2 (Compiled).

As cattle dung is the important input, its availability should be assessed while selecting the size of the plant.

Table-IV depicts the subsidy available for different sizes of the plant to all types of families. From this table it is noticed that the subsidy available to S. C. families is equal to that of the S, T. familes, small and marginal farmers up to the size of 4 CUMTR. After that size, the S.T/S.F/M.F. families are getting more subsidy than the S. C. families.

TABLE—IV

Amount of Subsidy available according to the Plant Size.

Sl. No.	Size of the Plant (in CUMTR)	Amout of subsidy available (in Rs.)		
		S. T/S.F./M.F. families.	S. C. families.	Others.
1.	2	2350	2350	1560
2.	3	2860	2860	1900
3.	4	3220	3200	2140
4.	6	3920	2610	2610
5.	8	4640	3100	3100
6.	10	5540	3700	3700
7.	15	8150	5430	5430

From Table-II, it is clear that taking the maximum size of a family with 8 members, the suitable plant size is 2 CUMTR for cooking and lighting. For that size, the cost of construction is Rs.6.2 thousand (in case of floating dome model), of which the subsidy is Rs. 2350/-for ST/SC SF/MF families, and Rs. 1560/-for others (Tables-III and IV). So the actual expenditure that the family has to bear is only Rs. 3850/-. This size will provide energy for cooking food for 5 to 8 persons and lighting 100 candle power lamps for 4 hours. As most of the families of our rural area consist of 5 to 8 members, 2 CUMTR bio-gas plant is an ideal one for rural families. In the alternative, if electricity is used for cooking and lighting, the daily consumption of electricity will be 4 units in heater of 1000 wt. and 1. 5 units in 4 bulbs of 100 wt The cost of electricity consumption

per day comes to Rs.3/- including other charges, and the cost of fire-wood and kerosene comes to Rs.5 whereas in case of Biogas the recurring expenditure is almost absent as it is run with cattle-dung which is available in the household itself as most of the rural households are having cattle heads.

Development of Biogas at National and State Levels.

Biogas was first initiated by the Khadi and Village Industries Commission in 1962 in the country and about 7 thousand plants were setup by 1973-74. In 1974-75 the Ministry of Agriculture, Govt. of India, in the wake of the energy crisis, implemented a programme for the development of biogas. During the 5th plan period (1974-79). over 70 thousand plants were set-up in the country. During 1979-80 and 1980-81 a little more than 30 thousand units were installed. In 1981-82, the Govt. of India launched a central sector scheme entitled National Project for Bio-gas Development (NPBD) for the sixth plan. During the sixth plan, 3.71 lakh plants were created allover the country. The target for the seventh Plan is 15 lakhs.

TABLE-V

Development of Bio-gas Units in Different States/Union Territories.. (in 000' Nos.)

Sl. No.	Name of the State/U. T.	No. of plants setup prior to NPED (from 1974-75 to 1980-81.)	No. of plants set-up during NPED period (from 1981-82 to 1984-85)
1,	Andhra Pradesh.	2.9	31.4
2.	Uttar Pradesh.	27.9	71.2
3.	Hariyana	10.3	7.8
4.	Maharashtra.	11.9	88.12
5.	Bihar.	9.8	21.1
6.	Karnataka	7.8	20.8
7.	Punjab	5.6	4,9
8.	Tamil Nadu	6.6	31 9
9.	Gujarat.	9.2	22.9
10.	Madhya Pradesh.	3.6	16.4
11.	West Bengal.	2,4	6,3
12.	Kerala.	1.6	6.5
13,	Orissa.	0.6	5 9
14.	Rajasthan.	0.4	14.3
15.	Delhi.	0.05	0.2
16.	Assam.	0.07	0.1
17.	Other States/U.Ts.	0 5	5.0
	TOTAL	101.2	355.9

From the above Table it is revealed that the performance of the State of Orissa is poor compared to that of Andhra Pradesh, Uttar Pradesh, Maharastra, Bihar, Karnataka, Tamil Nadu, Gujarat, Madhya Pradesh, and Rajasthan. The share of Orissa was only 1.6% to the total number of plants set-up in the country during 1981-82 to 1984-85. It was due to non-fulfilment of the targets fixed at the district level (Table-VI).

TABLE—VI

Districtwise Target and Achievement of Biogas Installation in Orissa durlng 1982-83

Sl. No. (1)	Name of the districts (2)	Target fixed (3)	Achievement made (4)	Col.4 as % of Col.3 (5)
1.	Balasore	250	114	45.6
2.	Bolangir	212	51	24 1
3.	Cuttack	292	100	34 2
4.	Dhenkanal	175	91	52.0
5.	Ganjam	250	105	42 0
6.	Kalahandi	208	70	33.6
7.	Keonjhar	125	61	48.8
8.	Koraput	204	53	26.0
9.	Mayurbhanj	312	175	56.1
10.	Phulbani	125	20	16 0
11.	Puri	305	100	32.8
12.	Sambalpur	250	71	28.4
13.	Sundargarh	292	51	17.5
	ORISSA	3000	1062	35.4

Only the districts of Dhenkanal and Mayurbhanj had achieved more than 50% of the target fixed. The performance was unsatisfactory in Bolangir, Koraput, Phulbani, Sambalpur and Sundargarh, where the success was less than 30%. This state of affair shows a poor performance of the State during that year in which the fulfilment of target fixed was only 35.4%.

In subsequent years many districts of the State showed a rosy picture in fulfilling the target fixed (Table-VII). The percentage of success has increased from 35.4% in 1982-83 to 90.2% in 1985-86. Again, it came down to 71.8% in 1986-87. The achievement was more than the target in the districts like Bolangir, Cuttack, Kalahandi, Koraput and Phulbani in 1986-87. The performance of Ganjam district was poor in comparison to

other districts of the State. It was only 17.7% in 1985-86 and 50% in 1986-87. In Puri it was 52.7% and 24.7% during 1985-86 and 1986-87 respectively. The achievement of Sambalpur and Sundargarh was drastically decreased during 1986-87 compared to the previous year's achievement.

TABLE-VII

Instaliation of Biogas Units in Orissa During 1985-86 And 1986-87. (in numbers).

Sl. No.	Name of the Districts.	During 1985-86			During 1986-87		
		Targat	Achievement.	% of success	Target	Achievement.	% of success
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1.	Balasore.	300	273	91.0	300	251	83.7
2.	Bolangir.	250	276	110.0	300	340	113 3
3.	Cuttack.	600	638	106.0	650	655	100.8
4.	Dhenkanal	250	152	60.8	350	201	57.4
5.	Ganjam.	600	106	17.7	800	401	50.0
6.	Kalahandi.	500	622	124.0	650	755	116.2
7.	Keonjhar.	250	267	106.8	300	242	80.7
8.	Koraput.	100	93	93 0	150	185	123.3
9.	Mayurbhanja	600	629	104.8	650	446	68.6
19.	Phulbani.	100	55	55 0	100	103	103.0
11.	Puri.	300	158	52.7	350	125	35.7
12.	Sambalpur.	700	636	90.8	750	304	40.5
13.	Sundargarh.	450	603	134 0	650	300	46.2
	Orissa.	5,000	4,508	90.2	6,000	4,308	71.8

Source : Monthly Review, March 1987, OREDA.
(Fiqures compiled).

During the 5th plan (1974-75 to 1977-78) 221 biogas plants were set-up in the State. The number increased to 5,968 in the sixth plan and 10,141 during the first three years of the seventh plan.

Developmental Measures of Central Government/State Government and Other Financial Institutions :

(1) Development of Biogas system was accorded priority in the Prime Minister's 20-point Programme. Different types ol assistance were provided for the development of bio-gas units in the State.

(2) For effective implementation the NABARD issued a number of instuctions to Commercial Banks to facilitate loans and subsidies.

(3) The Reserve Bank of India issued instructions to banks not to demand security by way of mortgage of land if the loan amount does not exceed Rs.5,000/-. It also provides refinancing facility to co-operetives for financing biogas plants.

Conclusion and Suggestions :

Of all energies, Biogas has been accepted as a source of energy which can supplement power energy. To develop biogas both the Central & State Governmenta implemented various promotional measures to provide financial and technical support. Yet in rural areas many households are not coming forward to accept it due to their illiteracy conservatiom and lack of knowledge about the triple benefits of Biogas plant i.e., as a source of energy, as an organic manure, and improved sanitation. They still depend on fuel-wood for cooking and on kerosene for lighting. They are unaware about the fact that biogas unit is an asset to a farming family. It is also unknown to them that the manure prodrced through biogas has a comparative advantage over ordinary manure in terms of both quantity and quality. About 70 to 75% of the original weight of cattle dung is conserved in a biogas unit, while in open compost pits 50% or more is lost. Similarly, almost all the nitrogen content in the cattledung is conserved in a biogas plant, while a substantial part of nitrogen contont is lost during camposting The biogas manure which is known as digested slurry improves soil fertility and increase crop yield about 10 to 20% over the ordinary compost. (3)

---

(3) Biogas Technology, Op. cit., P. 26

Presently only the rich and big farmers are having biogas plants. They, too, also use electricity. But the small and marginal farmers, even if they are having required cattle-heads, use the dung as a manure or use the same for cooking by making cakes as a supplement to fuel-wood. The large-scale use of fuel wood in rural areas leads to degradation of forests which causes environmental imbalance.

Therefore it is suggested that —

1. More and more bio-gas manure demonstration programmes are to be conducted to motivate rural farmers to instal bio-gas plants. It is revealed that at present the efforts of the government machinary are poor. Except the districts of Puri, Keonjhar, Sundargarh and Balasore, the responses from other districts "are still awaited since this is one important item for the Orissa farmers for better use of biogas plants."

2. Steps should be taken to motivate all the rural house-holds to take-up biogas units, if they have a minimum of 3 cattle.

3. The out-look and individualistic lifestyle of rural people should be changed to popularise the community biogas system in which the cost of expenditure will be less and easy to supervise.

4. Regular training programmes for rural youth should be conducted.

5. Effective co-operation and co-ordination from different departments and financial institutions must be assured so that biogas technology will certainly create valuable impact on the rural people and gain popularity.

An Evaluation of Bio-Gas Programme In the District of Dhenkanal A Case Study

Sushanta Kumar Das
Dhenkanal College
DHENKANAL

THE PROBLEM :

With its inclusion in the 20-Point Programme, the importance of bio-gas Programme no more requires emphasis let alone elaboration. In the Indian context, it is considered as the most relevant source of renewable energy, that can make a significant dent in the much talked about 'fuel crisis', the less talked about fertiliser crisis and the problem of rural health and sanitation[1]. Since 1982-83, the Orissa Renewable Energy Development Agency (OREDA) has taken vigorous steps for popularising the bio-gas programme in the rural sector of the state to work as an alternative source of energy and solve the problem of fuel crisis. However, success achieved in this field has been controversial. The objective of this paper is to evaluate how far bio-gas programme has solved the problem of fuel and fertiliser crisis in the country-side, by taking a case-study of a back in an otherwise back-ward district (Dhenkanal) of Orissa.

SCOPE AND METHOD :

The scope of the study is limited to Dhenkanal Sadar Block of the Dhenkanal District. The choice of the Dhenkanal Sadar block is due to its typical feature of depressed economic condition, predominance of landless labourers, marginal and small farmers and poor implementation of the Rural Development Programmes The beneficiary house holds are divided into three socioeconomic groups and their proportion in the total was determined. Fifty percent of the total bio-gas units in the block from each group has been randomly selected for the purpose. A cost-benefit analysis is undertaken to find out the profitability of the bio-gas programme. The year of reference is 1986-87.

FINDINGS :

Table -1, indicates the classification of sample plants according to their size and socioeconomic status of the households. The plants are divided into three categories according to their size, as 2 CUMTR , 3 CUMTR, and 4 CUMTR Similarly the sample households are categorised into three groups according to their socio-economic status. The first, Group—1, consists of S. C./S. T. households, Group – 2 consists of Marginal and Small farmers, and Group—3 consists of other households.[9] The Table reveals that 63.6 percent of the plants are of 2 CUMTR. size, 26.4% are of 3 CUMTR. size and only 10% are of 4 CUMTR. size. The Table further indicates that Group—1 owned only 13.3%, Group—2 owned 76.7% and Group—3 owned 20% of the total plants. Thus there is heavy concentration of plants in the group consisting of marginal and small farmers.

Table—2, represents the financing of plants by different agencies, On an average 76.7 percent of the total plants have been financed by the Commercial Banks, while the remaining 23.3 percent have been self-financed by the owners. In case of Group—1, 100% of the plants have been financed by the banks, while the corresponding figure stand at 77% for Group-2 and 66% for the Group-3. Thus the Commercial Banks have rightly taken care of the relatively less affluent households.

Table-3, reveals the working condition of the different size of plants belonging to different socio-economic categories. On an average, only 43.4 percent of the plants were found to be in working condition during the time of survey. Thus a majority of plants (56·6%) were not in working order. The percentage of working plants to the total plants stood at 42.1% for the 2 CUMTR. size, 37.5% for the 3 CUMTR. size and 66 6% for the 4 CUMTR. size Further in case of Group—1 no plant was in working order. For the 2nd Group, the percentage of working plant to the total plant stood at 39 1% and the corresponding figure stood at 66·7% for the Group—3. Thus it is found that the working of plants and economic status of the oweners are directly related to each other.

The cost-benefit analysis of the working plants is given in Table—4. The cost has been divided into two parts : (i) Fixed cost and (ii) Variable cost. The fixed cost consists of the construction of the plant and the purchase of

stove. The variable cost included the cost of cow-dung and the labour charges. In estimating the total cost of working plants per unit for one year, interest on variable cost at a rate of 12%, depreciation on plant at the rate os 10% and on the stove at the rate of 20% were added to the variable cost. Thus, on an average, the cost per unit of plant stood at Rs. 3715·90 per year. The corresponding figure stood at Rs. 540·00 for the Group—1, Rs. 3628·67 for the Group—2 and Rs. 4012·44 for the Group —3, respectively.

The cost incurred by the relatively affluent households was more due to the big size of their plant.

As regards returns, the average value of gas per annum amounted to Rs. 1080/- for group 2 and Rs. 1240/- for Group 3. The value of manure amounted to Rs. 3375/- for the Group-2 and Rs. 3777/- for the Group-3 owners. Thus the totol return on bio-gas scheme stood at Rs. 4455/- for Group-2 and Rs. 5017/- for the Group-3 of owners. On an average, the return on Bio-gas plant stood at Rs. 4621/- per annum.

The net return of the bio-gas plant stood at Rs. 826·33 for Group-2 at Rs.1004·56 for the Group-3 at Rs. 905·10 on an average per annum. Thus Table-4 points out that the bio-gas programme has been more successful in case of the relatively affluent households.

Table —5, show the loan-subsidy component of the bio-gas plant and return on every Rs 100/- of investment in the programme. On an average subsidy accounted for 44·33%of total cost of the plant. The amount of subsidy stood at 47·9% for Group - 1, 45·7% for Group-2 and 32% for Group—3 household. The return for every Rs. 100/- of investment on bio-gas plant is nil for the first group, Rs. 15·25 for the 2nd Group and Rs. 17·90 for the 3rd. Group of households On an average, the return from bio-gas for every Rs. 100/- of investment per annum stood at Rs. 17·09, which is comparatively more than in any other developmental scheme. The returns for every Rs. 100/- of investment from animal husbandry scheme stood at Rs. 2·3 and from the bullock cart plying at Rs. 0·55 in the studied area[3].

Further it was found at the time of survey that not a Single beneficiary belonging to any socio economic group has started repaying the bank dues. The

non-repayment in the case of the low economic group is due to the non-functioning of the plant, while the affluent households have an attitude not to repay.

CONCLUSION :

The analysis of the study reveals that a large section of the plant (56·6%) was not in working condition. Further the non-functioning of the plant is more in the case of relatively low economic groups (100% for S. C./S. T. and 60·9% for M. F./S. F.). The success has only been achieved in case of the relatively affluent households. The bio-gas programme faild in case of the low econamic groups as they could not provide required amount of feeding (the initial feeding of 30 quintals of fresh cow-dung and the daily feeding) to the plant. Consequently, the plant could not generate the desired amount of gas and the poor scheme failed for the poor households. Thus the success of bio-gas programme is intimately associated with the ownership of land and diary farming of the beneficiaries. The by products of land, when used as food, the dropping of the animals increases substantially. Further, in the rural areas, there is no market for the manures processed by the bio-gas plant. Hence the landless households, small and marginal farmers find difficulty in marketing their excess manure. On the contrary, the big farmers can provide more food to their animals and use the processed manure on their own field. Hence the programme succeeds in their case The failure of the scheme can also be attributed to the target approach adopted by the OREDA. The authorities without taking into consideration the availability of animals and their quality in the area fixed targets according to wh ch plants were installed. Subsequently the plants stopped functioning after a while due to non-availability of cow-dungs. Thus the bio-gas programme has failed more due to its faulty implementation rather than the non-suitability of the scheme.

REFERENCES :

1. Agnihotri, S. B. – Bio-gas Programme, 1985-86, Orissa Renewal Energy Development Agency. P-1.

2. The classification is adopted according to the norms fixed by O. R. E. D A.

3. Panigrahi and Das, Impact of Developmental Schemes on Tribal Economy. A case study, Orissa Economic Journal, Volume – 1985.

Table—1. Classification of Sample Plants according to their size and Socio—Economic Status of the house-holds.

Categories.	Size of Plant.			Total
	2 CUMTR	3 CUMTR	4 CUMTR	
Group—1. (S.C./S.T.)	1	—	—	1 (3·3)
Group—2 (M.F./S.F.)	15	6	2	23 (76·7)
Group—3 (Others)	3	2	1	6 (20)
Total.	19 (63·6)	8 (26·4)	3 (10)	30 (100)

(Figures in the brackets indicate percentage)
Source—Primary Data.

Table—3. Classification of plants according to the source of Finance.

Categories	Size of Plant.						Total.		Grand Totel
	2 CUMTR		3 CUMTR		4 CUMTR		Funct-ioning	Non-funct-ioning	
	Funct-ioning	NF	F.	NF	F.	NF			
Gr—1.	—	1	—	—	—	—	—	1 (100)	1 (100%)
Gr—2.	6	9	2	4	1	1	9 (39·1)	14 (60·9%)	23 (100)
Gr—3.	2	1	1	1	1	—	4 (66·67)	2 (33·33)	6 (100)
Total.	8 (42·1)	11 (57·9)	3 (37·5)	5 (62·5)	2 (66·67)	1 (33·33)	13 (43.4)	17 (56·6)	30 (100

Figures in brackets indicates percentage
Source – Primary data.

Table—2: Classification of Plants According to the source of Finance.

Categories	Size of plant.								
	2 CUMTR		3 CUMTR		4 CUMTR		Total.		Grand Total.
	Self	Bank	Self	Bank	Self	Bank	Self	Bank	
Gr—1	—	1	—	—	—	—	—	1 (100)	1 (100)
Gr—2	2	13	2	4	1	1	5 (23)	18 (77)	23 (100)
Gr - 3	1	2	1	1	—	1	2 (33·33)	4 (66·67)	6 (100)
Total.	3	16	3	5	1	2	7 (23·3)	23 (76·7)	30 (100)

Figures in Brackets indicates percentage. Source - Primary data.

Table —5 Loan Subsidy Component and Return on every Rs. 100/- of investment per Unit.

(in Rs.)

Categories	Loan	Subsidy	Loan + Subsidy	Net Return	Return for every Rs. 100/- of Investment
Gr —1	2550 (52·1)	2350 (47·9)	4900 (100)	0	0
Gr—2	2935 (54·3)	2452 (45·7)	5387 (100)	826·33	15·25
Gr—3	3808 (68)	1792 (32)	5600 (100)	1004·56	17·90
Total	2764·25 (55·67)	2198 (44·33)	4962·25 (100)	905·10	17·09

Figures in brackets are in percentage. Source—Primary data.

COST BENEFIT ANALYSIS

Table—4. (in Rs.)

Items	Categories			Totel
	Gr—1	Gr—2	Gr—3	
A—Cost Side				
1. Fixed cost per unit.				
a. Construction of plant.	4900·00	5387·00	5600·00	
b. Purchase of stove.	250·00	295·00	325·00	
2. Variable Cost per Unit				
a. Cow-dung.	—	2250·00	2518·50	
b. Labour charges	—	456·25	506·00	
3. Interest on Variable cost 12%	—	324·72	362·94	
4. Depreciation on				
a. Plant@10%	490.00	538·70	560·00	
b. Stove @ 20%	50·00	59 00	65·00	
Total cost per unit	540·00	3628 67	4012·44	3715·90
B—RETURN SIDE				
1. Price of the Gas	—	1080·00	1240.00	
2. Price of the Manure	—	3375 00	3777 00	
Total.	00	4455·00	5017·00	4621·00
Net Return	— 540.00	826.33	1044·56	905·10

Source —Primary data.

Bio-Gas use in Rural Households—A Study

Dr. R. K. Panda &
G. D. Behera.

To-day almost all the developing countries of the world are striving to achieve an accelerated growth in terms of G. N. P. To achieve this objective there is increased use of modern technology in all production sectors of the economy. This has resulted in intensive consumption of energy in substitution human or animal power. India is no exception to it. During different five year plans there has been increasing dependence on energy for achieving an accelerated pace of development in different sectors. But the continued and widespread use of energy, particularly non-commercial sources of energy, results in not only their fast depletion but also causes serious environmental pollution and degradation. While the rural people get non-commercial fuels at almost zero private cost, the social cost of meeting their energy needs has been increasing over the year. In order to reduce pressure on non-commercial energy resources and popularise the non-conventional energy sources to combat growing energy crisis, a lot of ways have been developed. Of late bio-gas as a non-conventional source of energy has been developed in the country. The use of bio-gas is advocated from the point of view of economy, efficiency, hygiene and environmental sanitation. Recently the Department of Non-conventional Energy Sources has given new thrust to bio-gas programme under National Project on Bio-gas Development, initiated in November, 1981. During four years of working (1981-85) of NPBD a total of 343572 bio-gas plants have been installed in the country. A number of studies on the working of bio-gas have treveated that the programme is working well across the country[1].

---

1. Studies conducted by National Council of Applied Economics Research, Operations Research Group, Baroda, Centre for studies in Decentralisation. Industries cited by Khan , M. K. Ghosh Dastidar.

Bio-gas, the Benefactor, Yojana, November—1-15, 1986.

In the state of Orissa, 14879 units of biogas plants are operating as at the end of the year 1986 87[2]. To make the non-conventional energy more popular among the people, an outlay of Rs. 150/- crores has been estimated to be spent for the development of renewable energy in the state under Integrated Rural Energy Programme during Seventh Five Year Plan. (3)

In this context the present study is undertaken to analyse the working of the bio-gas plants at a micro-level with the following objectives :

(1) To study the socio-economic conditions of the households using bio-gas.

(2) To analyse the pattern of use of bio-gas by the households.

(3) To analyse the extent of adequacy of bio-gas to meet the requirements of the households.

(4) To point out the constraints faced by the households in the use of bio gas.

METHODOLOGY

Badasahi Block of Mayurbhanj district is taken as the area of the study. Until the year 1987 a total number of 130 households had been using bio-gas for domestic cooking and lighting purposes. Out of the total 130 households, 40 percent households are selected at random. Thus a total 52 sample households are selected for the purpose of study. Personal interview method is adopted to elicit information from the sample households.

RESULTS & DISCUSSION

The installation of bio-gas plant in any household needs two minimum pre-conditions - the number of family members and the number of cattle population. While the number of family members determines the

---

2. Official records of Orissa Renewable Energy Development Agency Bhubaneswar.

3. Rural Energy Division, Planning Commission, Government of India, 1986, Cited by K. L. Mukherjee "Exploiting non-commercial" energy for economic developn ent", Commerce. June 21, 1986.

size of the plant to be installed, the number of cattle population determines the extent to which the plant will be viable. Besides, as a majority of the rural households in Orissa depend on agriculture for their livelihood, it is the operational size of holding which determines the number of cattle popultion to be maintained by any household. On this basis, the socio-economic conditions of the sample households, particularly the average family, the average operational size of holding, the average family size and the average cattle population have been studied as a back-ground information for the study (Table-1). The total number of sample housholds (52) are classified into three size-class of holding basing upon the operational area under cultivation. (Category-I-Operational holding within one hectare, category-II-Operational holding between 1.01 to 2 hectares, and category-III-Operational holding of 2.01 hectares and above.)

Of the other households taken for study, 18 belong to category-I, 13 belong to category-II and 21 belong to category-III households. With regard to average family size and average number of cattle population among the households, it is revealed that with the increase in the operational holdiing, the family size and number of cattle kept by the household go on increasing. In other words, there is a positive relation between operational and the average family size and average number of cattle population of the households. The smaller farmers are having smaller family size and smaller cattle population than the larger ones. But it is revealed that as per the standard norm applied for the installation of bio-gas plant the sample households in each category fulfil the basic minimum conditions (in norms of cattle population) for the purpose.

The purpose-wise use of bio-gas among the sample household is shown in Table-2. It is observed that out of the total sample households 69.23 percent use bio-gas for cooking, 17.47 percent both for cooking and lighting. Thus in a majority of cases bio-gas is used for cooking in the study area. The use of bio-gas for lighting purpose is seen among the cotegory-I and II households only. A very small percentage of households the three categories use bio-gas both for cooking and lighting. While ques-

tioning, it is revealed that the households who are using the gas only for lighting purpose are doing so because of inadequate gas formation.

In order to know whether the installation of bio-gas plants meets the requirement of its beneficiaries, a calculation on the daily requirement and availability of bio-gas is made for the sample households. It is observed (Table 3) that the daily average need of gas works out to 1.96 cum for the sample households as a whole. The actual availability of gas comes on an average 1.36 cum for the sample households. Thus there is a shortage of 0.60 cum gas. Between different categories of households, it is seen that the deficiency of gas is more among category II households than in category I or III.

As a corollary to this phenomenon, the reasons for the shortage in the production of gas are worked out (Table 4) Only 8 households (2 in category-I, 2 in category II and 4 in category III) spoke about the sufficient production of gas for their domestic purposes. Rest 44 households spoke about inadequacy of gas to meet their daily requirement. While questioning, three reasons were found to be responsible for shortage of gas among of the households. A large percentage of households in category I and II (87 percent in category I and 73 parcent in category II) spoke about inadequate feeding of cowdung as the cause of insufficiency of gas. On the other hand, lack of operational Knowledge and leakages of gas due to constructional defects were found to be responsible for the insufficiency of gas among category III households.

CONCLUSION :

The study brings out the following major conclusions.

i) Bio-gas mostly used for cooking among majority of sample households in the study area. Only a few households where adequate gas is available are using it for both cooking and lighting. A small percentage of households, particularly in the category I and II are using biogas for lighting only.

ii) There is a gap between the need of biogas and its availability among the sample households All the three categories of households experience a shortage in the availability of biogas to meet their daily requirement. Between the categories, the sample households in category II

experience greater gap between their need and availability of biogas than category I and III households.

iii) For category I and II households, the inadequate feeding of cow dung is found to be largely responsible for insufficiency of gas. But for category III households the reasons for insufficiency in gas formation are attributed to lack of operational knowledge and leakages due to constructional defects.

POLICY IMPLICATIONS :

The development of bio-gas as an alternative source of energy in place of traditional energy is no doubt a commendable proposition,from the point of view of economy, efficiency, hygiene and environmental sanitation But, simultaneously every effort must be made to see that it yields result to its beneficiaries. The households who are installing bio-gas to meet their domestic need must get their wants satisfied. Trained personnel in rural areas should be appointed to have regular supervision on the smooth and efficient use of bio-gas by the households who instal it. Adequate extension programme should be undertaken to impart minimum operational knowledge to the users of bio-gas for its smooth functioning. If these things are not looked into, then not only the country's scarce resources which are increasingly invested on installation of bio-gas plants would be wasted but also our dependence on traditional sources of energy will continue. This will put us in grave danger about which everybody is aware of.

TABLE—I

Socio-economic characteristics of the sample households using Bio-gas.

Size of operational holdings (in hectares)	No. of households	Average family size	Average number of livestock
0 to 1	18	5.28	4.9
1.01 to 2	13	5.45	6.8
2.01 and above	21	8.60	10.3
Total/pooled	52	6.66	7.5

TABLE II

Pattern of use of bio-gas among sample households.

Size of operational holding (in hectars)	No. of households using bio-gas			
	Cooking	Lighting	Both cooking & lighting	Total
0 to 1	11 (61.11)	6 (33.33)	1 (5.56)	18 (100)
1.01 to 2	7 (53.84)	3 (23.06)	3 (23.10)	13 (100)
2.01 and above	18 (85.71)	Nil (.00)	3 (14.29)	21 (100)
Pooled	36 (69.23)	9 (17.30)	7 (13.47)	52 (100)

TABLE III

Daily average need and availability of bio-gas among Sample households [in cum].

Size of operational holding (in hectars)	Average need	Avetage availabillty	Gap
0 to 1	1.46	0.96	0 50
1.01 to 2	1.82	0.98	0.84
2.01 and above	2.48	1.95	0.53
Pooled	1.96	1.36	0.60

TABLE IV

Beneficiaries' response to the deficiency of bio-gas

Reasons	No. of beneficiaries [in hectars]			
	0 to 1	1.01 to 2	2.01 & above	Total
1. Inadequate feeding of cowdung	14 (87.50)	8 (72.72)	Nil (00)	22 (50.00)
2. Lack of operational knowledge	Nil (00)	2 (18.18)	7 (41.17)	9 (20.45)
3. Leakages due to constructional defects	2 (12.50)	1 (9.10)	10 (58.83)	13 (29.55)
Total	16 (100)	11 (100)	17 (100)	44 (100)

Biogas-an Alternative Source of Energy to Overcome the Energy Crisis in Ganjam District

S. N. Misra
Reader in Economics
Berhampur University

Energy crisis is real. The problem has received serious attention in the recent years. It has to be faced decisively with all the available information at our command. The conventional sources of energy like, firewood, agricultural wastes, fossil fuels, cattle dung and charcoal are not only in short supply but also they fail to meet the requirement of the people. Accordingly more attention is paid to promotion and development of non-conventional sources of energy like; biogas. biomass, solar energy, natural gas. and microhydel power etc Of the various non-conventional sousces of energy, biogas offers a wide scope for development in the less developed countries like India on account of the vast number of livestock population existing in these countries.

Biogas is derived from cow dung and other natural wastes by anaerobic formentation. The gas contains by volume about 55 percent methane (CH_4) and 45 percent carbon dioxide (CO_2). The gas is used for cooking, lighting and as a fuel for energising pump sets used for irrigation purposes. The residue that is left after gasification makes a good organic fertiliser. This is nitrogenous rich manuare as it contains about 1.5 percent nitrogen as against only 0.75 percent nitrogen in the farm yard manure As a result of recent increases in prices not only of fossil fuels but also of inorganic fertilizers, the prospective net benefits from the installation of 'gobar gas' plants for the production of fuel and fertilizer from cow dung is considerable [1].

Biogas plant is a structure which allows a mixture of dung and water to decompose anerobiocally and lets out the gas thus formed for its end use. Generally two types of biogas plants are available for use. They are, the floating dome model and the fixed dome model. The floating dome model is popularly known as KVIC model sponsored by Khadi and Village Industries Commission. The fixed dome model is of two types such as Janata model and Dinabandhu model. Both of these plants have been promoted by Ministry of Energy Resources, Government of India.

It is against this background that the study is mainly confined to the district of Ganjam. This is due to the fact that the district accounts for 13.0 percent of the total biogas plants at the state level.

The Profile of Biogas energy in Ganjam district

The district of Ganjam has nearly 2399 biogas plants as on 31. 1. 88. The district has a total cattle and buffalo population of 13.38 lakhs. The dung collected from these animals is mainly used for running the biogas plants. It is observed that the Janata model is more popular in the district followed by Dinabandhu model. Janata model accounts for 75.0 percent of the total number of biogas plants in the district. Next to Janata model, the Dinabandhu model accounts for 17.3 percent of the total biogas plants in the district. Although Dinabandhu model is structurally simpler and costwise more economical, yet these models, on account of their recent origin (1985-86) have not been widely used in the district. The Janata model although costlier compared to Dinabandhu model, claims wide popularity on account of its long stay in the scene. The KVIC model is not very much popular due to high cost factors. They account for only 7.6 percent of the total biogas plants in the district. These biogas plants are technologically superior to other models. For its installation they require expert supervision and guidance. Both the KVIC and Janata models are available in different sizes such as 2, 3, 4, 6, 8, and 10 cubic metres. The maximum size of Dinabandhu model is 6 cubic metres. In Ganjam district biogas plants having capacity up to 6 cubic metres are commonly used. The approximate cost and the use of these models for various purposes is given in Annexure I. The subsidies given for the construction of these different types of models by scheduled castes, scheduled tribes,

small and marginal farmers and others (i. e. mainly general public) are given in Annexure II. The subsidies vary between 25 percent and 75 percent for different category of weaker section borrowers.

At present biogas schemes have been mainly sponsored by D. R. D. A. OREDA and Gram Vikas, a voluntary organisation operating in the Ganjam district. Percentage-wise the distribution of biogas plants by Gram Vikas account for 72.2 percent of the total biogas plants in the district, followed by OREDA which account for 19.6 percent of the total biogas plants, till the first quarter of 1988. Compared to these agencies, DRDA account for only 7.9 percent of total biogas units in the district. The wide publicity and canvassing of the volunteers and supervisors of Gram Vikas mainly accounted for its largest share in the total distribution of biogas plants in the district.

Major findings :

With regards to the potentiality of cow dung and gas output, it is noticed that in the district of Ganjam there is large potentiality of both cow dung and gas output. The district, had a total livestock population, consisting mainly of cattle and buffalo, of 13. 38 lakhs in the year 1987. Percentagwise, this is 66.0 percent of the total livestock population (i. e. 20. 41 lakhs) in the district. It is assumed that a cattle or a buffalo, on an average, released 10 kilograms of dung per day. The quantity of dung released by the livestock population per year, therefore, amounts to 4895 million kilogrammes. In term of quintals, this amounts to 488.37 quintals per year. It is further assumed that the gas output per 10 kilogrammes of dung is, on an average, 1 cft per day From the expected quantity of dung released per year by the cattle population in the district, gas output to the tune of 6363 million cft or 180 million cubic metre can be generated in the district. Thus the dung potential and gas potential per year is 4895 Kg. and 6363 million cft respectively in the district.

With regard to utilisation, it may be observed that there are a total number of 2399 biogas plants in the district. It is further assumed that a biogas plant requires a minimum quantity of 45 kilogrammes of dung per day for its normal operation. However, the quantity of dung intake varies

with the size of the plant. But under any circumstances, a plant cannot operate at a less than *45* Kgs. of dung per day. It is observed that all the *2399* biogas plants have utilized a total quantity of *39.5* million Kgs. of dung per year. Assuming that the gas output capacity of *10* Kgs of dung is *13* cft the gas output produced from *45* Kgs. of dung per day per plant is *58. 5* cft. It is observed that all the plants located in the district have utilised *51. 2* million cft. of gas output or *1.5* million cubic meter of gas per year. Percentage-wise, this accounts for only *0.8* percent of the total gas potential.

It is further revealed that the number of gas plants required to exhaust the total waste dung potential of one year, is 2.9 lakh biogas plants. This is based on the assumption that a gas plant requires a minimum quantity of *45* Kgs. of dung and produces *58.5* cft. of gas output per day. As against this, the number of plants existing in the district is only *2399*. Percentage-wise, this accounts for *0.82* percent of the total expected plants in the district.

The district has a total number of *4395* inhabited villages The probable biogas plants that can be established with the help of available waste dung in the district is *2.9* lakhs. The average number of probable biogas plants that can be established per village, thus, comes to about *66* plants. As against this, the average number of actual plants (i. e. out of the total number of 2399 biogas plants in the district) in the district is *0.54* plants. This indicates that there is hardly a biogas plant, on an average, per village. From the point of view of the coverage of biogas plants per *1000* population in the district, one also notices a sizeable gap between the potential biogas plants and the existence of actual number of biogas plants. It is observed that average number of potential biogas plants that can be estabiished per *1000* population in the district is *121*. As against this, average number of existing biogas plant per *1000* population in the district is only *1.0*. All these clearly highlights the fact that there is a considerable degree of discrepancy betweeen biogas energy potential and its actual utilisation in the district. This therefore clearly indicates that biogas as an alternative source of energy to overcome the energy crisis has not made sufficient headway in the district.

There is also uneven distribution of biogas plants in different blocks of the district. It is interesting to observe that blocks where the percentage distribution of livestock population (i. e. cattle and buffaloes) is high, there the percentage distribution of biogas plants is low. As, for example, Soroda, Jagannath Prasad and Patrapur blocks, the percentage distribution of livestock population is 5.4 pecent, *5.3* percent and *5.0* percent, respectively of the total livestock population in the district, but the percentage distribution of biogas plants in these blocks is 1.*3* percent, *3.2* percent and 4.*0* percent respectivelv of the total biogas plants in the district. On the otherhand, the blocks where percentrge distribution of cattle population is low, there the percentage distribution of biogas plants is more. As, far instance, Chatrapur, Bhanjanagar and Hijilcut account for *2·4* percent, *5.0* percent, *4.0* percent of the total cattle population in the district, but the percentage distribution of biogas plants in these blocks is *5.9* percent, *6.I* pecrent and *6.7* percent respectvely of the total. This discrepancy is due to the variations in the degree of literacy in different blocks which account for a high degree of literacy have a greater awarness for harnessing waste dung for biogas formation. As for example, Bhanjanagar and Chatrapur. The percentage distribution of literacy there is *52.* 4 percent and *47.*3 percent respectively in the district. As against this, the blocks, where the percentage distribution of literacy is lower, show lower awareness of using waste dung for biogas formation. As for example Soroda and Jagannath Prasad where the percentage distribution of literacy is only *32.0* percent and 3*4.2* percent respectively. Thus, there is a high degree of co-relation between educational standards of the people and the demand for biogas energy.

Problems :

The biogas energy programme, however, is confronted with various problems. These are discussed below.

Identification of eligible beneficiaries is an essential condition for the success of biogas programme. However, this is not followed in a majority of cases. Eligible beneficiaries are those who have a minimum number of 4 to *5* heads of stalled cattle producing *45* kgs. of cow dung to feed the biogas plant. When the beneficiaries satisfy this essential condition, they

get the advantage of securing bank assistance and the subsidies from the government for establishing the biogas. Often the financial assistance and the subsidies have gone to beneficiaries who do not have the requisite number of stalled cattle at their disposal.

Inadequate supply of finance is another bottleneck for the spread of biogas programme in the district. For finance the beneficiaries mostly depend upon commercial banks, central co-operative banks and Regional Rural Banks. However, banks take considerable time to release the funds because of the delay in sponsoring the application of eligible beneficiaries by Technical Supervisor of OREDA or Block Development Office of Panchayat Samities. There is also delay in sponsoring the application by Supervisor or co-ordinator of Gram Vikas. There is also a lot of time involved in disbursing the subsidy. These agencies will forward the list of benficiaries to DRDA who thereafter, in consultation with OREDA, distributes the subsidies. The distribution of subsidies again rests on the receipt of completion certificate from the executing agency.

The mateaials used in biogas plants are cement, bricks, sands, steel sheets and iron angles etc. These are not evenly distributed in different parts of the district. Inadeduate transport and communication facilities also hinder the movement of these materials near the plant sites There is also dearth of expert masons having the needed experience in biogas technology. [5]

The scheme is highly target oriented. As for instance, under the scheme of National Programme for Biogas Development a target of 5000 biogas plants have been earmarked for the year 1985-86 for the state. Of this, a total number of 600 biogas plants or 12 percent of the total is earmarked for establishment in Ganjam district. [6] For achieving the target, biogas plants have been established very often by non-technical persons without taking into consideration the selection of the site, availability of water and waste dung etc. In most cases, technical guidance and supervisory assistance are rarely available. Consequently, a majority of the gas plants go sick after working for a few months.

Both the quantity and the quality of dung released by the cattle population is low and inferior in quality. In a majority of cases, waste dung released by a cattle or buffalo is 6 to 7 Kgs. per day. This is much lower than the requisite quantity of dung supposed to be released by a cattle. Besides, the quality of dung is also sub-standard. This is due to inadequate consumption of quality fodder by the livestock population. Besides, the unhygenic condition under which they live also affect the dung output of the cattle.

There is also the problem of maintenance and repair. It is necessary that the used dung be removed and fresh dung be fed into the plant every day. The beneficiaries mostly violate this norm. There is further the need that the dung and water mixture to be in ratio of 1:1. In certain cases, non-availability of water near the plant sites make; the mixture unbalanced. Non-availability of spare parts and other technical aids also affect the smooth operation of the plants.

There is lack of co-ordination between the beneficiaries and the supervisor, between the supervisor and authorities of DRDA, between DRDA and OREDA and other voluntary agencies. As a result, the programme is not very much successful in the district.

There is very little change in the attitude of the people. A majority of the people are not only unware of the scheme but also are highly non-co-operative. Inadequate publicity motivation and canvassing are mainly responsible for slow change in attitude towards biogas plants. The people should be made aware about the possible depletion of energy resources in future. Besides they need to be motivated to switch over to alternative sources of energy.

Suggested Steps :

Tte following steps need be taken to promote the biogas programme in the district.

For the sucessful operation of the plant cow dung as a raw material for the biogas plant must be available in requistite quantity. Since the beneficiaries do not have 4 to 5 heads of stalled cattle in most of the cases,

they fail to procure requisite quantity of cow dung to feed the plant regularly. It is, therefore, necessary that proper collection of cow dung and their proper distribution must receive adequate attention. For this a **state level marketing organisation for the collection and distribution of waste dung be established.**

At present the benefits of biogas plants mainly go in favour of the well-to-do beneficiaries. The poor and not well-to-do households rarely get the opportunity of using biogas on a wide scale. For this larger plants could established on a village basis and the costs of producing gas and fertilizers would fall as the scale of production increased. In this case, further substantial costs would then be incurred for distribution and metering if the gas were distributed by pipe lines or alternatively for storage facilities. Moreover, although a programme to encourage the installation of the present smaller designs for families and enterprises can be justified, because of high prospective return involved, provision should be made for recovery of costs where financing is made from public funds. At the same time, the possibility of establishing small plants to be operated by village authorities or on a co-operative basis should be explored, for sales to the poor families. Furthermore, while research and development should be diverted not only to improving the small scale process but to developing more effective methods of distribution or storage which would enable village-scale plants to become competitive. *7* It is possible that the process has the potential to become established as a major source of energy and fertilizer in the country-side.

Supply of gas is not adequate due to improper feeding of cow dung in to the plant. Moreover, the problem relating to supply becomes more acute during winter as gas generation declines due to slower rate of bacterial digestion at a low temperature. It is suggested that a solar water heating system should be installed to provide hot water to the plant The manure is not sold regularly. It is suggested that an effort should be made to sell the manure by packing it in polethene bags. *8*

The supply of various materials used for the construction of the plant must be increased in quantitative terms. Besides, the quality

of the materials supplied must be ensured. Besides technical assistance and expert participation at all levels of the construction be made available. Moreover, operational training, guidance and adequate follow up and supervision measures must be provided. Steps should also be taken for proper repair and maintenance of the plants. Besides, the spare parts required for the plants be made available at the block level. For undertaking all these activities, a separate wing at the block level way be created for exclusively looking after the implementation of biogas programme.

References :

1. Henderson, P. D., India : The Energy Sector, World Bank Publication, Oxford University Press, New Delhi, 1975.
2. Andhra Bank, Annual Action Plan 1987, Ganjam District.
3. Government of Orissa, District Statistical Handbook Ganjam (1980-81), 1986.
4. Appana, C. H , March of the Biogas Programme, Khadi Gramodyog, Vol. 14, No. 3, December 1987.
5. Singh, C. P., Alternative Energy Source-Biogas in Bihar, Khadi Gramodyog, Vol 33, No. 12, 1987.
6. Government of Orissa, OREDA, Non-Conventional Energy Programme, 1987 (A Brouchure).
7. Henderson, P. D., ibidim, p. 158.
8. Rao, N. N., Gobar gas and other fuels—A comparative study, Kurukhetra, Vol. 25, No. 7, January 1, 1977, Part 1; No. 8, January 16, 1977.

—o—

Annexure—1

Plant size, Heads of cattle required, approximate cost and possive use of Biogas programme

Size in cubic of meter.	Heads cattle needed	Approximate Kg. of fresh dung required per day.	Approximate cost (in Rs.) Fixed dome model (Janata)	Deena-bandhu model	Float-ing model KVIC	Use Cooking No. of persons	Lighting No. of 100 c. p. gas lamps for 4 Hrs.
2	3-5	45	4900	3935	6200	5-8	4
3.	6-8	60	6300	4607	7200	8-12	6
4	8-12	80	7800	5535	8500	12-16	8
5.	12-16	120	9400	7135	10400	16-20	10
8	16-20	160	13100	—	22800	22-26	12
10	20-24	200	15200	—	15200	28-32	14

Source Govt. of Orissa, OREDA, Non-Conventional Energy Programme (broucnure).

Annexure—2

Subsidy component in the Biogas plants-size wise.

KVIC, Janata, and Dinabandhu Models.

Size in cubic meter.	St/SF/MF	Scheduled caste	Others
2.	2350	2350	660
3	2860	2860	1900
4	3220	3220	2140
6	3910	2610	2610
8	4640	3100	3100
10	5540	3700	3700

Source : Government of Orissa, OREDA, Non Conventional Energy Programmme (Brochure)

Harnessing Wind Energy in Orissa

Lalitmohan Sahoo
Lecturer in Economices,
Salipur College, Salipur.

The consumption of energy in a country is generally regarded as a measure of its level of development. In terms of total production, India is below even some of the developing countries like Brazil, while in terms of per capita production, India's position is very low compared to some of the smaller third world countries. Even without the help of statistics, it is obvious that low availabilitv of energv is one of the main obstacles to development. The vear 1973 marks a turning point in the history of energy production in the world. The sharp hike in oil prices brought about by the OPEC marked the end of the era of cheap energy. That event gave rise to shock waves from which the world has still to recover. In India, however, we have responded very slowlv to the new situation and the response is on the whole inadequate and partial.

The need for intensification of research on renewable sources of energv is recognised in principle, but in practice very little attention is being devoted to it. Even at the existing level of technologv, a very considerable part of our energv requirements could be met by solal energy, use of bio-mass and wind energy. While considering different options for meeting the country's future energv needs, we should devlop a balanced perspective regarding the availability and the potential of a given energy source, environmental pollution due to energy-related-activities, relevant time scales needed for the development of any new source on technologies, apropriateness of any sources/technological options of our country anq so on.

The energy crisis looms large today. This has attracted the attention of development planners, rural technologists, scientists and others to look for new sources of energy as well as to conservs and use the existing resources more efficiently. The major energy sources are coal, oil, natural gas, nuclear energy, solar energy, wind energy, bio-energy, chemical energy and bio-thermal energy.

All over the world, nations are striving to develop new engery sources as fast as they can. And one of the sources that is attracting attention and development effort is wind energy.

Wind power has been in use for a variety of purposes for centuries. Velocity is the critical element in wind power. When wind speed doubles, the wind energy increases by a factor of eight. So minor changes in wind velocity can make a major difference in the viability of the equipment. In many areas the wind velocities are often above or below the optimum use level. An average wind speed of about 18 KMPH or more is needed for producing electricity. For water pumping, a lower velocity of about 14 KMPH can also help successfully.

Diesel and electrical pumps commonly used as source of irrigation and for other needs will become increasingly more uneconomical. Wind pumps can make an important contribution. Although on the face of it India does not appear to be a canditate for large-scale development of wind energy, there are a number of high potential and fairly high potential areas in India, particularly in the Himalayan region, the Western Ghats and the Eastern Coastal region. The wind-mill itself appears to have originated in persia some 2,000 years ago, when it was used for pumping water and grinding grain.

After the energy crisis of 1973, there was a renewed interest in wind energy utilisation and considerable research and development efforts were taken up by many countries including India. The availability of wind energy in India, however, is rather low, wind speeds being around 11-13 Km/Hr on an average. In certain parts of Rajasthan, Gujurat, the Coastal areas of Tamil Nadu, Andhra Pradesh as well as the Sunderbans in West Bengal, the average wind speeds are higher, being around 15-20 Km/Hr, and it is in these regions that wind energy could best be harnessed.

The development of wind machines is specially relevant in arid and semi-arid zones of Rajasthan. These areas have high velocity winds throughout the year which bring about a large amount of sediment transportation, thus posing a serious soil conservation problem to the State Government. If a large number of water pumping wind mills are installed here, they would absorb a considerable amount of the wind energy thereby reducing sediment transportation. Also, the availability of water from these machines would stabilise the soil and help development of agriculture and pastures for cattle growing.

Agriculture needs direct energy inputs for land development, irrigation and harvesting, drying and processing of the produce Since the Kharif crop, normally between June and October, is largely rainfed, there is not much scope for extensive irrigation. Wind mills could, however, be used to pump water for rural irrigation in the rabi season. This will give a fillip to the country's rural economy in a big way.

The National Aeronautical Lobortory (NAL), Bangalore developed a wind mill in 1966 for pumping water. The windmill could lift, about 4,000 litres of water per hour through 10-12 months. National Aeronautical Labora tory installed 68 windmills at various places, which the Council of Scienti ic Industrial Research (CSIR) later gifted to the district authorities and other agencies. U. S. A. and Canada have developed windmills with changing designs. Two Indian engineers, Safraz. H. Dairkee and Murad Hussain, have recently developed a windmill named as "Sheen" which is particularly well suited to Indian conditions where wind velocities are low. Its design is simple and it could be fabricated as a cottage industry. For desert farming and for use at high altitudes such windmills could be of great help.

Wind is an inexhaustible, cheap and pollutionfree power source. Winds of sufficient power and constancy are available at high latitudes. Power generated by windmills could be used for lifting water lighting houses and for many other purposes and thus save substantial quantity of our non-renewable fuels, such as oil and coal.

Wind power is abundantly available, free of cost and is pollution-free. With current sophisticated technology, mass production of windmills is possible. Though initital cost is high, it would be more than offset by the long lite of the mill. Maintenance cost is low. Thus, electricity generated from wind energy will, in the long run, be not only cheap but steady. Price fluctuations as in the case of fossil / fuels (Coal and oil etc.) or nuclear fuels affecting adversely the prospects of cheap power, will not operate in the case of wind power.

Scope and Position of Harnssing Wind Energy in Orissa

Under demonstration programme from the Department on Non-conventional Energy Sources (DNES) wind farm mills are being installed at various institutions in the state in order to evaluate their performance and popularise them. By now in total *270* wind-mills have been installed in the state. A new pilot extension programme has been launched during seventh plan period. Since Orissa is a state which has one of the highest wind velocity in the country, there is every reason to believe that the technology will prove vary popular in the near future. During *1985*, *11* wind energy stations have been installed out of which 9 are in operation. At Kaipadar near Khurdha, *2* were installed out of which one is closed and the other is in operation which is expected to give *90* Kw. of energy. The other places are Ramachandi, Kailani, Soran, Chandrapur, Bhubaneswar, Dalikhaia Puri, Balipada, and etc.

Apart from it, at present there are 3 wind farms. One is situated at Puri, the second at Ramachandi and the third at Kaipadar. The Puri wind farm comparises *20* units, out of which *10* are already giving power of *550* KW which is supplied to O. S. E. B The second farm at Ramrchandi which gives 4 KW is utilised for local use. The third unit at Kaipadar is under preparation and is expected to give 90 KW power which will be supplied to O. S. E. B.

Wind Maping

Monthly Average Wind Speed at Puri (KM/PH)

	1986	1987	1988
January	10.64	10.43	8.77
February	11,81	10.08	13.01
March	15.25	15.03	
April	21.69	18.016	
May	18.59	17.87	
June	18.74.	16.03	
July	15.95	16.14	
August	15.60	16,03	
September	12.31	14.37	
October	12.14	10.65	
November	9.08	12.29	
December	10.42	11.66	

During Seventh Plan Period, it is proposed to generate 1.4 MW. of electricity using windpower. The allocation proposed for 1985-86 is Rs.3.50 lakhs.

Higher initial investment and high cost of energy storage call for a technological break-through to overcome economic constraints in the case of wind energy. Optimum designs ensuring efficient use of materials should be evolved for the purpose. As a long-term strategy, wind power promises to be a major energy alternative in Orissa and India as well.

REFERENCE

1. "Energy Crisis and the way out",
Page—7, *10* Jan., Vol. *30*, M. O. *20*, Nov. 1-*15*, *1986*.
By Dr. Balgopaln Unni.

2. "Harnessing Wind Power"
Page—4, Jojana, Vol. *31*, No. 3, Feb. *16-28*, *1987*.
By Prof. Dhirendra Ku. Dixit.

3. "Conservation of Energy—Prospects and Issues"
Page—*564*, Economic Affairs.
By Kusum Sahai and Perver Chandra.

4. Wind Energy : Status and future in India,
Page—*81*, Capital, Annual *1982*.
By. S. K. Tewari.

5. Wind Energy, Page—*300*.
Seventh Plan 1985-90 and Annual Plan 1985-86
Orissa (Draft), Vol. I, Government of Orissa.

—×—

Energy Loss and Gain in Paddy Cultivation in Orissa

Dr. Dibakar Naik,
Dr. B. Bhuyan
and
D. C. Pradhan
O.U.A.T.

The food-grains production in India has increased from 50 million tonnes to 150 million tonnes during 1950-51 and 1985-86. This has resulted a rise in energy consumption from 1.8 MTCR (million tonnes of coal replacement) to 9.1 MTCR during 1953-54 and 197.0-71 in the agricultural sector. At present there is intensive consumption of energy by different sectors for achieving their targetted growth. But the average annual rate of growth of energy con sumption during this period is highest in agriculture recording 9.9 percent as compared to mining and manufacturing seetot (7.5 percent), transporr (6.9 percent), domestic sector (6.2 percent) and commercial sector (2.1 percent).

Food production in Orissa has increased from 48 to 68 lakh tonnes during 1970-71 to 1983-84. Thus the agricultural scenario of the State has undergone transformation. It has resulted in a substantial increase in energy requirement for agriculture in the State. This is so, because high productivity in agriculture is directly linked with increased use of energy resources. Paddy is the principal crop and occupies 60 percent of the total gross cropped area in the State. Therefore, an attempt is made to analyse the energy loss, gain and its ratio per hectare of paddy cultivation of Orissa.

Materials and Methods :

The data pertaining to the quantities of fertiliser, manures, seeds, pesticides, total man hour, bullock pair hour used and grain and straw yield per hectare in paddy cultivation of Orissa are collected from the Comprehensive Scheme (2). Cost of cultivation of principal crops for the year 1973-74 to 1975-76 and 1982-83 to 1984-85. The inputs used and form, i. e., Mega Joules by multiplying with energy co-efficients. *

The data collected from the Comprehensive Scheme do not reveal any machine labour during 1973-74 to 1975-76. The machine labour used during 1982-83 to 1984-85 costs less than one rupee per hectare of paddy. Due to such low machineries used in paddy cultivation, the mechanical the output obtained per hectare of paddy are converted Into energy energy loss is not calculated in this study.

Result and Discussion :

Energy loss and gain per hectare of paddy cultivation in Orissa during 1973-74 to 1975-76 is presented in Table---1. The total energy use through seeds, human labour, bullock labour, fertiliser, manures and insecticides per hectare of paddy vary from 6146.74 Mega Joules (1974-75) to 8715.53 Mega Joules (1975-76). On an average, the energy loss due to application of inputs and use of human and bullock labour is 7190.53 MJS per hectare, The energy gain in the form of grains varies from 18.19 thousand MJS (1974-75) to 23.09 thousand MJS (1973-74). The total biological yield (grain+straw) was highest during 1973-74 recording 52.55 thousand MJS and lowest in 1974-75 with 41.41 thousand MJS per hectare of paddy.

---

* The energy co-efficients used are as follows (1) Human labour male hour = 1.96 MJ (2) Female labour hour = 1.57 MJ (3) Bullock pair hour = 10.1 MJ (4) One Kg, of nitrogen = 60.00 MJ. (5) One Kg. of P_2O_2 = 11.10 MJ (6) One Kg. of K_2O = 6.70 MJ (7) One Kg. of FYM (dry) = 0.30 MJ (8) One Kg.of grain = 14.70 MJ (9) One Kg. of straw = 1212.50 MJ (10) Farm Machinery per one Kg. = 62.70 MJ. Farm Machinery per Kg. is calculated by distribution of the weight of machinery equally over the total life span of the machinery in hours. Then it will be multiplied by the hour use of machinery for particular operation.

Table—2 indicates that, on an average, the total energy use in the form of inputs and labour and energy gain in the form of grains and straw were of 9134.17 MJS and 62239.30 MJS respectively per hectare of paddy during 1982-83 to 1984-85. The total energy use varies from 8.49 thousand MJS (1982-83) to 10.04 thousand MJS (1984-85) per hectare of paddy. The total energy gain was highest in 1983 84 (72.75 thousand MJS) and lowest in 1982-83 (47.23 thousand MJS. Thus, Table—1 and Table—2 indicate that the energy gain in the form of grains and straw has significantly increased from 47.76 thousand MJS in 1973-76 to 62.24 thousand MJS in 1982-85 per hectare of paddy.

A comparative statement in the use of energy in form of seeds, human labour, bullock labour, fertilizer manures and insecticides during 1973-76 and 1892-85 is placed in Table—3. The total energy use per hectare of paddy cultivation has increased significantly from 7.1 thousand MJS to 9.13 thousand MJS during 1793-76 to 1982-85. This is mainly due to change in farm operations and adoption of high yielding vartieies over the years The use of human and bullock energy has considerably increased from 3.33 thousand to 4.58 thousand MJS per hectare of paddy over the years. This may be due to adoption of high yielding varieties and a change in farm operations over the year. This clearly indicates that the substitution of human and bullock energy by mechanical energy is negligible. The chemical energy use per hectare has increased from 2.85 thousand to 3.24 thousand MJS during 1973-76 to 1982-85. Table 3, further indicates thnt human and bullock labour contributes about 50 percent of the energy use in paddy cultivation of Orissa.

The ratio of energy loss in the form of inputs used in paddy cultivation and energy gain through harvested grain and straw during 1973-74 to 1984 85 are presented in Table—4. On an average, the energy ratio is 2 92 and 6 64 respertively with regard to grain and total biological yield (grain+straw) during 1973 74 to 1975-76. The energy ratio is 2 44,3 61 and 2 92 respectively in 1982 83, 1983-84 and 1984-85 with reference to grain yield. The corresponding ratio are 5.56, 8 20 and 6.64 with respect to total biological yield. The energy ratio is highest during 1983 84 recording 3.61 and 8.20 respectively for grain and total biological yield. On an average,

the energy ratio is 2.99 and 6.81 respectively of grain and total biological yield, during 1982-83 to 1984-85. Thus, Table—4 indicates that there is no significant increase in energy ratio during 1973-76 and 1982-85 in paddy cultivation of Orissa. This is mainly due to lack of substitution of human and bullock energy by mechanical energy, application of chemical energy in the crop and stagnation in the grain yield over the years.

Conclusion :

The total energy use per hectare of paddy cultivation in Orissa in the form of seeds, fertilisers, manures, insecticides, human labour and bullock lobour has increased significantly from 7.19 thousand to 9.13 thousand Mega Joules during 1973-76 to 1982-85. The energy gain in the form of grains and straw was 47.76 thousand Megajoules in 1973-76, which increased to 62.24 thousand Megajoules during 1982-85 per hectare of paddy in Orssa.

The totol use of human and bullock energy which was 3.33 thousand MJS during 1973-76 increased to 4.58 thousand MJS per hectare of paddy in 1982-85. Thus, due to change in farm operations and adoption of high yielding varieties the use of total energy per hectare has increased significantly over the years. A considerably increase in human and bullock energy over the period has been mainly due to non-substitution of human and bullock energy by mechanical energy.

The energy ratio has marginally increased from 2.92 to 2.99 and 6.64 to 6.81 respectively with regard to grain and total biological yield (grain + straw) during 1973-76 and 1982-85 per hectare of paddy in Orissa. It is mainly due to the fact that the level of paddy yield has not increased significantly over the years. The rice farming in Orissa has become more labour intensive on adoption of high yielding varieties. The use of mechanical energy is at a lower level. The degree of substitution of human and bullock energy by mechanical energy is negligible.

In India, the ratio of input-output of energy[3] varies from 1:5.23 to 1 : 5.47 with respect to grains and 1 : 10.98 to 1 : 11.5 with respect to

total biological yield, i. e., grain plus straw during 1973. But in Orissa, the energy ratio is only 1 : 2.99 with respect to grain and 1 : 6.81 with respect to total biological yield. This is mainly due to low grain yield per hectare in Orissa as compared to the national average.

NOTES AND REFERENCES :

1. Report of the Fuel Policy Committee, 1974.
2. Estimates of cost of cultivation/production of paddy in Orissa 1973 74 1984-85, Comprehensive Scheme, Cost of Cultivation of Principal Crops, Directorate of Economics and Statistics, Ministry of Agriculture, Government of India.
3. Mellor, J. W. and Moorti, T. A., 1973 :—A Comparative study of costs and benefite of irrigeton from State and Private tube–wells in Uttar Pradesh, Indian Journal of Agricultural Economics, Bombay.

× × ×

TABLE—1

Energy loss and gain per hectare of paddy cultivation in Orissa during 1973-74 to 1975-76 (Figures in regajoules)

Items	1973-74	1974-75	1975-76	Average
1. Energy use through seeds	1245.38	525 23	1260.23	10 0.28
2. Human Energy	1420.79	1384.47	1499.83	1435.03
3 Bullock Energy	1854.56	1680.74	2157.87	1897.72
4. Chemical Energy	2188.60	2556.30	3797.60	2847.50
5. Total Energy use	9709.33	6146.74	8715.53	71.90 53
6. Energy gain				
(a) grains	23,093.70	18 198.60	21,682.50	20,991.60
(b) straw	29,456.25	23,212.50	27,656.25	26,775.00
7. Total biological yield (grain + straw)	52,549.95	41, 411.10	49,338.75	47,766.60

TABLE–2

Energy loss and gain per hectare of Paddy Cultivation in Orissa during 1982-83 to 1984-85 (Figures in Mega Joules)

Items	1982-83	1983-84	1984-85	Average
1. Energy use through seeds	1326.38	1314.92	1298.89	1313.39
2. Human Energy	1686.97	1829.81	1756.63	1757.80
3. Bullock Energy	2796.69	2893.45	2787.70	2825.95
4. Chemical Energy	2682.90	2829.30	4198.90	3237.03
5. Total Energy use	8492.94	8867.48	10042.12	9134.17
6. Energy gain (a) grains	20,756.40	31,972.50	29,326.50	27,351.80
(b) straw	26,475.00	40,781.25	37,406.25	34,887.50
7. Total biological yield (grain + straw)	47,231.40	72,753.75	66,732.75	62,239.30

TABLE—3

Use of Energy during 1973-76 and 1982-85 in Paddy Cultivation of Orissa (Figures in Mega Joules)

Items	1973-76	1982-85
Seeds	1010.28	1313.39
	(14.05)	(14.38)
Human Energy	1435.03	1757.80
	(19.96)	(19.24)
Bullock Energy	1897.72	2825.95
	(26.39)	(30.94)
Total Human and Bullock Energy	3332.75	4583.75
	(46.35)	(50.18)
Chemical Energy (It is the Energy use through Fertilizer, manure and insecticides.)	2847.50	3257.03
	(39.60)	(35.44)

(Figures in paren-theses indicate percentage of total energy use per hectare of paddy).

TABLE –4

Energy ratio * in Paddy Cultivation of Orissa.

Years	With respect to grain	With respect to total biological yield (grain + straw)
1973-74	3.44	7.83
1974-75	2.96	6.74
1975-76	2.49	5.66
Average (1973 to 1976)	2.92	6.64
1982-83	2.44	5.56
1983-84	3.61	8.20
1984-85	2.92	6.64
Average (1982 to 1985)	2.99	6.81

*It is the ration of energy loss in the form of inputs used in paddy cultivation and energy gain in the form of harvested grain and straw.

Role of Community Biogas as Alternative of Source of Energy in Rural Economy : A Case Study of Seriguda Village in Koraput District.

S. Mukherjee
Reader in Economics,
V. Deb College, Jeypore

There is a massive deterioration of the landmass. environment and the quality of life in most of the Third World Countries. This has created an unprecedented social, economic and political disruption. If the loss of forest, the soil erosion, environmental degradation and general conditions of peverty continue at the present rate, results will be catastrophic by the end of the century.

Many of these problems are directly or indirectly related to the quality and quantity of energy produced, distributed and consumed. During the last few years it has been inereasingly recognised that the fossil fuel energy sources ate finite.

It is inevitable in these circumstance to search for alternative sources of energy. Among the alternative renewable sources, those with a promising future are bio-gas, solar and wind energy, which have been neglected because of the massive development of fossil fuel energy sources during the last 100 years. However, it is generally well recognised even in the highly industrialised countries that bio enrgy will provide a substantial alternative in the near future as well as during post-oil era. Hence

the importance of the biogas energy for economic development in the Third World.

It is well-known that China and India have provided the lead in this area, by testing and developing biogas plants, mostly in rural areas in order to provided energy for at least basic necessities of lighting and cooking. Record shows that China had 7 million and India had 80,000 biogas plants in 1980[1]. In Orissa total numer of biogas plants counstructed up to 1980 was 740[2].

Biogas is defined as the combustible gas produced by the anaerabic fermentation of organic residue materials originating from human, animal and vegetable resources. Biogas technology is understood to mean the spectrum of orgrnised knowledge including inputs, core digester technology and outputs. Input includes generation, collection of organic materials, water, manpower required for biogas generation. Core parameter includes the anaerobic fermentation of organic material in the digester. Output includes utilisation generated gas which is used for generating electricity, pumping water and as fuel for cooking, digested slurry as fertiliser and soil conditioner.

The International Biogas Workshop jointly organi ed by the Commonwea lth Science Council and the khadi village Industries Commission at Bombay in September, 1980 has rightly emphasised the importance of establishment of biogas plants in rural areas.

In India, for example it is estimated that over 30% of 980 million tonnes of cattle dung produced is burnt for fuel which would be used as organic manure if passed through biogas plants. In terms of nutrient, it is equivalent to third of India's chemical fertliser use. If the entire quantity of 980 million tonaes of cattle dung if put through gas plant, it can produce gas enough for 487 million prerson and production of organic manure (digested slurry) will increase by 360 million tonnes[3]. In Orissa, nearly 20,000 tonnes of cowdung are burnt annually[4]. Thus biogas plant has direct effe t on increasing agricultural production.

Another source of fuel is fire-wood. Nearly 83% of people in Orissa use fire-wood for cooking. As result, annually 42 lakh tonnes of fire-wood are consumed for cooking purposes in our State. This is causing deforestation at an alarming rate resulting in delayed mensoon, soil erosion, flood etc. Thus biogas programme is a very important prospective energy source for rural areas which will have a direct bearing in arresting deforestation to prevent ecological imbalance.

A significant area of biogas utilisation is in enhancing electricity supply. Despite extensive rural electrification it will take many years to cover all the rural areas. Decentalisation of power production is very much needed as we have problems and cost headaches of transmission lines and their maintenance, let alone theft. Nearly 80% of the homes of the country use Kerosine oil for lighting. Much of the foreign currency earnings of the country has to be used to import oil. In this connection, gas lighting or electricity generated through biogas offers a valuable alternative.

II

Keeping all these in view as a part of N. P. B. D. (National Programme for Biogas Development) OREDA Orissa Renewable Energy Development Agency) has been able to construct 14522 biogas plants between 1981-82 and 1986-87 in addition to the 740 plants established earlier for family size plants, there is provision for capital subsidy ranging between 20 to 75% and bank loans to the beneficiaries.

But to operate even a small size plant, cattle dung of 2 to 3 heads of cattle would be required. Only a limited number of farmers own more than 2 heads of cattle. There are also a large number of farms who do not own cattle. Despite capital subsidy less affluent farmers cannot afford to instal family-size biogas plants due to high cost of plants. To deprive the poorest section of the benefits of the biogas plants will have far-reaching social and economic consequences.

In view of these, instalation of community biogas plants have been emphasised in N. P. B. D. The need for installation of community biogas plants is much more in a back-ward district like koraput Encouraged by the success of the community biogas plants in the village Tundapalli in the Korkunda Block under Malkangiri Sub Division, the

Department of Nonconvetional Energy Sources, Govt. of India has financed a community biogas plants at village Seriguda in the Kasipur Block under Raygada Sub-Division. The scheme has been executed by OREDA. The cost of the project was Rs. 1. 5. lakh and it started operation in 1986. OREDA has also constructed a wind-mill in the village for irrigation and drinking water. Two more community biogas plants are under construction. One is being installed at village Lakrersi in Kasipur Block and another at village Pithageta in Korkunda Block in Malkangir: Sub-division.

The village Seriguda is situated at a distance of 6 kms. from block headquarters Kasipur and at a distance of 100 kms foom Dist. Headquarters, Koraput. It is situated at an altitude of 3000 feet above sea level. The climate is temperate. The village is inhabited by 42 tribal families Total number of inhabtants 210. Main occupations of the inhabtants are agriculture and animal husbandry. The total numbar of cattle is 176.

The plant is a KVIC floating dome two chamber vertical model. The disgester of the plant is fed daily 2.5 quintals of cattle dung supplid by the villagers. It has a capcity to produce 25 cubic metres gas per day. The gas is converted into 3.5 kilowatt of electricity per day through a dual fuel 5 h. p. diesel engine. This works on 85% biogas and 15% diesel. The consumption of diesel is 2 times per day. The electricity generated by the plant has provided 8 street lights and a single point hundred watt bulb to each of the 42 house-holds for 5 hours. Because of the village electrification a night school is in operation and community funcutions are performed with gay at night.

The operation and maintencance of the plants is looked after by a voluntary organisation-Social Workers' Research Centre. Rs. 10 per month is collected from each family towards maintencance of the plant.

Because of the excellent community feeling among the tribal folk ef the village and devotion of the social workers' Research Centre, the plant

---

* The author is greatly indebted to Sri N. R Gupta, Asst. Engineer, Energy OREDA, DRDA, Koraput for supplying data regarding the community biogas plants at Seriguda.

is working successfully. Apart from its contribution to village electrification, the digest slurry is used by the villagers as fertiliser.

Since the gas for cooking purposes is not supplied to the villagers, each house-hold has been given free a smokeless Chulah by OREDA. This Chulah consumes 30% less fire-wood than the traditional chulah, and thus helps minimising deforestation and at the same time reduces the drudgery of the women folk in collecting fire-wood and time taken for cooking. This also improves the health conditions as the use of traditional chulah causes cataract of eyes, dronchits' etc. Smokeless chulah is very popular with the women folk of the village as the kitchen is no more blackened with soot and as it prevents the staining of the cooking vessels. Use of smokeless chulah can also generate employment and income for the local people if earthen pipes are used in place of A. C. pipes normally being used to drive the smoke out and local potters may be employed in making pipe and chulah.

CONCLUSION

The present policy of supply of gas for cooking from family-size biogas plant and village elecrification by community biogas plant should continue. But higher capacity communal biogas plant may be installed to run village industries to utilise the raw material available to generate income and employment. But cost of the biogas plant is a limiting factor. Further researd is to be made to reduce the cost of community biogas plant.

Community biogas plant suffers from the problems of management, maintenance and operation. Problem of cooking of inlet and outlet pipes as in case of Seriguda plant, regular painting of dome of the plant to prevent rusting etc. requires proper training of personnel.

Floor mill rice hawler and even video parlour may be run by the electricity generated by the higher capacity community biogas plant as suggested by the Togore Society the voluntry organisation in charge of community biogas plant at Tundapalli in Malkangiri Subdivision to meet ahe maintenance cost of the plant.

Community biogas plant can also be used for supplying water for irrigation and drinking water through pumpsets apart from illumination but

this requires an integrated approch by OREDA as it executes other types of renewable energy project such as windmill, solar pump, solar distillers, solar light and smokeless chulah aprat from biogas plant (both domestic and community type.)

The large-scale application of biogas energy has to be judicious to achiev the best results. A study of the energy requirement both at the national and the regional level which can be satisfied by means of community biogas energy is a must. According to one estimate, the dung left-over by the cows and buffolos all over India can generate 26 thousand megawatts of electricity[5].

Thus the scope for expansion of commnity biogas plants is immense but higher initial investment calls for a technological breakthrough to overcome economic constraints. As a long run strategy, a community biogas plants promises to be a major energy alternative.

Reference :

1 Rashmi Mayur, Bio-Energy for development in the Commonwealth Countries Khadi gramodyog, December 1980.

2, C. V. Krishna, **Orissar Jaleni Samasya abong Tahar Samadhan.** P. 3

3. Inagural Address by R V. Swaminathan, Union Minister for Agriculture Rural construction in the International Biogas workshop in Sept. 1980.

4, C. V. Krishna, Opp, Cit. p-2

5. Sankar Ray, **Shiftirg Urban Emphasis : An energy Alternative,** Khadi gramodyog, December 1980.

LIST OF LIFE MEMBERS

1 Smt. Anjali Das, Deptt. of Economics, S.K.D.A.V. College, Rourkela.

2 Sri Ajoya Kumar Mohapatra, Deptt. of Economics, Ravenshaw College, Cuttack.

3 Sri A. B. Sahoo, Deptt. of Economics, Anandapur College, Anandapur, Keonjhar.

4 Dr. A. K. Mitra, Reader, Deptt. of A and A Economics, Utkal University, Vani Vihar, Bhubaneswar.

5 Miss Annapurna Satpathy, Deptt. of Economics, Ravenshaw College, Cuttack.

6 Major A. K. Roy, Deputy D. P. I. (Non-Govt. College Section) Heads of the Deptt. Buildings. Bhubaneswar.

7 Dr. A. K. Mohanty, Professor, Deptt. of A and A Economics, Utkal University, Vani Vihar, Bhubaneswar.

8 Smt. A. Choudhury, Deptt. of Economics, Berhampur University, Bhanja Vihar, Berhampur, Ganjam.

9 Sri B. E. R. Patnaik, Deptt. of Economics, V. Deb College, Yeypore.

10 Sri Bijoy Kumar Mohapatra, I. E. S., Joint Director, Directorate of Industries, Killa Maidan, Cuttack.

11 Sri Bhabani Prasad Das, Reader in Economics, Khallikote College, Berhampur.

12 Mrs. Banabasini Mohapatra, Deptt. of Economics, S. K. D. A. V. College, Rourkela.

13 Dr. Binayak Rath, H and S. Sc. Department, I. I. T. Kanpur (U. P.)

14 Sri Bidyadhar Nayak, Reader in Economics, Qrs. No. G/70, Old L. I. C. Colony, Badambadi, Cuttack.

15 Sri Basanta Kumar Das, Vice-Principal, Rajdhani College, Bhubaneswar.

16 Sri Benudhar Mishra, Principal, Biswayak Acharya College, Aska Road, Berhampur.

17 Prof. B. C. Parida, Professor of Economics, College of Cost Accountancy & Management Studies, Cuttack—7

18 Sri Bimal Kumar Das, Deptt. of Economics, Dhenkanal College, Dhenkanal.

19 Sri Bibhudhendu Mishra, Assistant Commissioner, Income Tax.

20 Sri B. K. Bose, I. D. B. I. Nariman Street, Bombay.

21 Sri Bimal Kumar Mohanty, Deptt. of Economics, Ravenshaw College, Cuttack—3

22 Dr. Basudeb Sahoo, Professor of Economics, Ravenshaw College, Cuttack

23 Dr. Bibekananda Das, Professor of Economics, Berhampur University, Bhanja Vihar, Berhampur.

24 Sri Bhagabat Patra, Dept. of Economics, Berhampur University, Bhanja Vihar, Berhampur.

25 Sri B. K. Sahu, Dept. of Economics, Hinjilicut College, Hinjilicut, Ganjam.

26 Sri B. K. Panda, Dept. of Economics, Berhampur University, Bhanja Vihar, Berhampur.

27 Sri Binayak Das, Dept. of Economics, Science College, Hinjilicut, Ganjam.

28 Sri B. Samantaray, Dept. of Economics, R. C. M. College, Khallikote, Ganjam.

29 Miss Bijayalaxmi Rout, Dept. of Economics, S. B. Women's College, Cuttack.

30 Major B. N. Sahu, Reader for Economics, Kendrapara College, Kendrapara.

31 Sri Chandramani Dash, Reader in Economics, Govt. Women's College, Berhampur.

32 Sri Chittaranjan Das. Dept. of Economics, U. N. College, Soro, Balasore.

33 Sri Dayanidhi Pal, Reader for Economics, Salipur College, Salipur,

34 Sri Dayanidhi Samantaray, Reader for Economics, Christ College, Cuttack.

35 Dr. D. Choudhury, Dept. of Economics, K. S. U. B. College, Bhanjanagar, Ganjam.

36 Gopabandhu Institute of Administration and Training, Bhubaneswar.

37 Dr. G. S. Das, Director of Education, Orissa, Bhubaneswar.

38 Smt. Gopa Das, Municipal College, Rourkela-12

39 Dr. G. C. Kar, Professor, Dept. of A and A Economics, Utkal University, Vani Vihar, Bhubaneswar.

40 Sri Gobinda Chandra Das, Dept. of Economics, Dhenkanal College, Dhenkanal.

41 Dr. G N. Das, Reader for Economics, Sambalpur University, Jyoti Vihar, Burla.

42 Sri G. B. Nath, Dept. of Economics, Deogarh, College, Deogarh.

43 Sri Gobinda Ch. Padhi, Dept. of Economics, Hinjilicut College, Hinjilicut, Ganjam.

44 Sri H. K. Sahu. Dept. of Economics, K. S. U. B. College, Bhanjanagar, Ganjam.

45 Sri I. Gopal Rao, Dept. of Economics, Gunupur College, Gunupur, Koraput.

46 Smt. Jharana Ray, Reader for Economics, J. K. B. K. College, Cuttack.

47 Sri Kartik Ch. Rath, Dept. of Economics, Salipur College, Salipur, Cuttack.

48 Smt. Kanaka Manjari Mishra, Dept. of Economics, Salipur College, Salipur, Cuttack.

49 Smt. Kanaka Manjari Mohanty, Dept. of Economics, R. D. Women's College, Bhubaneswar.

50 Dr. Kumarbar Das, Reader for A & A Economics, Utkal University, Bhubaneswar.

51 Sri K. N. Mohapatra, Dept. of Economics, Rourkela Evening College, Rourkela-2

52 Sri K. C. Nayak, Dept. of Economics, A. B. College, Basudevpur, Balasore.

53 Sri K. Srinivasan, I. A. S., Commissioner-cum-Secretary, Agriculture and Community Development Department, Govt. of Orissa, Secretariate, Bhubaneswar.

54 Sri K. C. Nayak, Dept. of Economics, Ravenshaw Evening College, Cuttack.

55 Dr. K. N. Buchi, Department of Economics, Khalikote Evening College, Berhampur.

56 Smt. Lopamudra Mohanty, Dept. of Economics, Govt. College, Rourkela.

57 Sri L. M. Sahoo, Dept. of Economics, Salipur College, Salipur, Cuttack.

58 Sri L. N. Panigrahi, Dept. of Economics, Godabarish Mahavidyalay, Banpur, Puri.

59 Dr Manoranjan Das, Dept. of Economics, Khallikote College, Berhampur.

60 Smt. Manorama Mohapatra, The Samaj, Gopabandhu Bhawan, Buxi Bazar, Cuttack.

61 Sri Mohit Kumar Sarangi, Dept. of Economics, M. P. C. College, Baripada.

62 Sri Manmohan Das, Reader for Economics, M. P. C. College, Baripada.

63 Sri M. Biswal, Dept. of Economics, M. S. College, Baramba.

64 Sri M. K. Mohanty, Dept. of Economics, Rajdhani College, Bhubaneswar.

65 Sri Narisingh Charan Acharya, Dept. of Economics, K. B. D. A. V. College, Nirakarpur, Puri

66 Dr. Nagen Charan Mohanty, Reader for Economics, Panchayat College, Bargarh, Sambalpur.

67 Dr. Nilakantha Rath, Gokhale Institute of Economics and Politics, Pune-4.

68 Sri N. Rout, Dept. of Economics, S. V. M. College, Jagatsinghpur, Cuttack

69 Sri N. C. Ray, Dept. of Economics, Ekamra College.

70 Smt. N. Prabhat Kusum, R. C. M. College, Khallikote, Ganjam.

71 Sri N. Nanda, Reader for Economics, F. M. College, Balasore.

72 Dr. N. C Sahu, Dept. of Economics, Berhampur University, Bhanja Vihar, Berhampur, Ganjam.

73 Dr. N. B. Pradhan, Reader in Economics, Berhampur University, Bhanja Vihar, Berhampur, Ganjam.

74 S, t. P. K. Singh, Dept. of Economics, V. Dev College, Jeypore, Koraput.

75 Sri Pramod Kumar Mohapatra, CARE, Saheed Nagar, Bhubaneswar.

76 Dr. Pravat Kumar Patnaik, Professor of Economics, Jawaharlal Nehru University, New Delhi-100067.

77 Dr. P. C. Mohapatra, Dept. of Economics, V. Dev College, Jeypore.

78 Dr. P. R. Brahmanda, Ex-Director, Dept. of Economics, Bombay University, Bombay.

79 Sri Pratap Kumar Nayak, Department of Economics, J. K. B. K. College, Cuttack-3

80 Sri P. K. Mohapatra, Dept. of Economics, Khemunda College, Digpabanth, Ganjam.

81 Dr. Prahallad Panda, Prof. of Economics, Berhampur University.

82 Sri P. K. Mohapatra, Dept. of Economics, Ravenshaw College, Cuttack.

83 Sri Rabindra Kumar Mishra, Reader in Economics, Ravenshaw College, Cuttack-3

84 Sri Raghabananda Mohapatra, Dept. of Economics, Municipal College, Rourkela-12

85 Sri Rajkishore Mishra, Dept. of Economics, B. J. B. College, Bhubaneswar.

86 Sri R. N. Kar, Small Industries Training Institute, Cuttack-8

87 Sri R. N. Patnaik, Dept. of Economics, Ravenshaw College, Cuttack.

88 Sri R. C. Sarangi, Department of Economics, Ravenshaw College, Cuttack.

89 Sri R. P. Choudhury, Dept. of Economics, Khallikote College, Berhampur.

90 Sri R. K. Sahu, Dept. of Economics, V. N. College, Jajpur Road, Jajpur.
91 Sri Rabindra B. Samal, M. S. College, Baramba.
92 Sri Rabindra K. Nayak, Dept. of Economics, B. J. B. College, Bhubaneswar.
93 Dr. R. N. Tripathy, Director, National Institute of Rural Development, Rajendra Nagar, Hydrabad (A. P.)
94 Sri R. K. Panda, B/L-115, VSS Nagar, Bhubaneswar-4
95 Dr. R. N. Padhi Sharma, Dept. of Economics, Berhampur University.
96 Sri R. P. Behera. Dept. of Economics, Govt. College, Bhawanipatna.
97 Sri R. K. Sahu, Reader in Economics, P. N. College, Khurda.
98 Sri Ramachandra Mishra, Department of Economics, S. C. S. Evening College, Puri.
99 Smt. Sashikala Patnaik, Dept. of Economics, Govt. College, Rourkela-2
100 Sri Surendra Swain, Dept. of Economics, Rourkela Evening College, Rourkela-2
101 Sri Saroj Kumar Panda, Department of Economics, Khallikote College, Berhampur.
102 Dr. (Mrs.) Santi Das, Reader in Economics, Ravenshaw College, Cuttack.
103 Sri S. N. Panigrahi, Department of Economics, Khalikote College, Berhampur.
104 Sri Sarat Kumar Nayak, Dept. of Economics, Ravenshaw Evening College, Cuttack.
105 Smt. Sita Sahu, Vice-Principal, S. B. Women's College, Cuttack.
106 Sri Surendra Nath Behera, Dept. of Economics, Ravenshaw College, Cuttack.
107 Dr. Salik Ram, Central Rice Research Institute, Bidyadharpur, Cuttack-6
108 Dr. Saila Devi, Department of A & A Economics, Utkal University, Bhubaneswar.
109 Sri S. C. Mohapatra, Department of Economics, V. Deb. College, Jeypore.
110 Sri S. Mishra, Department of Economics, K. B. D. A. V. College, Nirakarpur, Puri.
111 Sri Srinath Sahu, Reader in Economics, G. M. College, Sambalpur.
112 Sri Siben K. Bose, Department of Economics, Christ College, Cuttack.
113 Sri Satrughna Nath Das, Department of Economics, Ravenshaw College, Cuttack.
114 Smt. Surangiri Mishra, C/o. G. Mishra, Department of English, Utkal University, Vani Vihar, Bhubaneswar.
115 Sri Saroj Kumar Kanungo, Dept. of Economics, Rajdhani College, Bhubaneswar.

116 Sri Trilochan Mohanty, Dept. of Economics, Khalikote College, Berhampur.
117 Sri S. K. Mishra, Dept. of Economics, College of Cost Accountancy & Management Studies, Cuttack.
118 Sri U. C. Nayak, Department of Economics, S. V. M. College, Jagatsinghpur, Cuttack.

LIST OF ANNUAL MEMBERS

1 Sri Bhabani Kumar Pattanaik, Dept. of Economics, Tara Tarini College, Purusottampur, Ganjam.
2 Sri Upendra N. Padhi, Dept. of Economics, Kalinga Mahavidyalay, AT/Po-G. Udayagiri, Phulbani.
3 Sri Chintamani Nayak, Dept. of Economics, Kendrapara College.
4 Smt. Padmaja Mishra, Dept. of A & A Economics, Utkal University, Bhubaneswar
5 Smt. Ritanjali Dash, Department of Economics, Regional College of Education, Bhubaneswar.
6 Sri A. K. Padhi, Dept. of Economics, Ispat College, Rourkela.
7 Miss G. Samantray, Department of Economics, Pattamundai College, Pattamundai, Cuttack.
8 Sri Benudhar Nayak, Dept. of Economics, S. R. C. College, Belpal, Balasore,
9 Dr. Jyoti Prakash Patnaik, Dept. of Economics, Sambalpur University.
10 Sri Amulya K. Sahu, Dept. of Economics, Anchual College, Padmapur. Dist-Sambalpur.
11 Sri Gunanidhi Majhi, Dept. of Economics, Dalmia College, Rajgangpur.
12 Sri Radhashyam Mohapatra, Deptt. of Economics, V. N. College, Jajpur Road.
13 Dr. Dibakar Naik, Plot No. 622, Nuapalli, Near Kalinga Stadium, Bhubaneswar.
14 Dr. S. N. Mishra, Deptt. of Economics, Berhampur University.
15 Sri Ramesh Chandra Pradhan, Deptt. of Economics, V. N. College, Jajpur Road.
16 Sri Jagabandhu Samal, Deptt. of Economics, D. A. V. College, Koraput.
17 Sri Suhendu Mukherjee, Deptt. of Economics, V. Deb. College, Jeypore.
18 Dr. B. Bhuyan, Professor of Agricultural Economics, OUAT, Siripur, Bhubaneswar.
19 Sri J. K. Tripathy, Research Officer, Consultancy Organisation, OUAT, Siripur, Bhubaneswar.
20 Sri K. K. Sen, Vice-Principal, M. P. C. College, Baripada.
21 Sri K. C. Samal, Dept. of Economics, G. M. College, Sambalpur.
22 Sri N. K. Sahu, Project Evaluation Organisation, Planning Commission, Sambalpur-2

23 Sri S. K. Mohapatra, Dept. of Economics, Gopalpur College, Gopalpur, Balasore.

24 Sri G. Behera, Dept. of Economics, Betnoti College, Betnoti, Mayurbhanj.

25 Sri B. C. Mohanty, Dept. of Economics, Salipur College, Salipur, Cuttack.

26 Smt. Sandhyarani Mohapatra, Vill/P.O. Chandanpur, Puri.

27 Sri Anand Chandra Panda, Reader in Economics, Khallikote Evening College, Berhampur.

28 Sri Lokshrinarayan Dash, Research Scholar, Dept. of English, Berhampur University.

29 Sri T. Barapanda, Dept. of English. Berhampur University.

30 Proff. G. P. Mohapatra, Reader in Eco., Science College, Hinjilicut, Ganjam.

31 Sri Bansidhar Behera, Dept. of Eco. F. M. College, Balasore.

32 Sri Anand Kumar Jena, Reader in English, Bhadrak College.

33 Sri Malyabanta Routray, Department of Eco. K. B. College, Baranga.

34 Dr. N. P. Patra, Proff. of Eco. G. M. College, Sambalpur.

35 Sri. K. Anand Rao, Dept. of Eco. Govt. College, Bhawanipatna.

36 Sri B. Purohit, Dept. of Eco. Govt. College, Bhawanipatna.

37 Sri Surya Narayan Tripathy, N. B. C. College, Ganjam-761122.

38 Miss Debajani Baxipatra, C/o. H. Charan Baxipatra, Jeypore, Koraput-764001

39 Sri Kishore Ch. Nayak, Department of Eco. Brajraj Nagar College, Brajraj Nagar.

40 Dr. P. C. Mohapatra, P. G. Dept. of Economics, Ravenshaw College, Cuttack-3

41 Dr. Subrat Kumar Das, Dept. of Economics, B. J. B. College, Bhubaneswar.

42 Sri Nityananda Ray, Dept. of Economics, Vedavyas College, Rourkela.

43 Himansu Sekhar Dash, Dept. of Economics, Gandhi Mahavidyalaya, Rourkela.

44 Rabinarayan Patra, Dept. of Economics, Bhadrak College, Bhadrak.

45 Sri Kartik Dash, Dept. of Economics, D. D. College, Keonjhar.

46 Sri B. B. Mishra, Dept. of Economics, G. M. College, Sambalpur.

47 Sri S. Mishra, Dept. of Economics, F. M. College, Balasore.

48 Sri A. K. Dash, Dept. of Economics, Talcher College, Talcher.

49 Smt Bishnupriya Mishra, Dept. of Economics, R. D. Women's College, Bhubaneswar.

50 S. K. Satpathy, Dept. of Economics, Rourkela Evening College, Rourkela.

51 Smt. Satyabhama Das, Reader in Economics, Govt. Women's College, Bolangir.

52 Sri B. Routray, Dept. of Economics, V. N. College, Jajpur Road.

— O —

LIST OF PRESIDENTS

Year	Host & Venue	President
1968	Ravenshaw College, Cuttack	Dr. S. Mishra
1969	Dhenkanal College, Dhenkanal	Dr. D. C. Mishra
1970	Khallikote College, Berhampur	Dr. Bidyadhar Mishra
1971	Utkal University, Bhubaneswar	Dr. Baidyanath Mishra
1972	Bhadrak College, Bhadrak	Dr. C. D. Mishra
1973	Panchayat College, Bargarh	Prof. R C. Pattnaik
1974	OUAT, Bhubaneswar	Dr. S. P. Gupta
1975	Kendrapara College, Kendrapara	Prof. H. K. Mishra
1976	S. C. S. College, Puri	Dr. D. C. Mishra
1977	Nimapara College, Konark	Dr. S. Tripathy
1978	Berhampur University	Dr. N. K. Mishra
1979	Utkal University, Bhubaneswar	Dr. K. Kanungo
1980	G. M. College, Sambalpur	Dr. P. K. Pattnaik
1981	OUAT, Bhubaneswar	Prof. D. Mohapatra
1982	Municipal College, Rourkela	Dr. B. N. Das
1983	Ravenshaw College	Dr. G. S. Das
1984	Berhampur University	Dr. B. D. Sahu
1985	Vikram Deb College, Jeypore	Dr. S. Mohanty
1986	Banki College, Banki	Prof. B. C. Parida
1987	Kendrapara College	Dr. B. Bhuyan
1988	S. C. S. College, Puri	Dr. G. C. Kar