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BHUBANESWAR-4

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Report of the Secretary

I deem it a unique privilege for me to place the report on the activities of the Orissa Economics Association before this august gathering.

At the outset, I accord you all a hearty and cordial welcome to this 12th Annual Conference of the Orissa Economics Association. The Annual Conference is usually held in the month of February. I regret that there has been delay in organising the Conference this year for some unavoidable circumstances. It would not have been possible to hold the conference but for the Vice-Chancellor and the Chairman, Reception Committee, Dr. Bidyadhar Mishra. Dr. Mishra readily complied with our request to hold the conference here under the auspices of the Department of Analytical & Applied Economics. The Vice-Chancellor has been gracious enough to contribute a sum of Rs. 1000/- for organising the conference here. I take this opportunity to express my sincere gratitude to the Vice-Chancellor. We are really grateful to Dr. K. Kanungo, Vice-Chancellor, O. U. A. T. and the President of the Association for accepting our offer to preside over this conference. Dr Kanungo has achieved distinction in the field of Agricultural Economics and I am sure we will be immensely benefitted by his address to this gathering.

We are singularly fortunate to have in our midst to-day, Dr. Ram Prasad Mishra, Finance Minister of Orissa as our Chief Guest. I express my gratitude to our Chief Guest, for coming over here, inspite of his numerous preoccupations, to inaugurate the Conference.

The Orissa Economics Association was formed in 1968 with the objectives of discussing various economic problems, improving the standard of teaching in Economics and to stimulate research in the subject with special reference to the economic problems of the State. Since 1968, the Association has been making all possible efforts to discuss the economic issues pertaining to the State in the Annual Conferences. In the ensuing conference the delegates will deliberate on two important economic problems (a) Economics of Irrigation and (b) Orissa's Trade with rest of the country,which have great relevance for the economy of the State. It has been customary in the Annual Conference to have a symposium on current economic problems. In this Conference we will have a symposium on "Rural Development and Generation of Employment

Opportunity." The subject assumes great significance in the context of removal of unemployment within 10 years, as the accepted policy of the present Government. We will have the privilege of listening to three distinguished economists of the State Dr. Sadasiv Mishra, Dr. D. C. Misra, and Prof. R. C. Patnaik. My heartfelt thanks are due to all of them.

Professional economists as we are, we are mostly confined to the class room. But in a state like Orissa, which represents the case of 'Poverty in the midst of plenty' the expertise of the old experienced professional economists should be utilised in formulation of planning. More over, we have a responsibility to the society for its economic upliftment. To assess the role of economists in the right perspective we will also have a discussion on the role of economists in the planned economic development.

It has not been possible for the Association to impart required training to the young teachers so as to improve their ability in teaching through refresher course, work shop etc., because of paucity of funds.

In providing necessary stimulus to the young teachers, the Association has not been very much effective because of financial constraints. In the field of research there has been a clear trend towards micro-level studies. In fact, study of a project at the micro level assumes great significance in the context of a backward economy like Orissa. I personally feel that it is the responsibility of the Association to assist the young economists of the State to take up micro studies in different fields having relevance to the economic development of the State. We have to devise ways and means so as to make this association more meaningful and effective for young teachers.

Membership

There are about 400 teachers in economics in different colleges of State. I am sorry to point out that there are only 128 teachers who have enrolled themselves as members. During the year 1978-79 one remarkable feature with regard to membership is that about 150 students of the Post-graduate and Honours classes in economics have been associated as student members, 90 students from Ravenshaw College, 13 students from S. B. W. College, Cuttack, 10 students from M. P. C. College, Baripada and 37 students from the Department of Analytical and Applied Economics have been enrolled as student members of the Association. I take this

opportunity to express my thanks to Shri Norottam Nanda, Reader in Economics, M. P. C. College, Baripada, Miss. Annapurna Satpathy, Lecturer in Economics, S. B. W. College, Cuttack, Shri S. C. Panda, Lecturer in Economics, of the Department of Analytical and Applied Economics and Shri Bibekananda Mohapatra VI Year, Ravenshaw College and Madhusudan Mohanty for helping me in this membership drive.

Funds

During this year 1978-79 the Association has received a grant of Rs. 1000/- from the Revenue Department of Government of Orissa, Rs. 4,000/- from the State Youth Welfare Board and Rs. 10,000/- from Planning and Co-ordination Department of Government of Orissa. I take this opportunity to record my thanks to the authorities in the Revenue Department and the Planning and Co-ordination Department. I am especially thankful to the Finance Minister for the sanction of the grant. Dr. Baidyanath Mishra, the Joint Secretary of the State Youth Welfare Board has been generous to provide us a grant of Rs. 4,000/- every year. I express my gratitude to Dr. Mishra for the good gesture that he has shown to this association. Besides the grants the Association has received Rs. 1060/- from student membership fees and Rs. 950/- from the teacher-membership fees. Apart from this the Association has received Rs. 210/- from the sale of old Journals to the College Libraries of J. K. B. K. College, Cuttack, S. B. W. College, Cuttack, M. P. C. College Baripada and Pattamundai College. I have also received a donation of Rs. 200/- from Shri Bijoy Kumar Mohanty, Advocate, Cuttack and Rs. 50/- from the Proprietor of Kitab Mahal, Cuttack. Thus I have been able to collect Rs. 2470/- from membership fees, donations and sale of old Journals. I am thankful to Shri S. N. Patnaik, Lecturer in Economics, Christ College, Cuttack for raising the donation and helping me in membership drive. My thanks are also due to those of my colleagues who have taken keen interest for purchasing the old Journals for their College libraries.

Journals

Two issues of the Orissa Economics Journal have been published and distributed to the members in this Conference. The Conference number of the Journal for the year 1977 has unfortunately not been

published on account of certain unforeseen circumstances. The Executive Body of the Orissa Economics Association, has authorised Dr. B. Bhuyan, our Ex-Secretary and Shri D. Tripathy to take necessary steps in the direction of publication of the Conference number for 1977.

It was decided by the Executive Committee to publish a book on Orissa's Economy. Subjects were allotted to different writers. I have written letters to each one of them for completing the work, but I am disappointed that except two writers none of them has replied even to my letter.

The members of the Executive Committee have helped me in various ways in the activities of the Association and I am thankful to each of them.

I am really indebted to Dr. Baidyanath Mishra and Shri D. Mohapatra for inviting the Association to hold its conference here. I am really thankful to the members of the staff of the Department of Analytical and Applied Economics and the volunteers who have helped us in organising this Conference. I extend my thanks to Shri Dharani Dhar Panigrahi and Shri Durlava Chandra Mohanty for working as rapportuers in the last conference and for submitting their reports in time. I would be failing in my duty if I do not express my sincere thanks to all my colleagues in the Department of Economics, Ravenshaw College and especially to Shri G. K. Kar and Shri Adwait Kumar Mohanty for their kind help in very many ways. Lastly I am thankful to all the members for their unstinted co-operation and to you all for kindly giving me a patient hearing.

Thank you,

B. P. Dash.
Secretary.

Presidential Address

Dr. K. Kanungo
Vice-Chancellor, O. U. A. T.

I am most grateful to the members of the Orissa Economics Association for having elected me as their President, an honour and distinction which I hardly deserve. I accepted this honour in all humility as I recognised in it the generosity and graciousness of the members of the Association. I have been away from the operational orbit of a practising agricultural economist for more than a decade. The time that I spent as the Chief of Division of Agriculture in the Planning Commission could at best be termed as Memorandum Agriculturist and for the last 10 years I have been connected with the management of agricultural research and education. Therefore, at the outset I should like to seek your forgiveness for talking in a language which lacks the normal rigour of a professional economist and seek your indulgence to share with you a thought that has been constantly worrying my mind ever since I became involved in research management. Our State is one of the poorest in the country with nearly 85% of the population below the poverty line. It is all the more distasteful to us because from the very beginning, from the dawn of our political awakening and struggle for freedom, the main rallying cry has been removal of proverty and the establishment of an egalitarian society free from all forms of exploitation. This was the goal towards which we were supposed to be moving all along the 20 and odd years of planned development.

It is now increasingly realised that development is not merely the provision of opportunities for resource development in the light of appropriate science and technology; it is directly related to their actual utilisation and, therefore, the creation of the necessary facilities for such utilisation. It is conditioned by the power structure, its class composition and its unequal incidence in the interests it serves. Therefore, the economic, social and political institutions, the state of the law, the state of knowledge and use of science and technology, information and communication, bureaucracy, monitoring and evaluation arrangements fall within the scope of development. Development is an inter-disciplinary concept: it is not the exclusive concern of the professional economist or scientist or technologist.

Orissa despite its varied wealth of mineral deposits and forest resources, is basically dependent on agriculture. It is estimated that nearly 78 percent of the working force in Orissa is engaged in agriculture (Mohanty and Pati, 1975)[1]. Any rapid improvement in the economic well-being of the general mass in the State has, therefore, to start in the agricultural sector unless we foresee a structural change in the sectoral matrix. Increase in the per hectare yield and labour productivity thus hold the key to increasing income and standard of living appreciably in the near future.

Many of us who have concerned ourselves with this problem are aware that not only is the Orissa economy basically agricultural, the agriculture in this State is also characterised by what A. T. Mosher has called, traditional. Another feature of our agriculture is that presently overwhelming proportion of agricultural production is concentrated in rice in millions of small plots operated by preponderance of small and marginal farmers. The process of modernisation by which we may hope to increase the yield and labour productivity is thus intimately connected with the advancement in the rice production system.

Rice yields in Orissa have remained virtually stagnant over the past decade. It is during this decade that significant achievements in technological development in the rice production and yield increases have been made in the ideal conditions of the rice research stations. Acceptance of this technology both in terms of adoption of modern varieties and use of key inputs like chemical fertilizer and plant protection has remained rather low in this State. Even where modern varieties have been accepted, exploitation of their full potential at the farm level has been rare, particularly in the wet season— the main rice growing season of Orissa. In the dry season, under conditions of assured water availability, the new rice technology has been received with much greater enthusiasm. But even here the average farmer's yields are often much below what the rice scientists have shown possible to attain in the research station farm. This is not an isolated occurrance in Orissa but is true for the entire eastern India. In fact, in the greater part of south and south-east Asia the situation is more or less similar. This led Robert F. Chandler to write in a recent paper "on retiring from I. R. R. I. in 1972 the only real disappointment I felt was that somehow we did not understand sufficiently why the Asian farmer who had adopted the new varieties was not doing better. Somehow, I felt that the rice scientists who had obtained yields of 5 to 10 metric tons per hectare on the I. R. R. I. farm still could not explain why so many Filipino farmers (for example) obtained, on the average, less than one

metric ton per hectare increase in the yield after shifting from the traditional to the high yielding varieties. All of us were a bit mystified as to why not more than 25% of the riceland in the less developed Asian countries was planted to the new varieties" (Chandler 1975)[2]. Chandler's observation points to the existence of an yield gap— the difference in yields on the experimental station farm and on the farmers' fields. Had it been a purely transient phenomenon there would have been little cause of anxiety. For it is well known that the introduction of a new technology creates a yield gap and what economists sometimes refer to as "economic slack" (Evenson 1976)[3]. Economic slack is the difference between the present product of a sector and the product which could be realised if all resources were optimally utilised. Research activities produce access to technology which increases economic slack. It is reduced by expansion of extension activities, improvements in rural infrastructure etc., the incentive for such changes coming from an access to more productive technology. However, such changes do not occur immediately, and it is the delay in or constraints to the process of change which materialises in a gap between the actual and potential yield in the farmers field.

A proper analysis of the nature of this gap, its magnitude and the factors that contribute to its persistence is essential if we hope to successfully modernise traditional agriculture not only in rice, even though major emphasis needs to be accorded to this crop in view of its prime importance in the State's economy, but in other agricultural crops also. It is because through such an analysis is it possible to recognise the organisational changes— social, economic, institutional and also environmental— that have to be brought about to initiate the process of modernisation.

Even though the phrase "yield gap" has become common parlance among social scientists as well as administrative and political authorities, there is considerable confusion when one talks about the "yield gap". This is because there is not one "yield gap" but a whole range of yield gaps or differences between the actual and potential yield.

The objective of profit maximisation itself can result in a yield gap as first analysed by Davidson and Martin (1965)[4] while studying the relationship between yields on farms and at the experimental stations in Australia. They observed that the gap between farm and experimental station yields varied according to the growing season. In good years, the experimental station yields increased more rapidly than the yields of farms in the same district. This was because the farmers were constrained in their input investment by the desire to maximise profit while the experimenter with little or no cost constraints tried to maximise yield.

It is common to find the yield gap implicitly defined as the differences between the highest yield on a farm or at experiment station and the national average. D. K. Mukherji (1977)[5] followed somewhat this approach while defining the 'gap' as the ratio between the yield as found in the National Demonstrations in a State and the average of State yield. His conclusion that when the gap ratio is low the farmers technical competence is high can be countered by pointing out that the high ratio found in States like Bihar and Orissa reflects the fact that the demonstration plots are normally located in irrigated areas with good water control while most of the rice in these are grown under rainfed condition.

A somewhat similar definition of the yield gap was used by Herdt and Wickham (1975)[6] when they defined the gap as the difference between the yield potential at the experimental station during the dry season in a good year and the average national yield. For the Philippines, they estimated the high experiment station yield to be 8 t/ha as compared to the national average yield of 1.8 t/ha. They also partitioned this gap into year-to-year yield variation, seasonal differences (dry vs. wet), water control, economic constraints, and a residual including lack of available inputs and non-adoption of technology. Approximately 40% of the yield was estimated to be due to the socio-economic factors described in the latter two categories while 60% was due to environmental factors and to lack of water.

Another way of looking at the gap to estimate the difference in the yield between high and average sites or progressive and backward regions. Such yield differences are generally associated with the differences in input use specially the level of nitrogen input. Barker and Anden (1975)[7] identified the gap in nitrogen input from observation from 36 Asian rice villages and suggested that the environmental factors (solar energy and rain fall)and irrigation accounted for the major differences in nitrogen use between top 20 and the average of 65 sites (36 in wet season and 29 in dry season). All but 4 of the villages were irrigated but there was wide variability in the quality of irrigation. Obviously farmers with good water control could be expected to use more of nitrogen and other fertilizer.

That a high correlation exists between environment, infrastructure development, level of input and use and development of institutions on the one hand and growth in agricultural production on the other was noted by Parthasarathy and Prasad (1977)[8] when they analysed the

rate of growth of the yield of rice in 583 districts in India. Even though no causal relationships could be established their analysis pointed out the need to study sequence of the growth process.

If I have gone into some details over the different concepts of yield gap I have some definite reasons for this. The measurement of the yield gap is largely related to the definition we use. More importantly the policy implications that emerge out of the analysis of the gap have distinct bearing on the outcome of our attempts at removing the constraints to the wider dissemination of the improved technology. If we concentrate our attention to the difference between the "potential" yield at the experiment station or demonstration plots with the present farm yield we may be lulled into the belief that a technology is available but the farmer for some reason or other is unwilling or unable to accept it. The consequence of this where such an assumption may not be true can be very frustrating indeed. The other definition of the gap which compares the yield of the best farmers or best villages or best districts with their poor counterparts can only provide a very general trend regarding the influence of physical and social environment on the yield. Both these concepts, however, do indicate why some farmers in better invironments get higher yields and are more receptive to the use of modern rice technology than others. But they do not explain whether or how the farmer in the context of his own environment and resource constraints can profitably achieve a higher yield. The real utility of any yield constraint study lies precisely in this direction.

In more specific terms an analysis of the yield gap or constraints to higher yield should attempt to identify the factors which affect (i) the yield potential of the crop under the farmers environment and (ii) the ability and willingness of the farmers to achieve this yield potential. "The first category of constrains is related directly to the development of new technology and hence the organisation of research. The second is concerned on the one hand with the realisation of the production potential given the existing technology and physical environment, and on the other hand with the degree of equity among farmers and landless workers in access to resources and input" (Barker 1978)[7].

Such an exercise will once for all resolve the controversy among the biological scientists, who hold that a viable technology exists but the fault for its non-acceptance somehow lies with the farmer or the institutional system and the social scientists, who are often quick to suggest that the technology developed under experiment station conditions is not appropriate for the farmers environment. Wherever the yield constraints

are largely environmental the appropriate policy decision would be either to modify the technology or alter the farmers physical environment to the extent feasible, more suitably both at the same time. If on the other hand it is the farmer or the institutional system that is in default, appropriate measures have to be taken to remove the institutional barriers and improve the farmers ability and willingness through a suitable credit, pricing and marketing policy and extension education and other institutional reforms relevant to the small farm environment. In this context, the small farm environment embodies physical attributes of poor and scattered land (held under different sorts of ownership) inadequate skill base with reference to scientific agriculture and general paucity of capital inputs, cultural, social and psychological barriers as they exist and the existing set of institutions and supporting public services within which the small farmer is obliged to operate.

A clear understanding of the nature and magnitude and relative importance of the farm level constraint is essential to formulate effective and efficient policy measures for agricultural development in our context. In this important task I see a unique opportunity for the members of the Orissa Economics Association to engage themselves in collaborative programme of research with their agrobiological confreres in the different agro-climatic zones of our State. The results from such an effort can go a long way in formulating appropriate policy measures for agricultural development strategy relevant to our needs.

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ECONOMICS OF IRRIGATION IN ORISSA

Prof. Baidyanath Misra

The importance of irrigation hardly needs emphasis. It is recognised by all that irrigation is needed to stabilise and increase crop production, enable multiple cropping and increase the efficiency of other inputs like HYV of seeds, fertiliser, etc. In case of India, dry land agriculture accounts for 75 percent of the cultivated area and contributes 42 percent of the food production. Since dry land agriculture is susceptible to the vagaries of monsoon, there is a great deal of instability in agricultural production. Irrigation can be able to remove such instability and ensure not only an assured production but also increased income to the cultivator.

Another important element for which irrigation is now emphasised is creation of employment opportunities. Data collected from all over the country show that, on an average, irrigation increases employment in agriculture by 40 mandays per hectare. This means that if we can substantially increase irrigation facilities, we can reduce unemployment and underemployment in rural areas. Since creation of employment opportunities is one of the major objectives of the Sixth Plan, irrigation cannot be neglected. In fact, in the Sixth plan, irrigation has been accorded special importance. We consider what follows, some salient aspects of irrigation in Orissa.

I. Progress of irrigation in Orissa.

The total net area under cultivation in Orissa is a little more than 60 lakh hectares. Of this, the total potential for major and medium irrigation is estimated at 35.65 lakh hectares *i. e* about 60 percent. But by 1947, the potential created was only one lakh hectare *i. e.* 0. 16 percent which is very negligible. A lot of emphasis was given on irrigation during the plan period. By the end of 1974-75 irrigation potential created was 0.73 million hectares through major, 0.16 million hectares through medium and 0.81 million hectares by minor irrigation (0.66 million hectares from surface and 0.15 million hectares from gound water). In other words, as much as 22.46 percent of the surface gross area was irrigated in the State by the end of 1974-75.

Irrigation potential creation by the end of 1974-75
(Area in 000 hectare)

Source	Kharif	Rabi	Total
Major Irrigation	554.07	178.20	732.27
Medium Irrigation	53.23	6.46	59.69
Minor Irrigation Flow	611.13	52.54	663.67
Lift	105.11	40.31	145.42
All sources	1323.54	277.51	1601.05

Source :Irrigation Data, 1974-75, Planning & Co-ordination Deptt,, Government of Orissa.

By the end of Fifth Plan, the irrigation potential from all sources is estimated to reach the level of 19.6 lakh hectares. This would mean that 25 percent of the gross cropped area could be irrigated by 1977-78.

2. Discrepancy between different districts.

Though the irrigation potential created in the State is quite low, there is quite a great deal of discrepancy between different districts. By the end of 1974-75, Cuttack, Ganjam, Sambalpur and Puri had irrigation potential (from all sources) of 21.99, 19.55, 13.90 and 13.31 percent respectively. The districts which had negligible irrigation potential were Keonjhar, Koraput, Sundergarh, Dhenkanal, Phulbani, Mayurbhanja and Kalahandi. Even at the end of the 5th Plan, Keonjhar, Koraput and Sundergarh had less than one percent; Dhenkanal and Mayurbhanja less than 2 percent. However, it is understood that during the 6th Plan, out of a likely provision of Rs. 300 crores, about Rs. 200 crores *i. e*, about 70 percent will be spent in the above districts. Though this will not eliminate the discrepancy, it will go a long way in improving irrigation facility in these districts.

3. Extent of utilisation of irrigation potential.

The percentage of irrigation potential utilised is owefully low in Orissa. The following table shows the percentage of irrigation potential utilised in different types of irrigation potential utilised in different types of irrigation projects for the year 1975-76.

Percentage of irrigation water utilised.

Major & Medium	Minor Irrigation	Lift Irrigation
43 to 59%	63%	37.5%
	Kharif—65%	Kharif—8.6%
	Rabi—48%	Rabi—48 8%

One of the main reasons why there is such a low utilisation is due to inadequate maintenance. The State Government has accepted the C. W. P. C. proposal to adopt an average of Rs. 10 per acre of ayacut for maintenance. At the present cost of labour and material, it is supposed that the State should have a rate of Rs. 12 per acre of ayacut for major and medium sources of irrigation. But in practice, the maintenance cost comes to less than Rs. 8/– per acre. The minor irrigation projects fare much worse. They are supposed to be maintained by Panchyat Samities for which no grant is given by the government. The maintenance cost in case of minor irrigation projects is estimated at Rs. 10 per acre of ayacut. The actual comes to a little more than Rs. 6. 50 per acre. This is one of the main reasons why 50 percent of irrigation facilities are used in Orissa.

4. Poor distributive system :

There is a great deal of waste in the use of irrigation water. The distributive system is highly defective. The system of distribution in the State is that the Government provides irrigation channels upto the outlet of each 100 acre block. Construction of field channels within the block and their maintenance is supposedly the responsibility of the land-holders. But this is seldom done. The prevalent system for irrigation water use is by flooding the upper fields and allowing water to flow down to the fields below by gravity. The flooding system leads to colossal wastage of canal water. The farmer has no control over irrigation. There has been no detailed estimate of the water wastage and crop loss due to the flooding system. But all the low lands run the risks of water logging and ultimate salt effervescence. And low lands are generally computed to be one-third of the total crop area of the State. In the Sambalpur area, under the Hirakud ayacut, quite an extensive tract of low land has gone out of cultivation because of water logging.

Lift irrigation is better than canal irrigation in efficiency of water usage. But even in lift irrigation flooding system is prevalent in many parts of Orissa. And flooding system here not only wastes water resources, but involves additional working of the pumping sets to irrigate a piece of land farthest away from the tube-well site, an expensive job and a sheer waste of electric power.

Some of the experiments of the CRRI show that efficiency in irrigation can be improved by about 50 percent on a nominal expenditure by the farmer by having field channels. The farmers therefore should be encouraged to have field channels and the engineering section of the

district agricultural office should assist the farmers in the layout of the channels. In the proposed irrigation system, field channel construction must precede water release.

5. Economic use of water and change in cropping pattern :

Since irrigation water is scarce, it is necessary to use it economically. But so far no systematic attempt has been made to manage water. It is hardly understood by any farmer that water is a manageable input. Too much water during monson in Orissa without proper drainage limits the productivity per hectare. Too much water is as bad as lack of it.

Even in rice which is the main crop in Orissa (accounting about 65.57 percent of the cropped area (principal crops) in 1976-77 and which requires quite a lot of water, there is a great deal of wastage of water. It is generally thought that continued submersion type of rice farming increases yield. But research finding in experimental farms show different results. Partial submersion at crucial identifiable stages of rice plant growth and just saturation at other times brings about a better yield, beside considerable economy in water. Even the notion that HYV need considerably more water than traditional variety is subject to question. Bala and Cauvery, two high yielding varieties require about 500 mm of water and produce something about 5000 Kg per hectare as shown below :

Seed Variety	Crop duration	Total consumption of water in the season.	Water use efficiency (Kg of grain in mm of water)	Grain yield Kg/Ha.
Bala	96	449 mm	105	4643
Cauvery	108	514 mm	107	5500

There are enough research findings to show that both HYV and traditional variety can be grown with much less water.

In case of Orissa, multiple cropping has not made any significant impact on the agricultural production of the State. The cropping intensity varied from 109.57 in 1961-62 to 122.66 in 1976-77. During the decade 1967-77, the cropping intensity remained more or less stagnant. What we want to emphasise here is that a proper combination of crops will not only economise the use of water, but will also provide greater amount of income to the cultivator. For example, I. I. T., Kharagpur experiments

show that whereas a crop rotation of rice-rice-rice will require 467 cm of water, it will give a net income of Rs/ha/cm 423. On the other hand, a crop rotation of potato, maize and rice would require only 235 cm of water per hectare providing a net income of Rs/ha/cm 9285. In the 1st combination, the average yield of rice per hectare would be about 30 quintals per hectare (1st crop —39.0+2nd crop 38·4+3rd crop 14·2) whereas in the second combination, the yield of rice will be about 32.6 quintals per hectare. Orissa's acreage under Kharif rice is a little over 4 million hectares and the average yield is around 900 Kg/ha. If a proper combination of crops is done, there will be both economy in use of water and substantial increase in yield per hectare.

6. Return from irrigation sources :

Till the end of 1974-75, capital outlay on irrigation projects in Orissa was over Rs. 103 crores representing 20 per cent of the total capital outlay. But the financial returns from this investment has been negative. The estimate for selected major and medium projects made by A. G. placed the loss at Rs. 778·68 lakhs representing a return on capital of minus 5·24%. The position is similar all over the country.

What is distressing is that irrigation projects prior to independence provided a net surplus. For the country as a whole irrigation projects provided a net surplus of Rs. 10 million to the exchequer in 1950-51. By about 1971-72, there was a loss of Rs. 1410 million. Prior to independence the irrigation projects in public sector had to satisfy the criteria of minimum net financial return which varied from 5% to 3·7% during different periods. But after independence, though huge investments were made on irrigation projects, the state governments were reluctant to tax the beneficiaries. Thus in most of the States, the beneficiaries of irrigation were subsidised by other taxpayers including farmers not benefitted by irrigation.

The Irrigation Commission, 1972 gave some general outlines regarding irrigation rates : They are as follows :

(a) Irrigation rate should be related to the net benefit rendered to the irrigators and within their paying capacity.

(b) The revenue realised through water rates should not mopup more than 50 per cent of the net benefit.

(c) In the absence of reliable data on net benefit the water rate may be fixed at 5 to 12 per cent of gross income, the upper limit being applicable to commercial crops.

(d) Water rate should be on crop basis and certain measure of uniformity should be there in the same region for similar projects.

(e) Taken as a whole the irrigation scheme should not impose any burden on general resources.

If it is assumed that irrigation rates should not exceed 50% of the additional net benefit, but should cover in full the cost of irrigation. Two estimates are therefore necessary in order to fix water rates. First, additional benefits of irrigation to the cultivator have to be studied. So far no such study has been done. A detailed study is necessary to find out the net benefits in respect of different irrigation projects and in respect of different regions. Though this is a difficult task, it has to be done in order to properly determine the water rates.

Second, the cost of providing irrigation has to be calculated in order to find out how much is charged and what is the subsidy given to the cultivator in respect of irrigation. If subsidy has to be given, it should be given openly, and not in a concealed form. The components of cost comprise of (a) interest on capital cost or sum at charge, (b) depreciation, (c) operation and maintenance and (d) general supervision. Assuming 10 per cent as interest on capital cost, depreciation on the basis of one per cent of the sum at charge, expenditure on operation and maintenance at the rate of Rs. 11·81 per acre for major and medium projects, Rs. 10·62 per acre for minor irrigation flow projects and Rs. 218 per acre for lift irrigation projects, the Chandrasekhar Committee has calculated the cost per unit quantity of water (one acre inch) at Rs. 5.22 for major irrigation projects, Rs. 13.39 for medium irrigation projects, Rs. 8.23 for completed and Rs. 11.05 for the on-going minor irrigation projects, Rs. 6.82 for lift irrigation projects on the basis of normal depreciation and Rs. 7.94 for lift irrigation projects on the basis of repayment of interest and bank finance being utilised for these projects.

The World Bank mission has calculated the cost of irrigation for producing an additional tonne of foodgrains under different types of irrigation projects. This exercise has taken into account all the relevant items like interest, depreciation, maintenance etc. The results are as follows :

Sl. No.	Type of Irrigation	Annual estimated expenditure on irrigation/hectare in Rs.	Cost in Rs. per ton of foodgrain to be produced.
1.	Major & Medium Irrigation Projects.	555	945
2.	Minor Irrigation Projects.	427 (ongoing) 580 (new)	574 (ongoing) 795 (new)
3.	Lift Irrigation Projects.		
	a) Tube well	560 to 704	742 to 947
	b) Ri er lifts	750	945

But the rates charged in Orissa has no relevance to the cost. Water rates of principal crops in flow irrigation projects and lift irrigation projects are given below :

Water rates in Rupees per hectare

	Rice	Cotton	Wheat	Maize Jawan	Sugar cane	Garden Orchard
Flow Irrigition Projects.	Kh-4.97 to 19.80 Rabi-59.31	37.06	22.23	18.53	66 69	44.16
Lift Irrigation Projects.	Kh, Paddy-71.27 Rabi Paddy-297.00	107.80	89.10	142.56	287.30	178.20

The above tables show that the water rates in Orissa are much lower than the cost. The water rates in most of the other states in India are much higher than that of Orissa.

The Chandrasekhar Committee has estimated that the subsidy involved in providing irrigation in Orissa per acre for Rabi paddy is as follows :

Major Projects	.. ..	Rs. 226.00
Medium Projects	.. ..	Rs. 618.72
Minor Irrigation (flow) Projects	..	Rs. 484.00
Lift Irrigation	.. ..	Rs. 207.00

The lower amount of subsidy in the case of lift irrigation projects compared to others is due to the fact that water rates charged per acre

inch is very much higher under lift irrigation than under other systems. The subsidy has been calculated on the assumption that the utilisation is 100%. To the extent utilisation falls short of the optimum level, the extent of subsidy is higher.

The conclusions that we derive from the above analysis can be stated as follows :

(1) The irrigation potential created in Orissa is much less than that of many other states of India.

(2) There is a great deal of disparity in irrigation potential between different districts.

(3) The extent of utilisation is quite low primarily due to inadequate maintenance.

(4) The method of distribution is unscientific leading to wastage of water.

(5) Irrigation has not so far helped in changing the cropping pattern.

(6) The irrigation rates are quite low involving substantial amount of subsidy.

Unless immediate steps are taken to remove some of these defects irrigation cannot help to diversify agriculture nor provide sufficient income to the State exchequer.

SOME ASPECTS OF BENEFITS OF CANAL IRRIGATION :
A CASE STUDY OF CUTTACK DISTRICT

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This study makes an attempt to investigate and analyse certain aspects of the benefits, that emanate from the availability of canal irrigation water to farm operators. The objectives of the study are :—

1. To estimate the ' Farm Business Income" in an acre of irrigated and an acre of unirrigated farm and then to measure the differential between these two farm business incomes. The farm business income is significant as it reflects the return to land, labour and capital.

2. To evaluate the "Return to Family Labour and Management" in an acre of irrigated and unirrigated farm and then find out the difference between the two returns. This measure is indicative of the level of employment of family labour and the return there to.

3. To estimate the "Net Income" or "net value added" in an acre of irrigated and unirrigated farm and then to calculate the differential between two such net incomes. This net income reflects finally the important components of irrigation benefits like increased intensity of cropping, improved cropping pattern and finally the increase in crop yields.

The study uses to analyse these differential farm business incomes, family labour incomes (RFLM) and net incomes to illustrate the benefits of canal water supply.

Assumptions :

1. The tract under investigation covering two beneficiary villages and one non-beneficiary village is supposed to have homogeneous soil conditions, climatic features and rainfall precipitation. They also possess identical level of access to infrastructural and technological facilities.

2. It is assumed that the conditions of farm productivity, employment, income and land utilisation in beneficiary villages before the supply of canal water were indentical with those of the sample unirrigated village. Hence the difference between the irrigated beneficiary and unirrigated control village is treated as the outcome of irrigation only.

mitations :

(1) The investigation is confined to limited aspects and consequently does not deny the existence of other benefits. (2) The study also es not isolate the contribution of irrigation alone to the farm output d broadly asumes that the entire incremental benefit has resulted from gation. (3) The survey covers a small area and is based on input-out-t data of only 50 farms and as such its findings can't be claimed to be ly conclusive.

verage of Sample Procedure :

The study relates to the agricultural year from Ist June 1977 to 31st ay 1978. Cuttack Sadar and Cuttack II Blocks were purposively ected as the area of investigation. The stage stratified sampling chnique was adopted for the field survey— villages being the first stage it and the cultivator households being the second stage unit. The gated villages formed the first stratum and unirrigated villages formed e second stratum.

The study covers 50 sample farms of which 30 represent beneficiary ms in two irrigated villages and the rest 20 are non-beneficiary farms in e un-irrigated village. Of the two beneficiary villages one named indha is situated near the head reach of Harianta distributary and other named Andhoti happens to be a tail end village of the same stributary.

The cultivator households were stratified into their operational size oups of holding of 0 to 2.49 acres, 2.50 to 4.99 acres and finally 5 acres d above. The beneficiary samples were selected in the ratio of 3:2:1. buiid up a comparative analysis following the same procedure, 20 mples of non-beneficiary cultivator households were selected from the ee size groups of operational holdings from one control or unirrigated lage named Urali in the ratio of 2:1:1. The statistical framework of mple operational farms may be seen from Table–1.

TABLE—1

Sample Operational Forms.

ze Group acres	From 2 Irrigated villages	From 1 Unirrigated village	Total
2 49	15	10	25
50–4.99	10	5	15
00–above	5	5	10

Operational Holdings :

The average net operational holdings of sample cultivators can be seen from the table No. II given below. The average net operational holdings per farm does not vary significantly between irrigated and unirrigated villages for the first two size groups. However, there exists some difference in respect of third size groups and the average area for the all size groups taken together.

TABLE—II

Average net operational holding of sample cultivators (in acres)

Irrigated				Un-irrigated		
Size Group	No. of sample farms	Total culti-vated area	Average net operational holding per farm	No. of sample farms	Total Cultiva-ted area	Average net-operational holding per farm
0–2.49	15	25.65	1.71	10	17.60	1.76
2.50-4.99	10	36.20	3.62	5	19.35	3.87
5.00-above	5	30.85	6.17	5	34.20	6.84
All size group	30	92.70	3.09	20	71.15	3.55

Cropping Pattern

The crops grown by the beneficiaries of irrigation were local paddy in kharif and HYV paddy in Rabi season. The cultivators of irrigated villages were growing local paddy in Kharif and Biri or Kulthi in Rabi season. Vegetable cultivation particularly potato, cauliflower and cabbage were grown in sample farms in some parcels but these crops mostly depended upon irrigation water lifted from tanks.

Land Utilisation and Cropping Intensity

It is observed from the table No. III that the average intensity of cropping is higher in beneficiary farms compared to the non-beneficiary ones, the respective figures being 1.70 and 1.37, even in the case of irrigated farms the intensity of cropping is less than 200 per cent which means that some lands are lying fallow in the Rabi season. This has arisen because of two possible reasons. (a) The available irrigation is not adequate for growing paddy crops in some irrigable plots because specifically during the critical growth period of the plants acute shortage of water is experienced. (b) The gravity flow irrigation system in the absence

of field channels creates conditions in which pulses can't be grown due to the flooding of the fields in some cases.

It is also observed from the table that the intensity of cropping goes on declining with the increase in the holding size in both irrigated and unirrigated farms.

TABLE—III

Average gross cropped area in Irrigated villages. (in acres)

Size	No. of sample farms	Total cultivated area	Area under crops			
			Kharif	Rabi	Gross cropped area	Average Gross cropped area per farm
0-2.49	15	25.65	25.65	20.78	46.43	3.09
2.50–4.99	10	36.20	36.20	24.98	61.18	6.12
5.00–above	5	30.85	30.85	19.05	49.90	9.98
All size	30	92.70	92.70	64.81	157.51	5.25

TABLE—IV

Average gross cropped area in Un-irrigated villages (in acres)

Size	No. of sample farms	Total cultivated area	Area under crops			
			Kharif	Rabi	Gross cropped area	Average Gross cropped area per farm
0-2.49	10	17.60	17.60	8 10	25.70	2.57
2.50-4.99	5	19.35	19.35	7.57	26.92	5.38
5.00–above	5	34.20	34.20	10.61	44.81	8.96
All sizes	20	71.15	71.15	26.28	97.43	4.87

TABLE—V

Intensity of cropping in Irrigated and Unirrigated areas.

Size group	Irrigated	Unirrigated
0–2.49	1.81	1.46
2.50–4.99	1.69	1 39
5.00–above	1.61	1.31
All size group	1 70	1.37

Adoption of Improved Technology :

This issue has not been examined in detail since it did not constitute a part of the plan of enquiry. But regarding the extent of adoption of improved technology excepting improved seeds notable differences were observed in the adoption of various elements of improved technology between beneficiary and non-beneficiary farms. It is as fairly evident in the study that the adoption of improved seeds followed by fertilizers and pesticides has been the most popular item on the farms of irrigated villages. One hundred percent of sample farms of irrigated villages are found using improved H. Y, V. seeds. Improved implements like sprayers were used by 89 percent and iron plough by 62 percent of the farms in beneficiary areas. In the unirrigated villages, on the other hand only 44 percent of the sample farms are found using chemical fertilizers and 18 percent using iron ploughs.

Input-Output Analysis :

The difference between the net additional benefit per acre in the irrigated and unirrigated areas provide a measure of the net additional incremental benefit generated by the irrigation. For the computation of this benefit the following income and cost concepts have been used in the study. Cost A_1 includes the value of hired human labour, hired and owned bullock labour, value of seeds, manures and fertilzers, depreciation, irrigation charges, land revenue, interests and other miscellaneous charges involved in crop production. Cost A_2 includes Cost A_1 plus rent paid for leased in land. Cost B includes Cost A_2 plus rental value of owned land and interest on owned fixed capital. In order to avoid arbitrariness the rental value of own land is assumed to be equal to 25 percent of the total produce from all crops grown during the year[1]. Cost C includes Cost B plus imputed value of family labour. Total costs consist of Total Fixed Costs plus Total Variable Costs. Output or Gross Income : The output includes the values of both main and by-products of crops evaluated at the village prices prevailing within two months of the harvest.

Farm Business Income=Gross Value of output minus Cost A_2 or A_1 (in the case of owner cultivator.)

Return to Family Labour of Management = Gross value of output minus Cost B or Net income plus imputed value of family labour.

Net Income = Gross Value of Output minus Cost C:

Costs of Cultivation = Using these cost concepts the average costs per acre of irrigated and unirrigated land has been worked out separate by

under different size groups of holdings which can be seen from the Table—VI below.

TABLE—VI

Cost of Cultivation per acre in a sample farms (in Rupees)

Size group of holding	Irrigated				Unirrigated			
	Cost A_1	Cost A_2	Cost B	Cost C	Cost A_1	Cost A_2	Cost B	Cost C
0-2.49	962.64	979 78	1515.73	1880.73	486.59	501.77	753.18	928.68
2.50–4.99	1083.86	1098.23	1651.81	1934.34	552.75	566.51	832.26	956 76
5.00–above	1132.79	1132.79	1628.93	1693.68	563.64	568.84	823.57	886.07
Weighted average	1031.41	1044.77	1579.96	1867.15	522.39	535.72	790.55	925.05

It is seen from this table-VI that in case of the sample irrigated farms while both Cost A_1 and A_2 go on increasing with the rise in the size of the farms, the Cost B and C do not show any such definite trend. These two costs (B & C) rise in case of the second size group compared to the first size group and then while the Cost B in case of third size group falls but remains above Cost B of first size group, Cost C of the third size group falls and is less than Cost C of the first and second size group. This variance in the costs are probably due to the fact that, in Cost B 25 percent of the total gross output of the farms representing the rental value of own land is included.

Since gross value of output are different under different size classes as can be seen from Table-VII the variation in Cost C is the outcome. Further Cost C includes the imputed value of family labour and because this imputed value substantially declines with the increase in the size class of farms large farms employing more of hired labour and using less of family labour. This may probably be due to general apathy for manual work of greater preference of white collar jobs and may be even due to lower concentration of labour force in this size group.

So far as unirrigated sample farms are concerned, the various costs show identical behaviour with respect to size groups but the degree of variation is not marked as those of the costs under irrigated condition.

Gross Value of Output :

The gross value of output per acre in sample irrigated and unirrigated farms has been worked out separately under different size groups of holdings which can be seen from the Table-VII.

TABLE—VII

Value of output per acre in Sample farms (In Rupees)

Size of holding	Irrigated Farm	Unirrigated farm
0–2.49	2110.00	967.50
2.50–4.99	2158.00	1009.00
5.00–above	1904.00	952.00
All size groups	2091.61	974.00

A perusal of Table-VII would indicate that the per acre gross output in case of both irrigated and unirrigated sample case of farms rises in the second size group and in the third size class declines being even lower than that of the first size group. If the value of gross output is accepted as an indicator of farm efficiency, then the second size group in both beneficiary and non-beneficiary farms scores over other size groups.

Following estimation of the various costs and the gross value of output the different incomes have been computed in Table–VIII as per the formula indicated earlier.

TABLE—VIII

Return per acre in sample farms (In Rupees)

Size Group	Irrigated			Unirrigated		
	FBI	RFLM	N I	FBI	RFLM	NI
0–2.49	1130.22	594.27	229.77	465.73	214.32	38.82
2.50–4.99	1059.77	506.19	223.69	442.49	176.74	52.24
5.00–above	777.21	275.07	210.32	383.13	178.43	65.93
	1046.90	511.71	224.50	439.28	183.45	48.95

Analysis of different types of farm returns would indicate that both FBI and RFLM decline with the increase in size-class of holding in both the beneficiary as well as non-beneficiary farms. This is presumably due to the fact that under un-irrigated conditions small farms inspite of their better farm effort cannot sufficiently improve the farm productivity due to the scarcity of the most crucial and catalytic input that is water.

The average farm business income, the return to family labour and management and the net income as well as these incomes in case of each

size group in irrigated areas, are higher compared to their counterparts in unirrigated areas.

The computation of input-output ratio showing the extent of increase in output over every rupee of investment have been done in Table IX.

TABLE—IX

Input-output Ratio in irrigated and unirrigated sample farms

SIZE	IRRIGATED		UNIRRIGATED	
	Gross Cost A_2	Gross Income Cost C	Gross Income Cost A_2	Gross Cost C
0–2.49	1:2 15	1:1.12	1:1.93	1.04
2.49–4.99	1:1.97	1:1.15	1:1.78	1.05
5.00-above	1:1.69	1:1.12	1:1.67	1.07
All size groups	1:2.01	1:1.13	1:1.83	1:1.05

An analysis of input output ratio can be carried out from two points of view. Taking cost A_2 as the real operational paidout costs (FBI) it is found that both in the irrigated and unirrigated firms the input output ratio declines with the increase in the size of the firm.

Further treating Cost C as the input cost of farms it is observed that the input-output ratio in irrigated farm conditions show a marginal increase in case of second size group over the first size group but ultimately the input output ratio for third size group declines and becomes equal to that of first size group. In case of unirrigated farms this ratio (Gross output| Cost C) shows continueous marginal increase with successive farm sizes.

Further comparative analysis reveals the differences in ratios. Both the types of ratios are beneficial in case of irrigated farms from whatever direction they are measured.

The ratios in beneficiary farms in case of each size group as well as the average input output ratio of all farms taken together fair better compared to the input-output ratio of each size group and the average input-output ratio of unirrigated farms.

This confirms the hypothesis that the beneficiary farm operators of irrigated areas more efficient than the non-beneficiaries in control areas.

Incremental FBI, RFLM and NI

The Tables No. X.1, X.2 and X.3 indicate the absolute increases and the percentage increases in FBI, RFLM and NI to the introduction of irrigation facilities.

TABLE—X.1

(Absolute increases and the percentage increases per acre in FBI, RFLM and NI)

(In Rupees)

FBI

Size	Unirrigated	Irrigated	Absolute increase	Percentage of increase
0–2.49	465.73	1130.22	664.49	249.68
2.50–4.99	442.49	1059.77	617.28	239.48
5.00–above	383.16	771.21	388.05	201.02
All size groups	439.28	1046.90	607.62	238.32

TABLE—X.2

RFLM

Size group	Unirrigated	Irrigated	Absolute increase	Percentage of increase
0–2.49	214.32	594.27	379.95	253.49
2.50–4.99	176.74	506.19	329.45	286.40
5.00–above	128.43	275.07	146.64	214.17
All size groups	183.45	511.71	328.26	278.39

TABLE—X.3

NI

Size Group	Unirrigated	Irrigated	Absolute increase	Percentage of increase
0–2.49	38.82	229.77	190.95	591.89
2 50–4.99	52.24	223.69	171.45	328.20
5.00–above	65.93	210.32	144.39	219.01
All size groups	48.95	224.50	175.55	458.67

A perusal of table X.1 shows that FBI is higher both in each size group and average in case of beneficiary farms over the non-beneficiary ones in control villages. The absolute increases in FBI and the percentage increases in FBI declines with the increase in size group of farms. Since on an average the FBI in irrigated farms increases by Rs. 607.62 and by 238.32 per cent it can be concluded that farming in irrigated conditions is more profitable by generating greater returns to land, labour and capital.

Further Table-X 2 reveals that the RFLM in case of irrigated farms is more than unirrigated farms both in terms of each size group as well as average. Then both the absolute increase in RFLM as well as the percentage increase decline with the increase in the size of the farms. Since the absolute increase in RFLM is Rs: 328.26 per acre and the average percentage increase is also as high as 278.39 percent in case of beneficiary farms over non-beneficiary it can be safely concluded that farming under irrigated condition is more conducive to the employment of family labour and the return there to.

Similarly the NI under irrigated conditions is more than the N under unirrigated conditions both from the point of view of each size group as well as all size groups taken together. Further the absolute increase in NI and the percentage increase in NI, decline with the increase in the size of the farms. The table also reveals that the average NI of irrigated farms increase over that of unirrigated farms by Rs. 175.55. Such a comparatively smaller size increase is explained by the fact that the irrigated farming is not undertaken under optional conditions, i. e. the farm operators of irrigated areas are not applying adequate and recommended doses of fertilizers and pesticides besides being usually late in relation to requirement for the crops. Further the water management practices have not also been undertaken in appropriate manner so as to improve the crop yield in the irrigated areas. Above all the conversion of a dry land farmer to a water land farmer along with environmental changes has probably not taken place in full measure and as such full benefits are not realised by these farm operators. But however, the percentage change in NI due to irrigation water supply is as high as 458.67 percent. This high ratio is due to the simple statistical paradox of a very small base of NI in the unirrigated areas, i. e., only Rs. 48.95 per acre. But this percentage change is indicative of the boost that the NI has received due to irrigated farming. This increment in net income reveals that the farming under irrigated conditions is certainly superior to the farming in unirrigated conditions.

Thus it can be safely suggested that provision of canal irrigation water facilities and encourages the adoption of improved farm practices and the raising of short duration crops; and such as costs and the returns are relatively higher per acre for beneficiaries than the non-beneficiaries. Further it also reveals that the unirrigated areas have low intensity of cropping and insecure cultivation leading to lower levels of incomes, which in turn is indicative of the inferiority of farm operation in case of unirrigated farms compared to irrigated farms.

The logical conclusion emerging from this micro-study confirms the general belief that the beneficiary farm operators in canal irrigated villages score over the non-beneficiary farm operators of control and unirrigated villages.

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A BENEFIT-COST STUDY OF MINOR IRRIGATION PROJECTS IN ORISSA.*

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Introduction :

The paper attempts an analysis of the factors which determine the economic feasibility and viability of minor irrigation projects in Orissa. The paper is divided into three sections. Sec. I discusses the importance of irrigation projects in Orissa, Sec. II attempts an estimation of the benefit cost ratio of minor irrigation projects and the change in the cropping intensity in Orissa. Sec III developes a theoretical model to derive the feasibility criterion of a minor irrigation project.

The crops' requirement of water is a little like cars' requirement for oil : oil does not make the car run, but without a certain minimum of oil the car will not run, water does not make a plant grow, but without a certain minimum of water the plant will not grow. In large parts of India, irrigation can make the difference between subsistence and relative affluence. Without water a stress-sensitive-high-income crops is simply not possible.

Orissa is a predominantly agricultural economy and water and land are amongst its most valuable natural resources. Land being fixed, the prosperity of the people depends in no small measure on how judiciously water is used. In our anti-poverty programme agriculture in general and irrigation in particular occupies a key position.

After more than two decades of planned efforts agriculture in Orissa still continues to be a gamble in monsoons. Recurring droughts and irregular monsoons have kept the agricultural production low in the state as more than 80% of her cultivated land, being non-irrigated, are exposed to the vagaries of nature. Even in the years of normal rainfall, irregular and erratic distribution causes severe drought and flood which requires diversion of the scarce resources of Orissa, otherwise intended for development programmes towards the pressing necessities of famine relief. In order

to increase and stabilize agricultural production the need for regulated and controlled water supply through construction of storage tanks, reservoirs etc. is keenly felt.

With the recent advances in agricultural technology, which are more suitable to irrigated areas, differences in living-standards between irrigated and non-irrigated regions have increased further. Unbalanced development of irrigation facilities which results in unequal income and living standards becomes a major socio-economic problem.

TABLE—A (a)

Percentage of area irrigated by sources in coastal districts 1974-1975.

	Balasore	Cuttack	Ganjam	Puri
Major	71.20	75.14	18.11	69.58
Medium	0.00	0.00	12 57	5.83
Minor (i) flow	23.75	18.54	67.40	23.98
(ii) Lift.	5.05	6.32	1.92	0.61
	100	100	100	100

SOURCES : Reports of Irrigation Commission. Page, 300 Vol. II 1972

TABLE– A (b)

Land utilisation pattern in coastal districts 1973-1974.

	Classification	Ganjam	Cuttack	Puri	Balasore
1.	Forest	45.74	8.81	27 82	5.82
2.	Misc. crops (not included in area shown)	1.63	2.39	2.29	2.09
3.	Permanent pasture and other grazing land.	2.29	5.32	5.46	4.80
4.	Cultivable waste	1.63	3.95	5.83	3.86
5.	Area not available for cultivation	5.74	9.65	7.55	10.82
6.	Other fallows.	0.82	0.37	0.57	1.88
7.	Current fallows.	5.74	4.59	5.74	6.34
8.	Net area sown. (i) irrigated	12.38	19.10	10.61	10.51
	(ii) Non-irrigated	24.02	45.82	34.13	53.63
9.	Total cultivable area.	42.13	69.51	50.48	70.48
		100.00 (12.20)	100.00 (10.89)	100.00 (10.46)	100 00 (6.47)

SOURCES : Irrigation Commissions Report. Vol. II. 1972.

(Bracketed figures indicate geographical area of the district in lakh hectares.)

In the Table-A (a) we see that minor irrigation projects occupy predominant place in Ganjam and major irrigation projects the lowest place. In Cuttack district, major irrigation projects occupy the highest source of irrigation and minor irrigation projects occupy the least importance among these districts. In Cuttack and Balasore medium irrigation projects are non-existent; where as it constitute the highest source in Ganjam among the districts. In case of lift irrigation projects Balasore occupy the second place.

In Table-A (b) we find that % of irrigated area to total area, is highest in Cuttack, Ganjam being the second one. And % of non-irrigated area is highest in Balasore, Cuttack being the second one. Proportion of total cultivable area is maximum in Balasore and Cuttack occupies the second place, and Ganjam has the least % of cultivable land to its total area.

TABLE—B (a)

Net area irrigated by different sources in Orissa. '000' hectares

Period	Major & medium I. P.	Minor I. P. (Flow, IIft, others)	Total araa irrigated	% of net area irrigated to net area sown
1965-66	365 58	422.79	788 37	13.15
1966-67	407.27	466.75	874.02	14.52
1967-68	428.47	478.78	907.25	15 01
1968-69	470.02	504.64	974.66	16.06
1969-70	484.83	527.27	1012.10	16.61
1970-71	519.20	541.96	1061.16	17.34
1971-72	547.88	580.55	1128 43	18.44
1972-73	579.52	584.86	1164.38	19 40

SOURCES— Statistical abstracts of Orissa 1973. Bureau of Statistics and Economics Orissa.

It has seen from the Table-B (a) that irrigation facilities has been increasing at a very slower pace. In Orissa minor irrigation projects always supply water to more than 50% of the irrigated area. In the year 1972-73 the total area irrigated in Orissa is 1164.38 thousand hectares. But the aggregate % of area irrigated to area sown is very low. During the last of 3rd plan it was only 13.15% where as it increases to 19.40% during last part of 4th plan. This increase in irrigation facilities also helps to raise the food production at steady but slow rate.

TABLE—B (b)

"Million Tonnes"

	First Plan	2nd Plan	3rd Plan	4th Plan
First year of Plan	55.60	72.46	82.48	99.50
Second year of Plan	69.34	82.33	72.35	104.67
% of irrigated area to total area under food grain only	18.3	88.8	72.35	24.4

SOURCE— Indian Statistical Abstracts.

The Table–B (b) shows that food production has increased from 55.6 million tonnes (1951) to about 100 million tonnes in the year 1969. But land under irrigation has increased very slowly (only by 6.1%) from 1951 to 1969; where as quantity of food production has almost become the double the amount (100%). But in the year 1977–78 it has been estimated by a study of ministry of agricultural and irrigation that about 50% of the food production is from irrigated areas.

It is evident that water not labour or land is the limiting factor. So plan policy should adopt those measures which optimise the use of this searcest resource to maximise output and employment per unit of water. However from the point of view of regional social justice and without interfering with has growth of production, it would appear to be a better policy to give priority to new irrigation projects in regions with little or no irrigation at the moment than to the further intensification of agriculture in the areas which are alredy irrigated and are using the new technology. The only caveat is the large investment involved and the time needed for fructification in the case of major irrigation projects. But this will not apply to minor irrigation projects, which do not require large capital investment, yield quick results, and are more employment–intensive in terms of agricultural personnel. Hence minor irrigation projects in the regions where there is no or little irrigation should be preferred to new technology in irrigated regions.

II

Here two points need to be considered; before extending or establishing irrigation utility in any region, both the demand and supply aspects must be taken into consideration, to predict and/or determine the feasibility and viability of an irrigation project.

The first question is what is irrigation water in Orissa worth to a farmer ? We may hope widely different answers according to climate and crops grown. When we are dealing with a single climate and a single pattern of farming, the principles of economic analysis tell us that we must look for a demand curve; the price elasticities of demand (defined where q is quantity demanded and p the price as $\frac{dq/q}{dp/p}$) i. e. the proportionate effect on demand of a change in price. The amount of water for which a farmer can find remunerative use depends upon the prices of the goods he produce and other inputs and on the prices at which water is supplied to him. The demand curve for water may be measured in the first place empirically by observation of the amounts demanded by farmers under varying circumstances but also in a more sophisticated manner by linear programming. In this case agricultural economists armed with all the informations about cost of labour, fertilizer etc. for each unit of crop production, expected returns from it can tell the farmer precisely how much of each crop it is worthwhile for him to grow with varying water prices.

On the supply side the question is how should one judge the performance of irrigation enterprise ? The question arises because the custodians of public appear to think that performance should be measured in terms of return on capital employed. What irrigation is worth to itself ? To findout the feasibility or profitability of a project, we should take the economic returns it yields into our consideration. Irrigation on farms and fields should not become merely a drought insurance rather then becoming an income-earning and income-saving investment ?[7] Economic yields of irrigation will be reflected directly in study of cost benefit analysis and indirectly in the change in the intensity of cropping due to irrigation. In order to clinch the issue I have estimated the benefit-cost ratio and change in intensity of cropping taking some empirical data into consideration. The Table-C has been calculated to reveal $\beta=(B-C)$ ratio of 15 minor irrigation projects of four districts of Orissa.

Due to irrigation there has been considerable increase in the production of foodgrain during Khariff and Rabi season, as is seen from Col 1. 2 & 3 in the Table-C. During Khariff season it has been estimated that M. I. projects at Nakhara yield the maximum of additional benefit (Rs. 957–12) and during Rabi season Kajalganda project provides the maximum of benefit (Rs. 189–40) to Orissa in the year 1974–75. If we consider both the seasons, Nakhara projects will be the highest income earning project, second being Kajalganda project; in this regard. Among these 15 projects Ranijang projects yield the minimum additional benefit in both the

TABLE—C

Districts/Projects		Additional Benefit (Rs) per hectares due to irrigation		Intensity of cropping in Command Area of minor irrigation projects.			Cost Benefit ratio of M. I. Projects.		
		Khariff	Rabi	Net area sown in hectares	Gross area sown in hectares	Cropping intensity	Additional Benefits (Rs)	Annual cost (Rs)	Benefit-cost ratio.
1		2	3	4	5	6	7	8	9
Puri	1. Nakhara L. I	1327.23	1778.99	12.05	34.26	284.38	33001	7933	4.16
	2. Sisupalgarh L. I	255.52	1730.14	24 27	42.49	154.72	42205	13182	3.20
	3. Kajalganda R.	918.77	1891.40	362.84	520.52	143.45	541278	62496	8.66
Balasore	4. Ganijarg L. I	70.17	82.75	6.57	8.25	125.63	621	9604	0.06
	5. Gopalpur L. I	174 38	392.66	18.21	20.66	113.44	4538	10759	0.42
	6. Badapokhari R	NA.	82.75	6.07	7.03	115.66	472	NA	NA
	7. Kalidaspur L. I	64.66	203.16	10.79	27.49	154.66	5413	6969	0.78
	8. Patnaraipur L. I	187.10	224.30	6.90	11.02	159.77	1410	6969	0.20
Cuttack	9. Dandijhara R.	70.17	984.25	243.54	266.06	109.25	223758	30661	7.30
	10. Kadamnalia R.	818.01	933.73	206.92	221.07	106.83	95928	43442	2.20
	11. Dalanpur L. I	371.49	1150.23	39.88	79.23	198 66	60838	20067	3.03
	12. Nistipur L. I	358.50	889 84	34.50	52.22	151.35	48669	12395	3.93
Ganjam	13. Putipadar L. I	957.12	202.37	43.06	146.92	341.18	31518	14161	2.23
	14. Lankagarh R.	215.66	1098.58	339.20	418.82	104.91	609670	326147	0.34
	15. Ambapura L. I	220.89	225.34	3.37	3.57	105.88	755	2209	0.34

NOTE : (i) R = Reservoir, L. I. = Lift Irrigation. Year = 1973–1974 (data)

NOTE : (ii) In Rabi season and khariff season harvest prices of paddy and wholesale prices of other crops were taken in estimation.

SOURCES : Projected and computed by me from the data collected from :—

(i) Statistical abstracts of Orissa 1973-74 Bureau of Statistics and Economics Orissa.

(ii) Report of Irrigation Commission Vol. II 1973.

(iii) Agricultural situation in India Nov. 1975 Ministry of agriculture and irrigation. Govt. of India.

seasons; taking separately and jointly. These two columns have been estimated from the data given by Irrigation Commission 1974. In our estimation harvest prices of paddy and whole sale prices of other crops have been taken. During Rabi season, only 5 projects show additional benefit value in rupees which are above 1000.

In addition to this with the availability of assured irrigation facilities there has been a significant increase in the area under double and multiple cropping. The intensity of cropping varies from 104.91 to 341.18. In the Table-C (col. 4, 5 & 6) it is seen that minor irrigation projects have increased intensity of cropping considerably in command areas. Kajalganda occupies the highest place in the net area and gross area irrigated and the second place is oocupied by the project at Lankagarh. However Lankagarh project has the lowest cropping intensity, where as Putiapadar project having very small amount of net area sown has the highest cropping intensity in Orissa. Project of Ambapura constitute the net area least sown and also gross area sown. Projects at Lankagarh, Ambapura, Kadamnalia, Dandijhar have low cropping intensity (i. e. below 110).

The Table below shows the cropping-intensity among districts.

District-wise intensity of cropping

	Net area sown (in hectare)	Gross area (in hectare) Sown	Cropping intensity
Ganjam	179581	264232	147
Cuttack	285995	409131	143
Puri	189253	266694	141
Balasore	167811	192151	115

We see that cropping-intensity is maximum in the district of Ganjam, lowest in Balasore district. But net area and gross area sown is maximum in Cuttack and Puri occupies the second place in this regard. The range of cropping intensity among districtwise projects is not very wide as it is wide among particular projects.

However, when we compare with other provinces of India and other countries, Orissa occupies a very small position in relation to net marginal return from irrigation after meeting additional costs.

Place			Net marginal return after meeting additional cost.
Orissa	—	—	0.24
Bihar	—	—	0.45
Australia	—	—	0.94
France	—	—	0.88

III

In the last part of this paper, I try to build and prescribe a theoretical analysis to estimate and determine the benefit cost (B-C) ratio, feasibility or viability of a minor irrigation project suitable to Orissa.

Let the area of a crop irrigated by a irrigation project during a year be m_r Hectares, and the yield rate of the said crop if irrigated per hectares be n_r quintannts. And the cost of cultivation of the said crop if irrigated be c_r the price of the crop be p_r rupees per quintan both with and without irrigation. Then the gross agricultural income from the said crop after irrigation is provided by M. 1. Project will be

$$m_r\ n_r\ p_r \qquad \ldots\ldots\ldots(1)$$

And the cost of cultivation of the said crop when irrigation is provided will be

$$m_r\ c_r \qquad \ldots\ldots\ldots(2)$$

So the net agricultural benefit from the said crop after the irrigation is provided by a project ; will be (gross income–cost of cultivation) i. e.

$$m_r\ n_r\ p_r - m_r\ c_r \qquad \ldots\ldots\ldots(3)$$

Similarly let

n_u – be the yield rate of said crop if unirrigated per hectare.

c_u – be the cost of cultivation of the said crop if there is no irrigation.

So gross income from the crop without irrigation would be

$$m_r\ n_u\ p_r \qquad \ldots\ldots\ldots(4)$$

and cost of cultivation without irrigation would be

$$m_r\ c_u \qquad (5)$$

The net agricultural income from crop then would be

$$m_r \; n_u \; p_r - m_r \; c_u \qquad (6)$$

Therefore additional benefit from the said crop after irrigation is provided by irrigation project will be (3) — (6)

$$\text{i. e. } [\, m_r \; n_r \; p_r - m_r \; c_r \,] - [\, m_r \; n_u \; p_r - m_r \; c_u \,]$$

$$m_r \; [\, n_r \; p_r - c_r - n_u \; p_r + c_u \,]$$

$$m_r \; [\, p_r \; (\, n_r - n_u \,) - (\, c_r - c_u \,) \,] \qquad (7)$$

If a number of crops are cultivated and produced the net additional benefit of the project during a year will be

$$\sum_{u=r=1}^{n} m_r \left[\; p_r \; (n_r - n_u \,) - (\, c_r - c_u \,) \; \right] \qquad (8)$$

Let the life period of the project be t year, capital invested for construction be K rupees, rate of interest for capital invested be 1% per annum, annual working expenditure for maintenance of the project be V rupees.

So the annual depreciation of the capital invested would be $\frac{K}{t}$ rupees = rupees. (Say)

and quantum of annual interest of capital invested would be

$$\frac{\text{S. i. } (t+1)}{100 \times 2} = \text{q rupees (say)}$$

So the annual cost of the project would be [q+s+v] rupees

Therefore the Benefit–cost (B – C) ratio of the project will be :

$$\beta = \frac{\sum_{r=u=1}^{n} m_r \left[\; p_r \; (\, n_r - n_u \,) - (\, c_r - c_u \,) \; \right]}{(\, q + s + v \,)}$$

This theoretical model can be used to find out the benefit cost ratio of any irrigation project in Orissa both at district as well as provincial level. The last equation can predict profitability and prospects of a project. And by this method we can calculate the economics returns of irrigation of the particular project or of all projects in the State. My contention here is to say that the irrigation facilities should be extended on a liberal policy to the unirrigated, stress-sensitive-high income crop producing regions, by assessing the feasibility of the project. Irrigation should not be supposed to be a drought famine insurance, but it should be an income earning investment i. e. the $\beta = (B - C)$ ratio > 0 (must be positive). However

from the point of view of regional justice, this rule of Benefit-cost ratio should not be adhered to very strictly in a state so poor as Orissa. Because poverty will breed poverty in the State.

Conclusion :

Since the main objective of management will be to optimise the allocation of water as an input to agriculture, it follows that there should be the closest possible coordination between the key activities of agricultural planning, water distribution and agricultural extension. These closely related activities are likely to be most effectively executed by a unitary agency or command area authority. There is need for similar coordination in policy and planning at the provincial as well as lower levels within the project, down to the fields. Otherwise laxity in the distribution of water creates a very inefficient and inequitable pattern of water-use. Farmers in the head-reaches waste water to cultivate far larger area of crops with high water requirement. As a result the supply for tail-end farmers become highly unpredictable or in some case non-existent. There is, therefore, a need for strong organisational linkages. Mere increasing the irrigation potential will not do unless firstly and existing capacity is fully (optimally) utilised and secondly every drop of water is used by increasing the intensity of irrigation and intensity of cropping.

Besides, the system should have sufficient inbuilt-flexibility to allow for expected future change in operation as a result of new cropping pattern and increases in the intensity of irrigation.

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IMPACT OF IRRIGATION ON TENANCY.

Promod Kishore Das

The tenurial conditions under any land tenure system are determined not only by the historical factors, the existing social, legal and economic relationship but also governed by the economic infra-structure of the specific region. Any change in any of these factors might bring about a transition in the tenurial situation. There might even be a shift in the tenurial system, particularly with the change in infra-structure, which has a direct bearing on the production conditions existing under any form of land tenure no matter whether land is cultivated under crop sharing arrangements or fixed rent system. The present study makes an attempt to analyse the transition in the tenurial conditions which appeared to have occurred in the village Attabira, in the district of Sambalpur situated in Western Orissa, with the introduction of irrigation facilities and the consequent changes in the cropping pattern and adoption of new technology in agriculture. The agrarian situation in the village Attabira has undergone considerable changes in the late 1960s with the advent of Green Revolution. The present study is based on an intensive survey of the agro-economic structure of the village conducted during the year 1974-75.

In the late 1950s the village Attabira did not enjoy any economic significance in spite of its locational advantage. It did not have any irrigation facilities and was only a monocropping area. But the village has acquired a significant position after the extension of irrigation facilities to the area. The agro-economic conditions have improved. Cropping pattern has changed. Consumption of fertilisers has gone up. Per acre yield has increased. There has been a large influx of tenant cultivators particularly from Andhra Pradesh. A considerable number of labour families have immigrated and settled down in the village. Thus there has been a considerable change in the agrarian situation of the village in recent years.

Agrarian situation prior to 1960 :

Earlier to 1960, irrigation facilities were not extended to the area. Cultivation of crops entirely depended upon monsoon. Only a single crop,

mainly paddy, was cultivated. Large tracts of land were lift fallow. The problem of tenancy was not conspicuous in the village during this period. Magnitude of tenancy was very low and negligible. Table 1 will give us an idea of the tenancy conditions in the village during the period preceding to 1960, to be precise between 1957-59.

Out of the total land cultivated only 3.44 per cent of land was cultivated under fixed rent and crop sharing system of lease. One significant factor is that lease under fixed cash rent was conspicuously absent in the village during this period. Absence of irrigation facilities appears to be largely responsible for uncertainty in the crop cultivation. This might have been the reason for tenants not being interested in leasing in land. Land was cultivated mostly by the land-owners themselves or under their supervision.

It is not only the leasing out pattern and the mode of rent payment, but the amount of rent paid to the lessor which needs to be noted. During this period as the Farm Management Studies show the amount of rent paid to the lessor works out to be Rs. 17.21 per acre of land leased out under crop sharing tenancy where as under fixed rent tenancy it turns out to be Rs. 33.33 per acre. Thus the per acre rent was low, which might be largely due to the low productivity of land.

After 1960 :

The situation in the post 1960, particularly in late '60s, has completely changed with the introduction of irrigation facilities and the advent of green revolution. Adoption of new technology, cultivation of HYV paddy, extensive use of fertilisers and pesticides have increased the per acre productivity of land. Double cropping is feasible because of availability of irrigation facilities. More land has been brought under cultivation. Demand for cultivation of land under various forms of lease has gone up. A tendency seems to have been developed among the lessors to lease out land for a fixed period of time with a fixed amount of rent and the lessors appear to be more interested to enhance the rent in order to capitalise the gains of increased production.

Payment of rent :

In the mid '60s the annual rental share (for the lessor) per acre of land was 2.25 quintals of paddy for a single crop. Now that two crops are being raised during a year the per acre rent has doubled. But the significant factor is that proportionately the per acre rent has gone up. It is no more 2.25 quintals per acre for a single crop. The rate of increase

in rent varies from 0.75 quintals to 3.00 quintals of paddy for a single crop from one acre of land. We have already noted that prior to 1960 the per acre rent did not exceed Rs. 33.33 per year and in case of crop sharing lease arrangements it was still lower. Now with the introduction of irrigation productivity of land has increased which has resulted in an immediate shift in the rate of rent payment. The land owners do not shrink to raise the rentals in line with appreciation of land values or evicting a tenant having long-standing cultivating possession of land in order to earn a higher rent.

Mode of rent payment :

Apart from raising the rent the introduction of irrigation facilities has also influenced the mode of rent payment. We have already noted that cash rent was conspicuously absent in the village during 1957-59. The lease was either given on crop sharing arrangements or on a fixed kind rent. Usually the former system of lease was more in practice. But at present crop sharing system of lease is entirely absent in the village and lease is given only on fixed rent paid either in kind or in cash. In fact, it is the latter which is more prevalent in the village. We have collected informations from 27 (out of 28) tenants of the village who lease in land either on fixed kind rent or fixed cash rent. In all, there are 56 lease units out of which 35 units are leased out on fixed cash rent and 21 on fixed kind rent. (See Table-II)

Extension of irrigation facilities have resulted in the adoption of new technology in producing paddy particularly the HYV. The productivity has increased. This has induced the lessors to lease out land on fixed rent basis the strategy being that such a lease system would enable the lessors to appropriate the gains of increased productivity. Tenants under a fixed rent system of lease might be induced to produce more since they would obtain all the produce of the lease parcel after the landlord's share, which is fixed, is paid up. Thus under a fixed rent system of lease, it is assumed that a tenant would put in more of labour and other inputs.

There are fifteen cases where we notice a shift from fixed kind rent system to fixed cash rent system of lease. The rate of increase in the per acre rent has been more in the case of fixed cash rent over the last one year period from 1974 to' 75. (See Table II.)

Another form of leasing out of land has recently developed according to which the actual lessees are shown as advancing credit to the lessor

while in fact paying money rents for leasing in land to cultivate a fixed number of crops. This device is largely adopted to defeat the impact of land reform legislation. The above device makes it appear as if the land has been mortgaged for a loan to the "lessee" though the loan is in fact, the rent paid for the land and the creditor is no one else but the actual lessee.

Lease Duration :

It has been stated above that the landlords appear to be more interested in inducing productivity changes through leasing out land on fixed rent basis, thereby increasing his share of out-put in the form of rent for the lease parcel. Prior to 1960, when irrigation facilities were not available in the area and improved methods of growing paddy were unknown to the native cultivators the duration of lease used to be long. This was presumably to enable the tenant to compensate the loss of one year by a better harvest of another year.

But the situation has completely changed in the early '70s. As has been noted earlier, the demand to lease in land has increased considerably. The land owners interested to lease out land have taken advantage of this increased demand for leasing in land. Land parcels are no more leased out for longer duration. Land owners have not only enhanced the per acre rent but have also tried to appropriate gains of increased productivity by leasing out land for a short period usually for a single crop. Shortening of the lease period has enabled the landlord to raise the per acre rent whenever there comes an opportunity to do so. Lease contracts are terminated frequently and are renewed only at an enhanced rent. The same tenants are allowed to continue only if they agreed to pay the enhanced rent or are evicted and the lease is given to a fresh tenant.

Conclusion :

Thus we find that the introduction of irrigation facilities in the area has changed the agrarian conditions of the village. There appears to be a transition from share cropping arrangements of land lease to a fixed rent particularly fixed cash rent system. With the increase in the productivity of land the land owners have tried to change the mode of lease arrangements in order to appropriate a larger share of the produce from the lease parcel.

TABLE—I

Magnitude of Tenancy

	Owned and self-cultivated	Taken to laese					
		Under fixed cash system	Under fixed kind system	Crop sharing system	Total	Others	Total
Area in acres	919.57	—	19 00	25.09	44.09	310.16	1282.82
% to the total	71.68	—	1.48	1.96	3.44	23.84	100.00

SOURCE— Farm Management Studies, (Sambalpur District) 1960, p. 177.

TABLE—II

Amount of rent and mode of rent payment and the relative resource position of lessees and lessors

Sl No. of Tanant	Operational Holding			Status of the land-lord	Change in the kind rent			Change in the cash rent		Change over from kind to cash rent	
	Land owned	Land leased	Total		1974	1975	Money equivalent	1974	1975	1974	1975
1	2	3	4	5	6	7	8	9	10	11	12
1.	—	4.00	4.00	25.00	—	—	—	800.00	900.00	—	—
2.	—	2.00	2.00	2.00	—	—	—	600.00	960.00	—	—
3.	—	9.50	9.50	3.00	9.00	9.75	1040.00 (for 1 acre)		—	—	—
					9.00	9.00	960 00 (for 2 acres)		—	—	—
				3 00	—	—	—	600.00	750.00	—	—
				2.00	—	—	—	600.00	750.00	—	—
				15.00	—	—	—	—	900.00	(for one crop)	—

4.	—	4 00	4 00	2.00	6.00	7 50	800.00	600.00	700.00	—	—
				15.00	—	—	—	800.00	950.00	—	—
5.	—	4.50	4.50	20.00	—	—	—	600.00	800.00	—	—
				2.50	6.00	7.50	800.00	—	—	—	—
6.	2	2 50	4.50	18.00	—	—	—	600.00	800 00	—	—
7.	8	3.50	11 50	10.00	—	—	—	850.00	850.00	—	—
				15 00	—	—	—	800.00	850.00	—	—
				0.50	7.56	7.50	800 00	—	—	—	—
8.	1.60	5.00	6.60	2 50	7.50	7.50	800.00	—	—	—	—
				15.00	—	—	—	—	—	7.50	800.00
9.	0.65	3.00	3.65	4 00	9.00	12 00	1280.00	—	—	—	—
10.	4.50	2.00	6.50	2.00	9.00	12.00	1280 00	—	—	—	—
11.	3.00	2.00	5.00	2.50	9.00	9.00	960.00	—	—	—	—
				1.00	9 00	9.00	960 00	—	—	—	—
12.	8.50	8.00	16.00	15.00	—	—	—	—	—	9.00	950.00
			10 00						—	—	—
13.	6.50	3.50	10.00	40.00	—	—	—	—	—	—	—
				1.50	6.00	6.00	800.00	—	—	9.00	900.00
14.	2.00	15.00	17.00	40.00	—	—	—	600.00	900.00	—	—
				10.00	—	9 00	960.00	—	—	—	—
				2.00	7 50	7 50	800.00	—	—	—	—
15	4.00	4.00	8.00	15.00	9.00	10.50	1120.00	—	—	—	—
				15.00	9.00	10.50	1120.00	—	—	—	—
16.	2.00	3 00	5.00	15.00	7.50	9.00	960.00	—	—	—	—
				13.00	7.50	9.00	960.00	—	—	—	—
				2.00	7.50	7.50	800.00	—	—	—	—
17.	3.00	3.00	6.00	12.00	—	—	—	—	—	7.50	800.00
				15.00	—	—	—	—	—	7.50	800.00

Sl. No. of Tenant	Operational Holding			Status of the land-lord	Change in the kind rent			Change in the cash rent		Change over from kind to cash rent	
	Land owned	Land leased	Total		1974	1975	Money equivalent	1974	1975	1974	1975
1	2	3	4	5	6	7	8	9	10	11	12
18.	2.50	2.50	5.00	15.00	—	—	—	—	—	9.00	900.00
				15.00	—	—	—	—	—	7.50	800.00
19.	3.00	4.00	7.00	15.00	—	—	—	—	—	9.00	950.00
				15.00	—	—	—	—	—	7.50	800.00
20.	3.50	4.50	8.00	17.00	—	—	—	—	—	9.00	950.00
				13.00	—	—	—	—	—	7.50	800.00
21.	3.00	4 00	7.00	15.00	—	—	—	—	—	9.00	950 00
				13.00	—	—	—	—	—	7.50	800.00
22.	2 50	4.50	7.00	15.00	—	—	—	—	—	9.00	950.00
				40 00	—	—	—	—	—	9.00	950.00
23.	6.00	4.00	10.00	4 00	—	—	600 00	600 00	900.00	—	—
24.	5.00	4.00	9 00	0.80	—	—	—	600.00	800.00	—	—
				10.00	—	9 00	960 00	—	—	—	—
				15.00	—	—	—	—	950.00	—	—
25.	3.00	6.00	9.00	20.00	—	—	—	720.00	800 00	—	—
				15.00	—	—	—	720.00	800.00	—	—
				13.00	—	—	—	720 00	800.00	—	—
26.	3.20	4 00	7 20	40.00	—	—	—	600.00	900.00	—	—
					7.50	7.50	800 00	—	—	—	—
27.	1.50	4.00	5.50	25.00	—	—	—	720.00	900.00	—	—
				15.00	9.00	10.50	1120 00	—	—	—	—

OPPORTUNITY COST OF INVESTMENT IN IRRIGATION PROJECT IN ORISSA

B. C. Hota,
Reader in Agril. Ecno. OUAT

Increasing agricultural production is a matter of great urgency. Irrigation has a key role to play in it. In according approval for construction of irrigation project, economic considerations are often overlooked or overruled. But if maximisation of benefit within the limited financial resources available for irrigation is the objective, priority has to be accorded to the most economical project. The economic criterion to be applied to irrigation projects has, thus, not only to provide a measure for accepting or rejecting a project but should also give a satisfactory means of comparing the relative economic worth of number of projects for fixing their *inter-se* priorities.

Various economic and social factors are to be considered in assessing the benefits accruing to the proposed irrigation projects. The measures used, hither to, by economists in assessing the viability of irrigation projects are benefit cost ratio, internal rate of return etc. But the financial test alone does not give us a clear picture of benefits accruing from irrigation project. There are other indirect benefits accruing to the Govt. under income tax, excise duties, sales tax, transportation etc; benefits accruing to agriculture sector due to higher yield, better quality crops, switching over from less remunerative to more remunerative crops, and adoption of modern technical knowhow because of reduction of risk factor in irrigated-agriculture, higher intensity of cropping resulting from multiple cropping generation of gainful employment opportunity and the potential increase in the purchasing power of the rural community having a very low standard of living. Besides, higher and secured out put brings in its wake establishment of processing industries, expansion of consumer industries and retail trades, improvement in transportation and communication. Other secondary benefits are assured municipal and industrial water supply; psychic satisfaction due to recreation and change in eco-environment; extra earning from fishing etc.

The other factors considered are backwardness of the area, the extent of irrigation facilities there, susceptibility of the area to drought and

scarcity etc. It has been found out that wherever in drought affected areas irrigation has been introduced the benefits of irrigation has been relatively more and farmers there have become as prosperous as their counterparts with similar facilities else where. Thus the disparity in income gap between less developed and developed area is bridged. The scarcity that the capracious monsoon causes in the drought prone area in the upper reaches and flood in the lower reaches of the river basins makes it binding on the part of the Govt. to provide relief to alleviate the hardships of the scarcity riddern area in a welfare state such as India. Provision of irrigation facilities in the upper reaches will not only reduce the allocation under relief but diversion of savings from relief head to irrigation projects may also bring in the benefits enumerated above. Notwithstanding the fact that human society can pursue that combination of material and social objectives which they or their leaders prefer, and the economists some times cannot over–look this, the sum total of the direct and indirect benefits accruing to the society from alternative irrigation projects should be the guiding factor in according priority to alternative projects. The principle of opportunity cost is the choice indicator in making this decision.

Investment on irrigation project in which the prospective returns from all sources exceeds the capital cost and highest of the available alternatives should be accorded priority. The principle of opportunity cost is implicit in this statement. The opportunity cost differs from the capital cost of the project, since the former refers to the returns accruing from the best foregone alternative projects. Although the economist is interested in assessing the capital cost, the basic fact of scarcity drives him to the conclusion that the real cost of investment in one project is the alternative that are sacrificed. For example : the real cost of investment in a project is the highest amount of benefits given up that might otherwise have accrued, had the same amount of resources been invested in some other project or projects. This concept of opportunity cost is important because unless unemployed resources are available, resources are used for one thing at the cost of something else. In other words the real cost of a project is the benefits from all sources which have been sacrified for not taking up the best alternative project.

Opportunity cost is easy to define but difficult for practical application. The reflection of opportunity cost in quantitative term is far from simple, in fact, it probably is impossible to devise a programmed system of accounts that will routinely provide accurate estimates of opportunity

cost since it consists of a heterogeneous, amalgam of returns of quantitative, qualitative and psychic nature from best alternative sacrified. However, funds allocated for research to quantify and give a practical image to opportunity cost principle is worth trying.

The total water resources being less than the needs, ultimately all the physically feasible projects will have to be taken up. But as it stands to-day there are more projects under consideration than can be financed. The criteria of choice between projects, therefore, become of primary importance.

Besides the above factors, since the country is short of foreign exchange to import sophisticated capital goods from foreign countries, a premium must be given on selection of those works local manpower can be substituted for scarce foreign exchange. Here again the backward drought prone areas having cheap labour supply may be considered in assigning project.

Investment in areas producing high value, and hence taxable, crops, in which the Govt. automatically shares in the product, will yield the quickest returns. These can then be ploughed back. The agro-environment of many drought prone, backward areas of Orissa like Bolangir, Kalahandi, part of Sambalpur district adjoining Padmapur, Baud and Phulbani district, is most suitable for crops like potato, fruits, vegetables, tobacco cotton and maize which yield highest returns to irrigation in that order.

In backward and drought prone areas of Orissa, underemployment and seasonal unemployment of rural people are rampant. It is a major policy of a welfare state to find gainful employment for these people. Since irrigation allows the growing of more high value crops, insures a high percentage of crop maturity, increases yield of crop and animals or allows other input to be used more efficiently it will have a salutory effect on labour productivity. The gap in productivity of labour in the backward areas as compared to productivity of labour in the non-irrigated area of more developed district is quite large. Hence if the productivity of labour in the backward area is raised to the level of that in the irrigated area of developed districts the prospective rate of development will be more and the state as a whole stands to gain by investing a particular sum of money for providing irrigation facilities in the backward area than in the non-irrigated tracts of developed districts. The immobile nature and illiteracy

of rural labour of backward area, their inability to adjust to new urban and industrial settings keep them confined to agricultural vocation. On the other hand their counterparts in the non-irrigated area of developed districts are more mobile, educated and accommodative and hence they can move in search of employment in urban and industrial establishments. The solution to this problem lies in providing full time gainful employment to the rural labour of back-ward areas by providing irrigation facilities. The National Commission on Agriculture reports that one crore rupees of invest-ment in irrigation project generates 4,000 man-year of employment opportunity.

The drought prone areas of Orissa are mostly located in the upper reaches of the main rivers of their tributaries. Very high intensity of rains in certain part of the year and lack of natural precipitations in sufficient amounts, with enough frequency and low intensity when needed by crops may bring in drought conditions. If the flow of water during the torrential rains can be harnessed in the upper reaches, it will not only diminish the miseries of the drought prone areas but it can also save people in the lower reaches from the vagaries of flood. Thus the Government will save a colossal sum of money from relief of the distressed people of the drought prone and flooded areas in addition to the repair and maintenance cost of the embankments in the flooded area. Henceforth, the State exchequer will have to bear a larger share of expenditure on famine relief following the recommendations of the Sixth Finance Commission which scrapped the old formula providing central assistance of upto 75 percent of actual famine relief expenditure. This necessitates intensification of efforts to develop additional water resources, wherever feasible, in the drought prone areas, even without considering productivity, toward off year to year fluctuation in agricultural production. In addition, injection of relief assistance may contribute to the breakdown of the traditional structure of the area, while offering no alternative structure because of its temporary nature.

The low standard of living of the people of the backward area gives ample latitude for development of infrastructures and secondary and tertiary industries in these areas.

There is no denying the fact that in the long period the primary benefits from adjustment in cropping patterns will attain their peak. But along with these adjustments the secondary, tertiary and further benefits will also be flowing in and rising to their own highest levels. For instance, if as a result of irrigation, these adjustments in cropping patterns are

switched over to growing of potato, vegetables, tobacco and cotton as permanent crops of the area, it is likely that activities connected with further processing of these products will develop. This will generate additional employment and income. Tertiary industries may also develop to process some of the bi-products of the secondary processing industries. For instance, if irrigation leads to expansion of area under cotton, increased output of cotton might lead to establishment of ginning factories and even if the lighter bi-product, lint is exported outside the locality, the bulky cotton seed available may further be processed for getting oil and cotton seed cake. The former may be further used in making soap.

All these activities will not only generate additional direct employment opportunity but it will also give indirect benefits in that when the increased incomes generated from the sources are spent, they increase economic activities further giving rise to tertiary indirect benefits like improvement in transportation, communication, trades and other infra-structure of the locality. This chain can go on *ad-infinitum*. Tho cummulative benefits arising from these secondary tertiary and further activities are likely to be less in the backward tribal and drought prone areas mentioned earlier. This is due to the fact that a higher powered multiplier will play its role in the backward area as compared to that in the more developed non-irrigated area because of higher MPC of the people of backward area due to low level of income, less leakages through saving, taxation and consumption of goods purchased from outside the area. Hence the total benefit accruing to the society by injection of a particular dose of investment for irrigation in the backward area will be more than that of its investment in the more developed non-irrigated area.

It may be pointed out here that lack of proper planning will not only retard the flow of benefits but may also reduce the levels of total benefits, increase the cost and lead to undesirable and harmful developments.

It may be emphasised here that primary benefits lend themselves to easy measurement and that the measurement of secondary tertiary and other benefits becomes more difficult. Direct benefits in these categories again are easier to measure than indirect ones. These limitations must be borne in mind when assessing the benefits accruing from an irrigation project. However, attempts may be made to take the help of macroeconomic tools like marginal propensity to consume. (MPC) taxation, consumption goods brought from outside the locality and multiplier effect to

gauge the employment and income generation potential of various non-irrigated areas of the State.

The other method of measuring the total potential benefit involves comparison of socio-economic conditions of people within the ambit of the proposed project with that of the irrigated area having mostly similar conditions. This can be done by carrying out a socio-economic survey covering agriculture, industries, trade, transport, occupations, incomes, standard of living etc. of people in both the areas. The difference between these two area, will give a rough approximation of potential benefits accruing to the non-irrigated area after provision of irrigation facility. For example, Padmapur (non-irrigated) area and Bargarh (irrigated) area have similar conditions, and socio-economic status of the people of the two areas may be measured to estimate the potential benefit expected in Padmapur area after irrigation. Similarly, one irrigated and one non-irrigated area of coastal district having mostly similar conditions with respect to culture, tradition, eco-climate may be surveyed. In other areas cluster of villages receiving irrigation facility and another cluster of adjoining villages receiving irrigation facility may be surveyed for the purpose.

By suitable interpolation and extra-polation the total benefits expected to be reaped by people of the command area of the proposed project may be roughly estimated. Any one or both the methods may be used in conjuction to assess the potential benefits. All these benefits accruing to the society and the revenue earnings of the Government may be entered on the credit side of the balance sheet.

The debit side consists of items like the capital cost of a project including construction of distributaries and channels upto the field level, an acceptable rate of returns on the capital invested and the establishment and administrative expenses for repair and maintanance work.

The difference between the credit and debit side yields the net benefit. This net benefit may be converted to a common denominator. Now these figures thus derived may be used and the principle of opportunity cost utilised for according priority to contemplated projects in various parts of the State.

COST-BENEFIT ANALYSIS OF AN IRRIGATION PROJECT- A CASE STUDY

S. Mishra & B. Nayak ★

Water is an important and valuable input for the modern, commercial agriculture. This is essentially needed for the thirsty high yielding varieties and also enhances the fertiliser absorption capacity of the crop plants and increases the crop yield manifold. In the State of Orissa though the agricultural innovations have made a rapid stride yet, the production setback is always presistent with the farmers of Orissa in want of water for raising crops. Even the available water sources are not beneficially exploited as the holdings are very small and the consolidation has not yet been made. In the agriculturally advanced States of Punjab and Haryana consolidation of holding has increased water use efficiency beyond expectation. But in our State much water is wasted due to oddly levelled land pattern, faulty embankment and drainage system, seepage and farmers' incompetence to judge the water requirement of the plants and timely use of water to avoid evapor-tanspiration losses. Canal and pond, irrigation are mainly in practice in Orissa and introduction of dugwell and lift irrigation pumps are very much in need and making the use of lift pump on co-operative basis by formulating co-operative societies are still needed and has a better scope for further expansion in different tracts of coastal Orissa where water level in higher.

Co-operatives are mostly busy for catering to the needs for credit and marketing and irrigation sector is very less influenced by the co-operative movement in Orissa. During 1975-76 there were only 90 irrigation co-operatives in Orissa with a membership of 4836 and working capital worth 20.98 thousands. Like the fate of other ventures in the co-operative sector in this country many Lift Irrigation Co-operative Societies (L.I.C.S) are in precarious condition due to paucity of funds, bad management, deteriorating cohesiveness among members, crises of leadership, faulty assessment of water cost and bad re-payment. But the co-operative for which this study was made was in a better condition.

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Location :

The society under study named Radha Mohan Lift Irrigation Co-operative Society is located at Gati Rout Patna village situated 10 kms. away from Cuttack city beside the Cuttack-Paradip link road. Being situated nearer to Cuttack, the scope for adopting trade and commerce as profession, for the villagers is good. But, on the contrary, 95% of families are dependant on agriculture, 3% in other profession and 2% in government services.

The Lift Irrigation (L. I.) point is situated at a distance of 1 km. from Gatiroutpatna canal. Total area covered under irrigation is 26 acres. Pump House is located centrally from which the net-work of field channels run to different parts of the field. Before the installation of tube-well mono-culture was the only practise but after the water being made available the cropping intensity has more than trippled.

Ground water is lifted by a 15 HP submersible Motor. Water availability is sufficient and supply is made 4 times a month.

Objective of the Study :

1. To findout the post-installation feasibility of the irrigation project specifically emphasising the economic feasibility of the project.
2. Finding out the cost of the project (both the installation and operational cost) from which the unit cost of irrigation water is to be assessed.
3. Analysing the benefit derived from the project in terms of changes in cropping practises and generation of the enhanced income by the farmers and thereby to earn a higher net-returnable income.

Feasibility :

The appraisal is made on the basis of five criteria of feasibility such as :

1. Engineering/Technical
2. Economic
3. Financial
4. Political
5. Social.

Engineering feasibility for this project was sound and the decision for installing the well was taken by the information given by the Lift Irrigation Directorate, Orissa. According to them, this spot is located in

Mahanadi Delta area where water table is at depth of 15'—25' and can sustain large number of shallow tube wells. Lift pump installed indicated the following technical information; viz :

Static water level	15'
Draw Drawn	25'
Pumping Level	40'
Discharge	2500 gallons/hour.

Political feasibility of this project was also very sound as it has got a much popular support from the public. But the local politics of the election of Sarpanch has created the faction between the secretary and the president of the society leading to a "leadership crisis" for which the society has to run without managerial guidance for about two years.

The test of social feasibility is said to be good as the potential users have responded favourably to project construction. The fear among the farmers that, by combining the land to a co-operative may hamper the individual ownership has been receded. They have also inhanced the success of the project being motivated to shift to irrigated agriculture.

Project was financially sound without facing any problem of making the funds available. Out of the total cost of Rs. 70,000/- 50% was subsidised by the MFAL, Cuttack and the other half was got from Union Bank India, Cuttack Branch. The funds were sufficient and readily made available for the installation and operational payments.

The project was also economically feasible as the total benefit that resulted from project exceeded those which accrued without project by an amount in excess of the project cost. This aspect is dealt with more exhaustively in the discussions below :

Cost of the Project :

The total cost of the project is classified as—

(i) Associated and induced cost,
(ii) Project Installation cost,
(iii) Operation and maintenance cost.

Associated costs are found out from the expenses incurred from the analysis of the farm investment required for utilising project output. Induced costs are the expenses incurred out of the adverse consequences of natural calamities on the project. In this project though some associated

cost has been incurred in preparing bunds and ditch channels as the land under irrigation is infested by flood water for three months, no calculation of cost in this regard is made in this study.

Project installation cost is estimated by quantity of each item required for the construction and the payments made for that. Operation costs are estimated from expected salary, fringe benefit, overhead cost of hiring personnel and providing them with required supply of the equipments, cost of energy etc. A break-up of the cost involved is given below:—

Fixed cost	*Total cost (Rs.)*	*Loan recommended (Rs)*
1. Cost of installation of Tube well (12′×6′) including cost of 15 HP. submersible motor with accessories.	37,466	18,733
2. Construction of field channel @ Rs. 8/- per ft. for 200.	16,000	8,000
3. Construction of pump chamber-cum-Driver's chamber size 40′×17′	8,000	4,000
4. Cost of the pump site and internal wiring service connections.	8534	4267
	70,000	35,000

Variable costs (Recurring)

Electricity charges (when pump is in use)	1800.00
Electricity charges (Minimum when pump is not used in off season).	270.00
Secretary's pay Rs. 150/- P. M.	1800.00
Driver's pay @ Rs. 150/- P. M. for 9 months.	1350.00
Contingency expenses.	500.00
Annual maintainance, repair	2000.00
Reserve provision.	1280.00
	9000.00

Recurring operational cost for 7 years 9000×7 = Rs. 63,000.

Cost is discounted to find out the net present cost. Taking the economic life of the project to be seven years, the total loan of Rs. 35000 is divided over 7 years. Interest component is added to give rise to the cost of the project distributed yearwise.

Year Component of Costs (Rs.)

	(i) Capital	(ii) Interest	Total fixed cost
1.	5000	4200	9200
2.	5000	3600	8600
3.	5000	3000	8000
4.	5000	2400	7400
5.	5000	1800	6800
6.	5000	1200	6200
7.	5000	600	5600

	Cost with subsidy:—	W. T. without subsidy
Installation	35000	70000
Operational	63000	63000
Total	98,000	1,33,000

While calculating the cost Rs. 35,000/- i. e. 50% of the project cost given in the form of subsidy should be taken into consideration as a social cost. But since the farmers are only paying interest and concerned for Rs. 35,000/-, this is taken as the cost for the calculation purpose.

Benefits:—

Most important benefit of this project is to provide the scope for tripple cropping where a single crop was taken before hand. Two cropping patterns (given in Annexture I & II) are being adopted after the irrigation water was made available.

The income from Ist. cropping pattern	Rs. 2730/ acre
—do— 2nd —do—	Rs. 2890/ acre
	Rs. 5620/ acres

Per acre average income = 5620/2 = Rs. 2810/-
Net income = 2810 - 745 = 2065
Assuming that this income shall remain constant,
Net present benefit, by applying the similar formula as that of the cost, equals to

$$\frac{2065}{1.12} + \frac{2065}{(1.12)^2} + \frac{2065}{(1.12)^3} + \frac{2065}{(1.12)^4} + \frac{2065}{(1.12)^5} + \frac{2065}{(1.12)^6} + \frac{2065}{(1.12)^7} = 2424.2470$$

For 26 acres income = 9424. 2470 × 26 = 245030. 42

C/B ratio = $\frac{98.000}{245030.42}$ = 0.3999 – not treating subsidy as cost, and

$\frac{133000}{245030.42}$ = 0. 5427 treating subsidy as cost.

Other Benefits from the Project includes:—

—Employment generation for the families dependant on this project, all the disguise unemployment is transferred into productive labour.

—This has changed the attitude of the farmers to go for irrigated agriculture and intensive cropping.

—Seepage waste of irrigation water is low in flowing the water in concrete channel in comparison to field channels as in canal irrigation.

—The project has increased the value of land by 30 times which was previously regarded as uncultivable wasteland.

—Subsidy component of the project helped the farmers financially that they has derived the bouble benefit, exempted from paying interest and risk component being very low they are motivated in a very big way.

(Annexture—I)

Present cropping pattern and economics of the scheme (Before irrigation.)

	Expenditure			Income			
Croppining pattern	Acreage	Cost of cultivation	Total cost	Yield/acre	Total yield	Rate/Unit	Total income
Early paddy	26 acre	Rs 200/-	Rs 5200/-	5Q	208 Q	Rs. 70/-	Rs.14560/-
Winter vegetable	10 acres	Rs.500/-	Rs 5000/-	30Q	300 Q	Rs. 50/-	Rs.15000/-
			Rs. 10 200/-				Rs 29,560/-

Total income (B) Rs. 29,560/-

Total Expdt. (A) Rs. 10,200/-

Net income (B – A) Rs. 19,360/-

Per acre net income comes to be Rs. 745/- approximately.

PROPOSED CROPPING PATTERN AND ECONOMICS OF THE SCHEME

Annexture II

Cropping Pattern	Acreage	EXPENDITURE (A) Cost of cultivation	Total Cost	Field acre	INCOME (B) Income (B) Total yield	Rate/Unit	Total Income
1	2	3	4	5	6	7	8
1. a) Paddy	26	Rs. 600/-	Rs. 15,600/-	20 Q	520 Q	Rs. 70/-	Rs. 36,400/-
b) Cabbage & cauliflower	26	Rs. 800/-	Rs. 20,800/-	50 Q	1300 Q	Rs. 50/-	Rs. 65,000/-
c) Small Vegetable	26	Rs. 500/-	Rs. 13,000/-	30 Q	780 Q	Rs. 50/-	Rs. 39,000/-
			Rs. 49,400/-				Rs. 1,40,000/-
			Total expected income B		Rs. 1,40,000/-		
			Total expenditure A		Rs. 49,400/-		
					Rs. 91,000/-		
			Less : Electricity charges etc.		Rs. 20,000/-		
			Net income—		Rs. 71,000/- i. e. Rs. 2,730/- per acre per year		
2. a) Jute	26	Rs. 400/-	Rs. 10,400/-	8 Q	208 Q	Rs. 120/-	Rs. 24,960/-
b) Patato	26	Rs. 1500/-	Rs. 39,000/-	60 Q	1560 Q	Rs. 60/-	Rs. 93,600/-
c) Summer vegetable	26	Rs. 500/-	Rs. 13,000/-	30 Q	780 Q	Rs. 50/-	Rs. 39,000/-
			Rs. 62,400/-				Rs. 1,57,560/-

Total expected income (B) Rs. 1,57,560/- minus Total expenditure A Rs. 62,400/- = Rs. 95,160/-

Less electricity charges etc. Rs. 20,000/-

Net income Rs. 75,000/- i. e. per acre income Rs. 2,890/- per year.

NOTE—Thus net income per acre per year calculated on the basis of proposed two types of cropping patterns is appx. Rs. 2,800/- which is about Rs. 2,000/- more than the present (Annexture I).

THE IMPACT OF DUGWELL IRRIGATION ON SMALL / MARGINAL & TRIBAL FARMERS IN NUAGADA BLOCK OF GANJAM DISTRICT *

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The Western part of the State otherwise known as Agency area (Ganjam Agency declared as scheduled district under the Act of 1874) is predominantly a tribal area inhabited by Lanjia Souras and Kondhas. They have been characterised as 'A' class tribe by the State Government. The report of Dhebar Commission acknowledges them to be one of the most primitive tribals in the country. The hill terrain inhabited by Souras and Kondhas is mainly formed by Northern and Southern plateaus where the highest peak *Sringaraj* (4, 796 feet), *Mahendragiri* (4, 928 feet) forming portion of the Western ghats are situated. There is extreme climate with frost in the winter at higher altitude of the uplands. The tribals live a hard subhuman existence in the environment which does not always promise a decent standard of living even when the forests and land resources are utilised to the optimum extent. This is partly on account of the fact that undulating terrain in which they live, by its nature does not offer scope for practising modern methods of cultivation except by resorting to terraced cultivation which does not help the tribal in getting adequate return from the land and in addition destroys the valuable forest wealth.

The second crop in which the tribal economy rests is collection and sale of minor forest produce. The inadequacy of these resources has given rise to lack of adequate employment opportunities to primitive tribals.

To improve the conditions of the tribals, Government of India in the Ministry of Agriculture, in the first stage sanctioned six pilot projects for the country out of which Tribal Development Agency at Parlakhemedi is

* *The author is grateful to Dr. B. Sahu, M A , Ph. D., Reader in the Dept of Analytical & Applied Economics, Utkal University for his kind guidance in preparing this paper.*

one. This was formed and registered on 13-3-1972 under the Societies Registration Act of 1860. The Agency is supposed to serve as a catalyst for stimulating and promoting developmental activities aimed at raising the economic standards of the tribals in the tribal belts. The strategy of development in the project area lies in settling (i) Legal rights over the land (ii) introduction of improved agricultural practices to ensure the optimum return from the land by cultivation (iii) introduction of a system through which the tribal can freely collect and sell not only minor forest produce but also his agriculture produce at a fair price and tribals can get their daily requirements of life at a reasonable price (iv) encouraging as many tribal families as possible to take to settled agricultural practices.

The project is, therefore, mainly agriculture-oriented.

In view of this, provision of water source to implement the planned activity is very essential. Alongwith it, provision of infrastructure facilities including that of roads and communication, easy marketability and follow-up package of practices are a must if the tribal economy is to improve.

The experts are of the view that planning for rural areas without taking into account their functional linkage with urban|semi urban centres is a self-defeating strategy. This has resulted for the people of hinterlands to accept *Gothipratha* (bonded labour) whatever be the publicity on rural development.

Thus from the beginning of emergence of TDA, efforts have been made to solve the problems relating to land and land developments, e. g., creation of infrastructure facilities like water source, road and communication, seeds and fertiliser, etc., for agricultural development; the removal of technology-gap and channelisation of credit for input supplies etc.

An impact study was conducted to assess the benefits of dugwell irrigation. The survey was conducted in the year 1977-78. The respondents were asked to give informations on the points stated in the schedule. The acres covered under irrigation, income before and after, assets created before and after, the pattern of expenditure, employment generated, and land utilisation, etc , were assessed before the construction of dugwell in the year 1976–77 and its after-effects when the well was completed and used.

Both tribals and non–tribals of small and marginal category were interviewed. From their responses and from the various analysis in the above line, we find the following changes .

Name of Dugwell owner	No. of family member	Total land holding	Acreage Irrigated		Crop yeilded in all seasons worth (in Rs.)		Employment generated in months		Pattern of expenditure per month		Assets	
			Before D/W	After D/W	Before D/W	After D/W	Before D/W	After D/W	Before D/W	After D/W	Before D/W	After D/W
Menge Raika	6	0.5	Nil	0 5	500	500	3	3	55	90	—	5524
Soloman Raika	6	0 5	Nil	0 5	870	870	3	3	55	62	550	3600
L. B. Raika	4	2.2	Nil	1.0	2675	3215	4	12	65	90	9500	12842
B. Mandal	9	4.0	Nil	0.5	2700	3010	2	7	107	212	7040	8240
S. Mandal	7	0.5	Nil	0.5	105	105	6	6	160	318	4500	4550
M. Raita	8	1.0	Nil	1.0	825	1325	3	6	34	88	3240	3340
T. Mandal	7	2.5	Nil	1.0	1665	1665	6	9	165	376	3240	3310
S. Mandal	7	1 2	Nil	1.2	1305	1321	3	6	128	268	2000	2000
P. Mandal	7	3 0	Nil	0.5	2250	2450	6	12	162	284	4550	6600
J. B. Raita	6	1.2	Nil	1.2	1440	1494	3	5	163	280	1300	2350
Total :	67	16.6	Nil	7.9	14335	15955	39	69	1094	2068	35870	52356
Average :	6.7	1.66	Nil	0.79	1433.5	1595.5	3.9	6.9	109.4	206.8	3587.0	5235.6

From the above analysis it is clear that whether financially benefitted or not; tribal farmers have remained employed for an average of 6.9 months in a year in agricultural operation as against 3.9 months which was the employment potential prior to dugwell construction. Similarly as against per head land holding of 1.66 acs. at least 0.79 acres on an average being irrigated at all times of the year. In case of crop yield, hardly 40% of the farmers have been benefitted. In respect of pattern of expenditure, almost all the farmers' expenditure has increased though the rise in few cases is not of much significance. In case of assets creation, there has been increase of Rs. 164.6 per head. All this indicates that if due attention is given and extension work is enlarged, the farmers can improve their condition further, and effective utilisation of water sources so created can be ensured.

The data compiled above also reveals as to how the benefits have been lop-sided in some cases. The non availability of adequate extension work probably is responsible for this sort of uneven status. There will be no meaning in creating a water source project in a particular village, if the villagers do not have the access to seeds and fertiliser and no adequate extension work is done in the area for adopting scientific methods of cultivation. This also brings out the deficiency in the State Electricity Board's rural electrification scheme where villages are electrified without promoting load in the area and wherever loads are promoted so motto; the Board fails to collect the tariff at regular intervals even though party is prepared to pay the dues.

The right approach is to begin by trying to understand the tribal people and develop comradeship with them. This is a very long process for which patient and sustained work is necessary. Then only creation of low cost irrigation facilities can be effectively utilised and it will have some impact on the tribals who will feel like owning it and maintaining the same which is lacking in many of the areas.

Agricultural development can be promoted if simultaneous activities like provision of water source, package of practices and provision of required credit, etc. are arranged at appropriate time and due extension work is done in the area. Had the tribals been so active and receptive to follow the procedures demonstrated once or twice; probably there would have been no need to have so many catalyst agencies in these areas.

ECONOMICS OF LIFT IRRIGATION
A CASE STUDY OF PATTAMUNDAI BLOCK *

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I

In view of the inadequacy of water resources to meet the agricultural and other requirements, it becomes a matter of a great national importance to conserve and utilise most judiciously and economically the available resources. There has to be proper planning for water use with river basins as natural units of such plan. While any source of irrigation is better than a situation of no irrigation our endeavour should be to give special attention to sources which are perennial and reliable. Lift irrigation has this double attribute. It consists of both river-lift and tube-well projects.

The objectives of this paper is to find out

(i) the comparative Benefit Cost (BC) ratios of two categories of projects; viz., river lift and tube-well and the relative proportion of economic acreage to total acreage in region.

(ii) The minimum economic farm size for tube-well of the lowest cost possible at any one point of time.

II

Pattamundai Block is situated in North-Eastern part of Cuttack district and mainly comes under the basin of river Brahmani. Though the gross area of the block is 310 square kilo-metres; for the purpose of ground water development only an area of 136 square kilo-metres has been considered, since the remaining part of the Block comes under the surface flow irrigation and some parts under lift irrigation through river-lift projects. and tube-wells.

* *I am thankful to Sri S K. Sinha, Asst. Engineer, Lift Irrigation, Pattamundai Block for his computational help and valuable suggestions.*

A comparative study of BC ratios has been undertaken in between Nilakanthapur river lift project and Baladevanagar Tube-Well project during the year 1975-76.

(a) **Nilakanthapur River Lift Project :—**

1. Ayacut—60 acres
2. Water discharges—1.5 cusecs.
3. Cost of the project—Rs. 71,600.00
4. Expenditure incurred in the project per annum—
   (i) Repayment of loan with interest (10.5% per annum) = Rs. 12,133.00
   (ii) Pay of operator, Rs. 240.00 per month for one year—Rs. 2880.00
   (iii) Energy charges per annum : Rs. 6535.00
   (iv) Repair and maintenance charge (5% of the capital cost)—Rs. 3,580.00
   (v) Miscellaneous expenditure and supervision charges (10% over item-iv only) Rs. 358.00

   Total Rs. 25,486.00

Total expenditure : Rs. 25,486.00.....(C)

Total acre-inch = 3860

Cost per acre inch :— $\frac{25486.00}{3860}$ = Rs. 6.60

Calculation of profit for different crops (In the same ayacut of 60 acres)—

Sl. No.	Name of the crop	Area in acres	Yield profit/Ac. in Rs.	Total profit in Rs.
1	2	3	4	5
1.	HY. Paddy (K)	35	380.00	13,300.00
2.	Jute	25	595.00	14,875.00
3.	HY. Paddy (R)	35	750.00	26,250.00
4.	Patato	25	1310.00	32,750.00
5.	Pulses	20	750.00	15,000.00
6.	Vegetables	20	850.00	19,000.00
	Total 160 Acres		—	1,21,175.00

Total acres covered with triple cropping pattern—160 acres.

Total profit.....Rs. 1,21,175.00

If there were no irrigation through this river lift project, there would have some benefit depending upon natural condition and therefore, it is culculated that there will be benefit of Rs. 300/- per acre under non-irrigation condition. For 60 acres of ayacut area the benefit will be Rs. 300.00 x 60 = Rs. 18,000.00. Deducting this amount from the gross profit of Rs. 1,21,175.00, we get net profit of Rs. 1,03,175/- (B).

$$\text{Benefit cost ratio} = \frac{B}{C} = \frac{\text{Total benefit}}{\text{Total expenditure}}$$

$$= \frac{1,03,175.00}{25,486.00} = \frac{4.1}{1} \text{ (Approx) or } 4.1:1$$

(b) **Baladevanagar Tube-well project :**

1. Ayacut area :— 150 acres.
2. Water discharge :— 2.5 cusecs.
3. Water requirement for crops/annum = 5750 Ac. inches.
4. Cost of tube-well :— Rs. 2,15,500.00
5. Expenditure incurred in the project per annum :—

i)	Repayment of loan with average interest 10.5% per annum	Rs.	36,685.00
ii)	Energy charges per annum	Rs.	9,895.00
iii)	Pay and allowances of one pump operator Rs. 250.00 per month for one year	Rs.	3,000.00
iv)	Repair and maintenance charges 5% of capital cost of works	Rs.	9,608.50
		Total Rs.	59,188.50

Cost of irrigation per acre inch of water = Rs. $\frac{59,188\ 00}{5750}$ Rs. 10.29

Direct benefit from the project per annum

Name of the crop	Acreage	Yield from one acre of crop in Rs.	Total profit after irrigation in Rs.
1. *Khariff* :—			
Jute	100	755.00	75,500.00
HY. Paddy	50	1050.00	52,500.00
2. *Rabi* :—			
HY. Paddy	75	1050.00	78,750.00
Total	225 Acs.		2,06,750.00

Total profit after irrigation facility =Rs. 2,06,750.00

Deduct profit Rs. 300.00/ Acre for 150 acres before irrigation (Khariff crop only) :- Rs. 45,000.00

Net profit = Rs. 1,61,750.00 (B)

Benefit cost ratio : $\frac{B}{C} = \frac{1,61,750.00}{59,188.50} = \frac{2.7}{1}$ (or) 2.7:1

Benefit is more in case river lift project because higher cost is involved in tube-well installation. As in this area upper aquifer is saline deep tube-well above 600/ is necessary. As such, net incremental benefit becomes lower in the tube-well project. Secondly the tube-well farming suffers from size disability.

III

There are innumerable studies on diffusion of agricultural innovations in India that have high-lighted the important role played by farm size in their diffusion. One can visualize a minimum farm size below which investment on a tube-well is uneconomic in the sense that costs exceed benefits.

(i) **Economic Farm size :**

The algebraic formulation : $A = \frac{100.\ a}{I\ (B - r.\ C - b)}$ provides an explanation for the lowest cost possible at any one point of time with a given state of the arts. In the analysis, Baladevanagara tube-well project is taken into consideration.

$$A = \frac{100xa}{I\ (B - r.\ c - b)}$$

A = Size of operated farm holding of farmers (acres).

B = Net benefit per gross irrigated acre (Rs.)

I = Percentage of holding irrigated by tube-well (%)

C = Associated cost of irrigation (Rs. per gross irrigated acre).

r = Short term rate of interest on working capital.

a = Unavoidable (fixed) cost of tube-well irrigation per year (Rs.)

b = Avoidable (variable) cost of tube-well irrigation per irrigated acre (Rs.).

$B = Rs. \frac{1,61,750.00}{225} = Rs.\ 778.88$

I=30%

C=Associated cost of irrigation per gross irrigation acre—

i)	Energy charges per annum :	Rs. 9.895.00
ii)	Pay and allowance of one pump operator Rs. 250/- per month for one year :	Rs. 3,000 00
iii)	Repair and maintenance 5% of capital cost :	Rs. 9.608.00
	Total	Rs. 22,503.00

Rs. 22,503.00 for ayacut area of 150 acres. Hence associated cost per gross irrigated acre = Rs. $\frac{22503.00}{150}$ = Rs. 150.00

C= Rs. 150.00

r= 10.5%

a= Rs. 36,685.00 (fixed cost) (Appendix—II)

$b = \frac{\text{Associated cost}}{\text{gross irrigated area}} = \frac{22503.00}{225} = Rs.\ 100.00$ (Appendix—I)

Now applying these values into the formulation we get :

$$A = \frac{100 \times 36,685}{30\ (778.88 - \frac{10.5 \times 150 - 100)}{100}} = 184.4 \text{ acres}$$

Hence the economic farm size in the Beladevanagar tube-well project will be 184.4 acres instead of 150 acres actually cultivated.

(ii) Salient Features :

Some salient propositions with flow from the above formulation are discussed below :—

1. 'A' is inversely related to 'I'. And as such, the spatial fragmentation of a holding in the area continues to be much more. Because of this fragmentation disability effective farm size in this area in the matter of an indivisible investment like tube-well boils down to the size of the biggest fragment to the farm holding.
2. Minimum economic size of holding bears an elastic inverse relationship with benefits 'B' from irrigation, with an absolute value of the elasticity being greater than unity.

The Baladevanagara tube-well project suffers from the operated size disability.

However, in the particular context of tube-well projects, substantial portion of the farm acreage can benefit from this source of irrigation provided the state can promote among other things (i) consolidation of holding, (ii) provision of medium term as well as short term farm credit on liberal terms and in requisite amount. (iii) Assured source of electricity and (iv) the real agricultural extension services.

Appendix I

Cropping pattern suggested for one tube-well project in Pattamundai Block

1. **High land–Sandy loan**

	1st Crop	*2nd Crop*	*3rd Crop*
1.	Jute	Patato	Groundnut
2.	Jute	Wheat	Groundnut
3.	Jute	Paddy	Groundnut
4.	Hy. Paddy	Hy. wheat	Vegetable
5.	Hy. Paddy	Patato	Ragi

2. **Medium land-Sandy loan**

1.	Hy. Paddy	Hy. Paddy	Green manuring.
2.	Hy. Paddy	Vegetable (winter)	Hy. Paddy
3.	Jute	Patato	Vegetable
4.	Hy. paddy	wheat	Vegetable
5.	Ragi	Groundnut	Vegetable
6.	Jute	Paddy	Pulses
7.	Hy. Paddy	Mustard	Hy. Paddy

3. **Low land Clay**

1.	Improved paddy	Hy. Paddy	Pulses
2.	Hy. Paddy	Hy. Paddy	Pulses

SOURCE : D. A. O. Kendrapara.

Appendix II

Repayment Schedule

Loan amount—Rs. 64,95,000/-

Period of loan—9 years.

Interest rate—10.5%

Year	Payment of capital is Rs.	Payment towards interest in Rs.	Total amount of payment per annum	Balance of the end of the year
1	2	3	4	5
First	7,21,667.00	6,81,975.00	14,03,642.00	57,73,333.00
Second	7,21,667.00	6,06,200.00	13,27,867.00	50,51,666.00
Third	7,21,667.00	5,30,425.00	12,52,092.00	43,29,999.00
Fourth	7,21,667.00	4,54,650.00	11,76,317.00	36,08,332.00
Fifth	7,21,667.00	3,78,875.00	11,00,542.00	28,86,665.00
Sixth	7,21,667.00	3,03,100.00	10,24,767.00	21,64,999.00
Seventh	7,21,667.00	2,27,325.00	9,48,992.00	14,43,331.00
Eighth	7,21,667.00	1,51,550.00	8,73,217.00	7,21,664.00
Ninth	7,21,664.00	75,775.00	7,97,439.00	—
	64,95,000.00	34,09,875.00	99,04,875.00	

Total repayment of loan in 9 years = Rs. 99,04,875.00

Average annual repayment = Rs. 11,00,542.00 for 30 Numbers of Tube-well.

Average annual repayment per project—Rs. 36,685.00.

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CONSTRAINTS ON THE UTILISATION OF IRRIGATION POTENTIAL

(with special reference to Orissa)

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Irrigation is the most dominant input in accelerating the agricultural productivity. A resource like irrigation if properly utilised will increase the employment opportunites in the agricultural sector immensely. According to the estimate of Dr. N. K. Rath, irrigation potential properly harnessed in the state of Orissa can create work for 300 mandays per year, by irrigating $7\frac{1}{2}$ acres of land at a capital cost of Rs. 18,000, if it is major and medium irrigation and Rs. 30,000 incase of dug-well[1]. According to the official statistics only 42.01 percent of the irrigation potential created is being utilised. This is evident from Table-I which shows the percentage of Gross Irrigation Potential to the percentage of Gross cropped area[2]. According to the estimate of the govt. we have not been able to utilise more than 32% of the irrigation potential of major and medium irrigation projects. The Irrigation Commission of India estimated that the full irrigation potential of the state would be near about 5 million hectares out of which the potential already created is only 1.5 million hectares and we have not been able to utilise even half of the irrigation potential created. Let us briefly analyse the constraints which stand on the way of proper utilisation of the irrigation potential created in the State.

Major and medium irrigation :

(a) Preparation of Field Channels : Field channels are essentially necessary for supplying water to each field independently. When field channels were constructed there was more utilisation of irrigation in Hirakud command area than the previous use of irrigation. Many people hold the view that this should be the responsibility of the farmers and not of the Govt. But it has been our experience, that the farmers are not willing to finance field channels and field drains by taking institutional credit from the co-operatives or commercial banks. Inview of the large social benefits that will accrue by proper distribution of irrigation water

there is no other alternative than to execute those works departmentally. There is a proposal for constructing the field channels and the drains at govt.-expenditure and recover the cost by the levy of additional irrigation rates. It is therefore proposed that Govt. of India should give adequate assistance for this in the shape of loan to the state Govt[3].

TABLE- I

Percentage of net Irrigation Potential to Net-area sown and percentage of Gross-Irrigation Potential to Gross area sown :

Sl. No.	Name of Dist.	Percentage of net irrigation potential to net area sown.	Percentage of rabi irrigation potential to net area sown.	Percentage of gross irrigation potential to gross cropped.
1.	Balasore	20.57	3.82	20.97
2.	Balangir	22.68	6.49	24.80
3.	Cuttack	40.62	10.04	34.62
4.	Dhenkanal	13.23	2.40	13.18
5.	Ganjam	59.73	4.55	43.79
6.	Kalahandi	10.74	1.31	9.81
7.	Keonjhar	7.05	0.71	6.81
8.	Koraput	5.95	1.28	6.64
9.	Mayurbhanj	10.05	0.52	9.42
10.	Phulbani	16.35	0.91	13.29
11.	Puri	41.57	9.28	34.09
12.	Sambalpur	26.00	12.19	32.27
13.	Sundargarh	6.97	1.62	7.72
	Orissa	23.14	4.85	22.46

SOURCE— Irrigation Data published by Planning & Co-ordination Department, Government of Orissa.

(b) Secondly the constraint on utilisation of the irrigation potential of the major and medium sector is the drainage. Drainage is necessary to extract excess moisture from the field. Lack of drainage encourages the farmers to utilise more water than what is required and this propensity to utilise more water than the requirement is possible because with equal cost one is allowed to use as much quantity of water as he likes.

(c) Seepage losses should be avoided by lining of canals. This will avoid undue and injudicious use of water at the head of the canal system and will supply adequate water to the tailend. This will avoid

inequity in the distribution of canal water and will encourage proper utilisation of the irrigation potential.

(d) Dr. B. N. Mishra observes that "irrigation water can be reutilised by means of dugwells and shallow tubewells in the Ayacut area and also by pumping water from the lowest valley or patch of the area nearby crop fields back to the irrigation distribution system"[4].

(e) Response of the Farmers :— Response of the farmers to utilise the opportunities provided by irrigation is the major determinant of utilisation of irrigation. According to the estimate of Rath the poor intensity of cropping due to heavy dependence on Sarad rice which does not allow time for a second crop before the month of December, prevents proper utilisation of irrigation potential. Added to this the impact of the introduction of high yielding variety of paddy has become marginal in case of Orissa, only 2.5 percent of total paddy area is covered by the scheme and the produce constitutes only 5 percent of the total paddy cultivation. Similar has been our experience so far as the use of fertiliser is concerned. The poor response of farmers to the new challenges has become a major constraint on utilising the irrigation potential created.

(f) Monsoons and the Multipurpose Projects :— The canal water for the dryseason is not available due to the fact that the water in the reservoir canal fall below a certain minimum level for the generation of electricity. Many a time the canals are closed during the summer season for repair, construction and expansion and this also creates bottlenecks for effective utilisation of the irrigation potential created so far.

Medium-Irrigation :

Medium irrigation projects were emphasised to bring about an interdistrict balance in irrigation facilities. But official statistics point out that the interdistrict differences are glaring. The Table–II shows how Kalahandi, Koraput, Keonjhar, Sundargarh have not yet got atleast 10% of their gross cropped area irrigated where as Cuttack has got 34.62 percent of the gross cropped area irrigated. This imbalances in the level of irrigation also is one of the reason responsible for low utilisation of the irrigation potential created in the State.

Spill-over Irrigation Projects :

Priority should be given to complete the spill-over irrigation projects, so that we can create irrigation potential better in the State. But the spill-over projects also require more sanction of funds for completion

because of escalation of costs. This is a sort of vicious circle. If the initial costs of the projects are projected higher in real terms then there is the risk that it may be rejected. Therefore low estimates are initially drawn-up to sanction the scheme and after it is sanctioned it becomes spill-over schemes and suffer from incompletion. This sort of vicious circle hinder the proper utilisation of irrigation potential.

Minor Irrigation :—

Minor irrigation has got two aspects such as lift and flow irrigation. Lift Irrigation—Lift Irrigation schemes are implemented by the state owned Lift Irrigation Corporation. The State Govt. provides budgetary support in form of equity contribution and water rate subsidy. By the end of the fifth plan 2816 L. I. Projects were energised with irrigation potential of 61,640 hectares in Khariff and 36,990 in Rabi. The programme for the sixth five year plan is 54006 L. I. tubewells. The sixth plan outlay is 43 crores and the allocation for the first year is 5.80 crores.

The potential created by the lift irrigation sometimes remain unutilised because of the fact that the farmers have not become responsible to the alternative cropping pattern after the installation of the projects. The farmers should go for summer paddy and they must divert their land from less remunerative crops to more remunerative crops, i. e. from sugarcane to pulses. Studies of the lift irrigation projects indicate that it promises better B/C ratio if it is properly utilised and for this proper crop planning is necessary. Unless we adopt multiple crop planning we cannot get a better, B/C ratio[5].

Dug well

Since the advantages of flow irrigation is limited it is necessary to develop ground water potential in all those areas where flow irrigation is not possible. The programme for the sixth plan, is 60,000 dugwells, 3,000 shallow tube wells and 10,000 pump sets to be installed in the State and Rs. 5,00,000 are provided as subsidy.

A study was conducted by the Post-Graduate Department, Bank-Management, Cuttack to find out the cost benefit aspect of dugwell project financed by Angul Central Co-operative Bank in Dhenkanal district. The objective of the study was to find out the cost of dugwell and the benefit of the dugwell, and the causes of overdue and re-payment. The study showed that the average cost of constructing a small sized dugwell is Rs. 1730/- and a large sized dugwell is Rs. 2737/-. Actually

the loanee for dugwell received on an average rupees 1125 and rupees 2331/- for small sized and large sized well respectively. Therefore there is a credit gap which discourages the loanees to take loans. This credit gap can be minimised by not insisting on the 10 percent margin money and by subsidising the farmers from other sources like small and marginal farmers developing agencies.

TABLE—2

Percentage of Net-irrigation Potential and Rabi Irrigation Potential to Net-area sown and percentage of gross-irrigation Potential to Gross-Cropped Area by 1978-79.

Sl. No.	Name of Dist.	Percentage of net Irrigation Potential to net-area sown,	Percentage of Rabi Irrigation Potential to net-area sown	Percentage of Gross Irrigation Potential to gross cropped area.
1.	Balasore	44.44	19.30	54.78
2.	Balangir	62.96	27.36	76.80
3.	Cuttack	66.06	36.35	69.98
4.	Dhenkanal	23.81	8.97	27.65
5.	Ganjam	60.10	7.10	45.77
6.	Kalahandi	15.95	3.74	16.03
7.	Keonjhar	29.24	11.88	36.08
8.	Koraput	16.89	9.73	24.43
9.	Mayurbhanja	15.81	3.68	17.12
10.	Puri	62.54	30.70	62.51
11.	Phulbani	24.34	4.05	21.85
12.	Sambalpur	29.90	13.54	36.70
13.	Sundargarh	12.21	4.06	14.63
	Orissa	37.13	15.24	42.01

SOURCE—Irrigation data Orissa, 1974-75 published by Planning and Co-ordination Department, Government of Orissa.

So far as the benefits are concerned the net incremental returns per acre and per farm increased from Rs. 256/- to Rs. 358/- and Rs. 271/- to 475/- respectively after the dugwell scheme came into operation. 10% of the farmer got more than Rs. 500 increase in their net incremental return and 50% of the beneficiaries of dugwell got increases in the net incremental return below Rs. 200. This happened because out of 33 dugwells,

17 dugwells were declared as failed well having less than 5 feet deep water during the summer and as such these wells were not suitable for irrigation purposes. The irrigation facilities of large sized dugwell could not be properly utilised because of limited bailing power of the farmer during summer and installation of electric pump will go a long way to utilise these wells intensively.

The Auditor Generals report for 1975-76 on underutilisation of the irrigation potential of the new project in the States and on the revenue loses on their account reveals a most un-satisfactory state of affairs. For all public works taken together revenue receipts total to about rupees 65 crores as against rupees 278 crores of expenditure on revenue account. Thus irrigation cost exceeded irrigation revenue by about 330% in 1973-74 and the position today is no way different[6]. Added to this some economists advocate that a part of the resettlement cost of the displaced persons in the catchment area of the major and medium irrigation project shoule be borne by the beneficiaries. This clearly point out the urgent necessities of utilising the irrigation potential created to the maximum and with the increased income to over the losses on irrigation account.

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EFFECTS OF IRRIGATION : A CASE STUDY

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Irrigation development has been recognized as a major instrument of transforming a traditional, subsistence agriculture into a modern and expanding sector. Notable increases in agricultural productivity have been registered in areas served by irrigation facilities. Prof. Lakdawala[1] states that substantial expansion in irrigation resulted in a more than 5 percent compound growth rate per annum in Punjab, Haryana and Western U. P. and that it provided the stimulus to an appreciable increase in agricultural production in M. P., Rajasthan and Karnatak. Prof. Dantwalla[2] while analysing the variations in growth rate in different irrigated areas, finds positive correlation between the gross irrigated area and growth rate. Michel Cartillier[3] also finds out output augmenting capacity of irrigation-well irrigation in Tamilnadu.

This paper seeks to present the information which the author collected by interviewing a cross-section of villagers of Ramkrishnapur in February 1978 on the impact of canal irrigation on the economic life of the community. Ramkrishnapur is located at a distance of about 12 kms. from Bhadrak railway station. The village is connected by surfaced and then by Kachha roads. As one moves in the direction of the village, one finds lush green fields around him. The fields have more than ankle-deep water. One sees rows of bent figures of men, women and children busy in the transplantation of rice seedlings. A close look at the workers reveals that it comprises labourers of every class. At a distance in the adjoining fields, farmers/workers are spraying insecticides on the growing plants. Sprinkling of fertilizer also catches the eye. The area is canal irrigated. Water is regularly released into the canal from the Salandi Irrigation Project at Hadgarh. There were complaints, however, regarding the timely availability of water for the cultivation of the new strains. Misgivings were also entertained regarding the adequacy of the flow and quantum of water supplied to the fields. Notwithstanding these deficiencies, spectacular gains achieved in agricultural output by the early starters

in early seventies could spread the growth impulse to other cultivators to make a limited trial of the new varieties of Summar rice[4]. The enthusiasm was infectious and after a few years almost all farmers in the area joined the band-wagon. The flow of canal-water and the subsequent interaction of the farmers with the progressive farmers of other areas induced a process of growth enlarging the rural base for economic uplift of the village.

We attempt to identify, in what follows, the visible effects of irrigation in shifting the farm production function to a higher level generating in the process more income and better employment opportunities for people of the area. The discussion of the role of irrigation in the contemporary development of the village economy takes due note of parts played by other inputs, institutional infra-structure, motivation .etc., along with the irrigation system. Irrigation has been treated, however, as the key instrument to accomplish the economic change.

Land-ownership pattern :

The farming community of the village can be classified into four district socio-economic classes. Two such classes comprising the land-owning Brahmins, the third and fourth comprising land-owning Vaishyas and Kshatriyas and the landless scheduled class respectively. Of the 230 households in the village group 1 has 20, group 2–60, group 3–40, and group 4–110 households.

Table–I represents the number of households in different groups in respect of their ownership of agriculture holdings.

TABLE—I

Ownership Classification

Groups	No. of Households	Ownership of Agricultural Holdings	
I	20	Approximate	50%
II	60	–do–	20%
III	40	–do–	23%
IV	110	–do–	7%

The village economy is over-whelmingly agricultural. Paddy is the principal crop. produced both in the Karif and Rabi seasons. 90% of the work force in the village are employed in agricultural operations, the rest engaged in urban areas in various occupations.

Effects of Irrigation :

(a) Agricultural Production and Income :

The introduction of irrigation has led to considerable improvement in agriculture production and consequent expansion in rural income. The situation of assured water-supply has resulted in a change in the cropping intensity. Apart from the production of traditional varieties of rice in the Kharif season, cultivation of the high-yielding varieties has taken place, and in place of one-crop-once-a-year, one-crop-twice-a-year situation now obtains. The effects of the change in the cropping intensity can be analysed in terms of the growth in agricultural output and the resultant income-growth. When questioned about the size of their increased income, some of the farmers were rather evasive. According to one estimate a farmer may get around Rs. 1500/- per acre in case of HYV depending on their use of fertilisers, insecticides and improved seeds. In real terms, one acre of land may yield 15 quintals of paddy. The yield-rate, however, varies from farm to farm, depending on their location, availability of inputs and the timely action of the farmer in transplanting the seedlings.

There was no consensus as to the cost of cultivation of HYV per acre. According to the local estimates the average cost of cultivation including wage-labour was around Rs. 900/- in 1976-77. The important items in the cost-structure of the production of HYV were (i) expenditure on fertilisers and chemicals, (ii) purchase of insecticides and (iii) payment of wages. The cost of cultivation as given by the farmers seems to be reasonable and roughly approximates the cost estimates made by Dr. B. Misra and others[5].

Cultivation of the HYV in the seventies after the irrigation facilities were provided and the resultant rise in total output is a distinct gain for the farmers in the area, compared to the pre-irrigation days, when only the traditional varieties of rice could be raised.

(b) Effects in Employment :

In pre-irrigation days, the agricultural labourers, small and marginal farmers used to migrate to the district/sub-divisional headquarters, very often to Calcutta in search of jobs after the harvesting and threshing operations were over. Even some of the workers who had permanent jobs as farm workers had to sit idle for days together. After water flowed in the canal, an important influence has been felt on the employment situation in the village.

The seasonal migration to the cities for jobs has been reduced. The man-days of employment per worker in the village has increased from around 230 days in pre-irrigation phase to 330 days currently[6]. Ploughing of agricultural fields, preparation of the seed-bed, transplantation and harvesting operations are done by hand. The labour-intensiveness of the HYV, particularly in the preparation and maintenance of field channels, spraying of insecticides, application of fertilisers and weeding operations has had a positive effect on the demand for labour. The demand for labour also originates from another source. Small and marginal farmers have taken to the cultivation of the HYV. Some of the landless workers and marginal farmers have leased in land for share-cropping. It is found that some peasants from not-too-distant villages with no-irrigation facilities have moved into the village for cultivating their relations' land. They bring their bullocks, but employ the local labour for conducting different operations. Thus agricultural labour is very much sought after and it is now beyond the capacity of the local labour to meet the situation.

Migration of Santhals, Kandhas belonging to the scheduled tribes to the village is a new phenomenon. Throughout the year groups of migratory labour move into the area. There has been a marked increase in the number of agricultural workers.

Along with an extension in the scope for higher mandays of employment, there has been a noticeable rise in the wage rate of agricultural labourers. In 1975–76, when cultivation of the HYV in the area gathered momentum, the wage rate varied between Rs. 2.50, Rs. 3.00 per day. In 1977-78, the wage rate has gone up by one rupee, i. e., from Rs. 2.50, Rs. 3.00 to Rs. 3.50 & Rs. 4.00. Sometimes in the peak period, the wage rate goes upto Rs. 4-50. It will, however, be premature to say that the agricultural workers are now much better off. An analysis of the price deflated wage rate may throw light on the debate. Reference may be made here to the study made by Pranab Bardhan in 1970[7] and the recent disclosures made by the Bureau of Statistics of Economics, Government of Orissa, that 85 percent of the people in rural Orissa are below the poverty line. The situation of poverty of the workers in the village may be marginally different to-day than what it was in the early seventies.

(c) *Other benefits* :

The indirect benefits for the village following irrigation are more pronounced. Construction of the canal has provided the village with a permanent, all-weather link road. The canal bank (one side only) is well–

maintained and is used by the people to move to the nearby towns on feet, by-cycles and motor cycles. The mobility of the farmers and farm workers has increased. Frequent trips to the town has led to close inter-action between the town-people and the villagers, between the progressive farmers and the urban elite and among the villagers of different regions. This influences the farmers' responsiveness and promotes his ability to respond to new challenges and opportunities in agriculture.

A second development has been the establishment of two rice-hullers in 1977 and 1978 enlarging the scope for subsidiary occupations. These have added a commercial touch to the economic scene of the village.

Who has benefitted from irrigation ?

The group-wise break-up the ownership pattern (Table–I) shows the overwhelming importance of group 1 comprising 20 households and owning approximately 50 percent of the agricultural holdings. On the other hand the most densely populated unit the scheduled caste sector-comprising 110 householders own only 7 percent of the holdings. This sector is the life-tine of the entire village since it provides labour throughout the year. Group II and III can be assigned an intermediary position in the village hie archical pattern. The agrarian relations prevailing in the village are based on the unequal distribution of land ownership. Disintegration of the old land-based relation is not in sight. A few of the scheduled caste landless farmers were given some plots of land by the Government to be used as agricultural holdings, but the existing ownership of land was left untouched.

The construction of the canal irrigation system-given the unequal ownership in landholdings and consequent production relation has conferred maximum benefits on the land-owning class, particularly the households belonging to the uppermost group. Four households owning more than 40 percent of the land holdings owned by the farmers in Group I, exhibit tendencies of capitalist farmers, using improved plough, employing hired labour and disposing of their produce in the market, after the harvest. On the 20 households in group I, two households have modern transport-taxis plying in the nearby towns since 1976, ten households have by-cycles acquired after 1970, and each household has a transistor set and at least one wrist-watch. Incidentally, some of the households have members serving in government offices and other organisations. The prosperity of this class of farmers can, to some extent, be ascribed to the flow of external income. On enquiry, it was revealed that all of them have taken

loans from more than one source; *viz*, village primary cooperative credit society and the commercial bank. Even to-day, they lionise the major share in the distribution of inputs by the village panchayat. An important socio-economic feature of this group is their accessibility to different occupations-trade, transport and government jobs.

The peasantry in Group II and III, consisting mostly of the small and marginal farmers have been fairy benefitted, both in terms of employment and income, as most of them had to sit idle or had to sell their services outside for a wage to supplement their family income in pre-irrigation days. Though they have taken up the cultivation of the HYV, they have remained largely traditional. Their production is mostly for family consumption. Many of them employed wage-labour since they have started sending their boys beyond the wage group of 15 to school. Two boys from group II are matriculates and doing their college studies. On enquiry, their parents revealed that they financed their education out of the income from agricultural pursuits. Unfortunately, out of the 100 households, in Group II and III, not a single man owns a job either in the government office or in any other organisation, though some of them still migrate to Calcutta.

Two distinct developments can be noted in respect of these groups :

(i) There is a growing propensity among the small farmers to buy new agricultural lands whenever these are offered for sale. And some of them have bought up the agricultural holdings of their neighbours.

(ii) The small farmers who used to borrow funds-money and paddy-to meet their consumption needs have discontinued the practice. On the other hand, a few of them have started lending with great zeal and aggressiveness.

The landless agricultural workers, belonging particularly to the scheduled castes, concentrated in group IV constitute a sizeable proportion of the total population in the village. They also represent a reserve pool of labour to be drawn upon whenever need arises. Some of the households in group IV have agricultural land holdings, which vary between 0.5 acre to 1 acre.

About 80 percent of the male workers have permanent jobs (terminable by either side by serving 15 days / 30 days notice) in the agricultural households in group I, II and III. The rest are engaged as daily or casual workers. Women, boys and girls from this group are also available for

employment. Not a single boy has read upto class X nor a single adult has a job in the government.

The agricultural workers have benefitted by the increased man-days of employment as well as a rise in the wage-rate. The wage-rate varies between Rs. 3-50 to Rs. 4/- a day. But after allowances are made for the rise in the cost of grains (his principal purchase) pulses, edible oil, kerosene and biddies, there is no doubt that his real income has increased only marginally. And if one accounts for the high rates at which the agricultural workers buy their requirements from the petty tradesman in the village, the increase in the wage rate is illusory. The gains of the agricultural workers, vis-a-vis the gains achieved by the land-owning classes, particularly in group I, subsequent to the opening of the canal appear to have declined. Though there has been an additional source of income for the landless poor, the distribution of income has been biased in favour of the land-owning elite.

As assessment of the earnings of the different class groups leads to the following propositions :

1. There has been considerable expansions in the incomes of the land-owning elite.
2. The small and some of the marginal farmers have benefitted.
3. There has been no substantial improvement in the living conditions of the landless poor, though man-days of employment has expanded.
4. The dualism in rural class structure is manifest. Group I comprising the educated, urban oriented land-owning class forges ahead. They are infected with modernisation ideology. And the impetus to further modernisation will be strengthened so long as they take advantage of the new technology in agriculture. They may be joined by some of the young enterprising farmers from Group II and III with the passage of time.
5. Group IV remains a subsistence sector earning just enough to maintain itself. They are still illiterate and tradition-bound, though trends of modernity can be discerned among some of them.

The inescapable conclusion one comes to is that irrigation, unaccompanied by changes in the structure of agrarian property relations, does not promote the welfare of the entire rural population, it tends to, on the contrary, to accentuate the extent skewed income distribution pattern in the rural sector.

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6. *All the man-days-230 days in pre-irrigation and 330 days in post Irrigation period-are not necessarily used for the agricultural operations only, rather they are utilized in multi-faceted activities.*
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DEVELOPMENT OF IRRIGATION IN ORISSA

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Summary :

It is said that among the material inputs irrigation bears the highest cerrelation with productivity. Orissa is primarily an agricultural state. 92% of her population live in villages, about 77% of her working force depend on agriculture and even in 1971-72, 56% of the State's income was derived from agriculture. Per capita income in Orissa at current prices was Rs. 216.5 in 1960-61 as against the all-India average of Rs. 305.6. In 1975-76 (quick estimates) per capita income of Orissa at current prices was Rs. 785/- as against the all India average of Rs. 1005/-. These facts go to show the relative backwardness of Orissa. In order to remove the backwardness of the State, all-out effort should be made for developing agriculture which in its turn depends mostly on the development of irrigation as this helps diversification of cropping pattern, increase in cropping intensity and increased use of H. Y. V. seeds and fertilizers. The progress in irrigation facilities which we witness today has been possible due to massive investments made by the Government in different types of irrigation projects. These investments have not yielded sufficient returns to meet the working expenses and interest charges. Net loss in respect of irrigation works was Rs. 30 75 lakhs in 1956-57, 1.60 lakhs in 1960-61 and 501.75 lakhs in 1973-74. In spite of this the Government has to on invest more and more on irrigation. Simultaneously it should see that the created potential is fully utilised because increase in production and productivity depends not on the "irrigable area" but on the actual "irrigated area."

ORISSA'S SHARE IN INTER-REGIONAL TRADE

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Introduction :

With the modernisation of India's economy, trade, as a tertiary sector activity, is gaining momentum thanks to the rapid development of communication and transport system. There are mainly two factors which have influenced the volume and value of inter-State trade in India, namely; i) Spatial distribution of resource-endowments, ii) Concentration of industrial locations in certain nodal growth centres. The first factor determines the volume and pattern of outward trade in industrial inputs and raw materials, whereas on the second factor depends the outward trade of industrial outputs, in the form of both finished products as well as intermediate goods. Besides these two, another aspect which has emerged as an important factor in recent years relates to demand for basic wage-goods, such as, food-grains and other essential consumption goods in centres of large labour concentrations. States with large agricultural surpluses have become major exporting States on account of this factor.

2. In an analysis of the characteristics of inter-regional/inter-state trade, the following aspects are important, namely;

i) Volume of Trade
ii) Composition of trade consignments
iii) Direction of trade, and
iv) Balance of trade.

Utilising the available statistics on inward and outward trade in India, an attempt has been made in this paper to obtain some salient features of Orissa's recent trading activities.

3. Volume of Trade :

3. 1 Unlike the national economy, a State's economy has open borders, and hence the flow of import (inward) and export (outward) trade outside the registered transport channels are not easily subject to measurement. Out of the three major channels of trade-flow, namely; rail-borne trade, water-borne trade and trade through road transport, statistics relating to trade through road transport are not yet available, even though with the construction of a net work of National Highways, it has become a major

channel of inter-state trade. Data on goods traffic passing through railways or ports are available from the 'Statistics of the Rail and River-borne Trade of India—(Inward and outward Trade consignments by Trade blocks)' compiled by Department of Commercial Intelligence and Statistics, Ministry of Commerce, Government of India. For purpose of this publication, each State is treated as a trade-block. However, maritime States with major ports have been split into two trade-blocks, the ports constituting one trade-block and the rest of the State constituting another trade-block; but it still treats Orissa as one trade-block. The latest data available relate to the year 1974-75. Trade through ari-transport being very meagre in volume has not been taken into account.

3.2. Based on these data, and supplemented by Statistics available from other sources, an estimate has been built up on the volume of trade in recent years.

3.3. The volume of rail and river-borne trade in India, by major commodities, as released by the Department of Commercial Intelligence and Statistics shows that the volume of trade in India during the one and half decade since 1960-61 to 1974-75 has increased from 581.6 lakhs M. T. to 737.3 lakhs M. T. This covers 13 major commodities, namely; (a) Cement; (b) Coal and coke; (c) Grain, pulses and flour; (d) Iron and Steel; (e) Lime and lime stone; (f) Manganese ore; (g) Oil cake; (h) Kerosene oil; (i) Vegetable oil; (j) Oil seeds; (k) Salt; (l) Sugar and (m) Woods & timber. The volume of trade of these commodities compiled on export basis has moved in the following order during this period.

TABLE—I

Volume of Rail and River-borne trade in India.

Year	Commodities (Quantity in lakh M. T.)*	Index No.
1960–61	581.6	100
1965–66	677.9	116
1970–71	740.9	127
1971–72	750.4	129
1972–73	755.9	130
1973–74	686.4	118
1974–75	737.3	126

NOTE : (*) The quantity of trade is on Export basis.

This shows that during the period from 1960-61 to 1972-73, there has been a consistently rising trend and the trade consignments gained by 30%, whereas in 1973-74 there has been a drastic fall, which inspite of considerable recovery to the tune of 7.4 percent during 1974-75, still fell short of 1970-71 level.

4. The fluctuations in the volume of trade does not however reflect the trend of output in agricultural and industrial productions in India. The index of agricultural and industrial productions in India showed the following picture.

TABLE—II

Index of commodity output in India.

Year	Index
1960-61	100
1965-66	103
1970-71	133
1971-72	131
1972-73	125
1973-74	136
1974-75	132

From the above two series of indices an inverse relationship is discernible for certain years. For example, in the year 1972-73, when the agricultural and industrial productions in India showed a down-ward shift, the trade-index showed an upward shift. Again in 1973-74, when output index was high, trade-index was low. One possible reason for this may be that current year's output perhaps influences next year's trade and not necessarily the same year's trade. A time-lag between the volume of output and the volume of trade certainly exists and this has to be recognised. However, without time-series data over a long period, it would be too hasty to draw any inference conclusively.

5. Orissa's Volume of Trade :

During the five years from 1970-71 to 1974-75, for which data are available, the average annual volume of export trade of Orissa (rail and river-borne) was about 35.1 lakhs M. T. and the import trade was 38.9 lakhs M. T. The year-wise movement of trade by railways of Orissa was of the following order.

TABLE—III

Rail-borne Trade of Orissa. (Lakhs M. T.)

Year	Export (outward)	Import (inward)
1970-71	37.1	36.7
1971-72	32.3	36.7
1972-73	35.7	41.5
1973-74	34.4	38.9
1974-75	36.0	40.5
Average-	35.1	38.9

6. While the Rail–borne trade constitutes the most important trade-route for Orissa, the statistics released by the Department of Commercial Intelligence & Statistics, Government of India, does not cover the trade consignments passing through the newly developing Paradeep Port of Orissa. However the importance of Paradeep Port could be seen from the fact that the exports through Paradeep Port which was nearly half the level of total rail-borne trade of Orissa in 1970-71, has shot up to near-parity level in 1976-77. Import trade through Paradeep Port is, of course, nominal. Taking into account the commodity traffic through Paradeep Port for which figures are available, and assuming that the road-traffic in import and export trade is estimated at 20% of the rail-borne trade, a complete picture of the export and import trade of Orissa could be built-up, which is given in the following table.

TABLE—4

Export & Import Trade of Orissa. (Lakhs M. T.)

Year	Exports				Imports			
	Rail borne	Port	Road@ 20% R. B. Trade	Total	Rail-borne	Port	Road@ 20% of R B Trade	Total
1970-71	37.1	16.8	7.4	61.3	36.7	—	7.3	44.0
1971-72	32.3	18.8	6.5	57.6	36.7	—	7.3	44.0
1972-73	35.7	19.8	7.1	62.6	41.5	—	8.3	49.8
1973-74	34.4	19.8	6.9	61.1	38.9	—	7.8	46.7
1974-75	36.0	23.4	7.2	66.6	40.5	—	8.1	48.6
1976-77	36.0	31.5	7.2	74.7	40.5	1.4	8.1	50.0
1977-78	36.0	26.5	7.2	69.7	40.5	0.8	8.1	49.4

7. Composition of trade consignments in India :

The composition of inter-state trade consignments shows that certain items have acquired very high degree of weightage, the first-two in order of importance being 'coal and coke', and 'grain and pulses'. These two commodities taken together account for 60% of India's rail-borne export trade, out of which coal and coke alone accounts for 44% and grain and pulses 16%. The other principal commodities entering into trade consignments are Iron and Steel, Cement, and Salt. Iron and Steel accounts for 11%, while the volume of trade in Cement and Salt come to 9% and 3% respectively. These figures are in terms of volume only, and one has to note that in terms of value the relative picture may change appreciably. Unfortunately, value figures of rail-borne trade are not available. However the pattern of trade that emerges out of the above picture clearly proves that India's trade basically centres round trading in primary products, namely; minerals and food-grains. There is still a long way off for 'manufacturers' to go for acquiring a respectable position in India's trade consignments.

8. Composition of Trade of Orissa :

Unlike at the all-India level, where primary products and agricultural goods dominate the composition of inter-state trade, in Orissa export of industrial manufacturers has acquired a leading place in the rail-borne trade, while export of minerals, namely: Iron-ore and chromite through Paradeep Port constitutes most important trade composition of sea-borne trade. The first five commodities entering into the export trade of Orissa are, Iron-ore (22-23 lakh M. T.), Lime and Limestone (10-11 lakh M. T.) Iron and Steel (9-10 lakh M. T.), Coal and coke (5-6 lakh M. T.), and Cement (3-4 lakh M. T.). In the import trade, the more important items consist of (i) Coal and coke (27-28 lakh M. T.), (ii) Lime and Lime stone (3-4 lakh M. T.), (iii) Wheat (2-3 lakh M. T.), (iv) Iron and Steel (2 lakh M. T.) and (v) Salt (1-2 lakh M. T.).

8.1. In the Sixties, in the wake of green revolution, export of rice was one of the major items of Orissa's exports but in the Seventies this has been reduced to a position of relative unimportance, so much so that in certain years, such as 1974–75 we have imported (1.4 lakh M. T.) more rice than we have exported (0.7 lakh M. T.). This reversal in the trend has occurred due to mainly two factors, namely, the rice-importing States, specially West Bengal has substantially increased its rice production from 60 lakh M. T. in the Sixties to 112 lakh M. T. of rice in late Seventies, and secondly, Orissa's rice production is nearly stagnant around 42-43 lakh tonnes in a good crop year, while the internal consumption is increasing.

9. Direction of Rail-borne trade :

9.1. *Export trade* : Direction of trade is to be studied through 'Origin and Destination' survey. In the absence of such data, we may have some broad ideas from data on Inter-state rail-borne trade. The capacity of a State for increasing its exports being dependent on its resource endowments and agricultural surpluses, it is found that in respect of outward trade, Bihar, Madhya Pradesh, West Bengal, Andhra Pradesh, Orissa and Punjab are important in that order. In 1974-75 they accounted for 76 percent of the total outward inter-state rail-borne trade. Between 1970-71 and 1974-75, the exports from major exporting States by rail-borne outward trade were of the following order.

TABLE—V

Share of outward Trade

States	1970–71		1972–73		1974–75	
	Volume of outward (in lakh M. T.)	% to total all India exports by Railways	Volume (lakh M. T)	% to total all India exports by Railways	Volume (lakh M. T.)	% of total all India exports by Railways
Bihar	193.9	25.1	190.1	26.6	185.7	23.9
M. P.	106.7	13 7	97.8	12 3	124 1	16.2
West Bengal	121 8	16.9	126.4	15.9	113 6	14 9
A. P.	36.2	4.9	33.9	4.2	38 7	5.2
Orissa	37.1	5.3	35.7	4 5	36 0	4.7
Punjab	29.5	4.1	48 4	6.1	34.3	4.4

9.2. The above outward trade figures reveal that Orissa which occupied the fourth highest place in volume of outward rail-borne trade among the States in India in 1970-71, has come down to the fifth place in 1974-75 and due to paucity of railway mileage there is not much prospect of substantial increase in rail-borne exports-trade of Orissa, unless railway links improve.

9.3. *Import Trade* : From the point of view of inward rail-borne trade, in 1970-71, over 60 percent of trade was shared by West Bengal, U. P., Maharashtra, Gujrat, M P., Bihar and Orissa in order of importance, where as the share increased to 63% in 1971-72 and 1972-73, but fell to 62% in 1973-74 and 61% in 1974-75. The following table shows the year-wise position of major importing States.

TABLE—VI

Inward Rail-borne Trade of Major importing States in India, 1970-71 to 1974-75.

(Percentage share in Inter-state Inward Trade) (Volume in lakh M. T.)

Sl. No.	States	1970-71 Volume	1970-71 %	1972-73 Volume	1972-73 %	1974-75 Volume	1974-75%
1.	West Bengal	123.5	15.9	119.3	15.0	107.9	14.1
2.	U. P.	97.7	12.5	94.7	12.5	87.3	11.4
3.	Maharastra	68.3	8.8	79.9	10.0	71.0	9.3
4.	Gujarat	48.2	6.2	57.7	7.2	61.8	8.1
5.	M. P.	50.4	6.4	54.2	6.8	50.4	6.5
6.	Bihar	55.6	7.1	53 8	6.7	49.8	6.4
7.	Orissa	36.7	4.6	41.8	5.2	40.5	5.2

10. Balance of Trade :

Certain important conclusions regarding balance of trade of Orissa could be drawn from the data in Table—4.

i) In terms of balance of trade, Orissa has become a net-exporting state, the export surplus over imports varying from 30% in 1971-72 to 49% in 1976-77.

ii) Though rail-borne trade of Orissa shows that Orissa is not an export-surplus State, but a net importing State, with the opening of Paradeep Port, where the direction of trade is almost exclusively export-oriented, Orissa has emerged to have a comfortable surplus in trade balance.

iii) As import trade through Paradeep Port is of recent origin, and has not yet developed, in the long-run when the Port is fully developed, the picture may change. Nevertheless, the contribution of Paradeep Port in turning Orissa from a net-importing State to an export-surplus State is not likely to be altered, as much of the imports through Paradeep Port may be meant for re-exports to other States.

11. Contribution of Trading sector to National and State Income :

In our National Income estimates, Trading sector contributes 10 to 12% of India's National Income. In the State Domestic Product of Orissa, income originating in the Trade-sector is around 5%. From 1970-71 to 1974-75, its share was slighty above 5%. but from 1975-76 it has varied between 4.9% to 4.7%. As this contribution is derived both from whole-sale and retail trade sub-sectors, and assuming that in the inter-state trade

only a part of the wholesale trade comes to picture, it is obvious that contribution of Orissa's trade with other regions of India accounts for much less than 5% of State income.

12. The Basic Malady :

12. 1 The existing price policy is the basic malady in Orissa's export trade.

12. 2 The price policy in regard to major items of Orissa's exports namely iron-ore, iron & steel and cement are not determined by the State Government nor by the forces of demand and supply. As a result, Orissa as a producer State does not get a competitive price for its exports.

12. 3 Secondly, the freight-equalisation policy pursued by Government of India in regard to certain basic manufactures like, Iron, Steel, Cement etc. which envisages that ex-factory cost, plus excise duties, plus the transport cost per M. T. of certain basic manufactures shall be nearly equal any where in India, deprives the steel and cement producing State from having a natural differential advantage over non-producing States. But there is no freight equalisation policy applied in case of cotton or textile goods or oil or oil seeds or petrol or petroleum products etc., as a result the value of exports relative to value of imports suffer from a policy of discrimination.

12. 4 Thirdly, the subsidy policy adopted by Government of India together with the bonus on procurement of food-grains are more favourable to wheat-growing States than rice-growing States. As a result the procurement price of paddy is always lower than that of wheat. This has affected incentive for producing agricultural surpluses in rice zone.

12. 5 To remedy some of these maladies a firm policy and its vigorous implementation are needed in the following direction.

1). Export quota in strategic items of exports should be fixed up in the State's Sixth Plan with a view to achieving at-least 10 percent of Orissa's State Income from value-added by export-sector.

2) Export varieties should change from low-value minerals or raw materials to high-value finished products.

3) State should have a greater say in the matter of fixation of price policy of goods entering into inter-state trade.

4) Orissa needs to produce sizeable agricultural surpluses, for boosting up its exports.

5) Self sufficiency in production of cereals like wheat, pulses and oil-seeds will go a long way in reducing the dependence on imports.

ORISSA'S EXTERNAL TRADE- PROBLEMS AND PROSPECTS

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Recorded history of Orissa and the socio-religious traditions and customs of the people amply prove that Orissa had a flourishing coastal and everseas trade with other maritime areas of the country as well as with the countries of far east *e. g.*, Java, Sumatra, Bali and Malayasia. In ancient time Orissa had many major and prosperous sea ports, beginning from Tamralipti in the north to Kalinganagar in the south, such as Palur, Dantapura, Kalinganagar, Charitra etc. Of these ports Palur was the most famous and active so far as voyages to Malayasia was concerned. Palur had been a prosperous port till the advent of the Portugeese in the Indian ocean in the 15th century[1]. Ancient Kalinga had not only a prosperous sea-borne trade but also "the people of Kalinga were the pioneers of Indian colonization in further India and the Indian Archipelago"[2]. In the back ground of such a prosperous trade in the remote past, the objective of this paper is to study the potentialities of Orissa for development of trade with other states in India as well as with other countries of the world and to analyse the role of the development of communications and ports in the growth of her trade.

Advent of Britishers and the decline of trade :

Orissa had a prosperous trade during the Mughal rule, even till the advent of the Europeans in the field of trade in India. The Portugeeses were the first Europeans to establish trade centre in Orissa in 1514. They established their settlement at Pipli, which was a natural harbour situated at a distance of 4 miles from the mouth of Subarnarekha in the district of Balasore[3]. Pipli remained as a trading centre till the beginning of the 18th century. When the Dutch and the English traders came for trade during the early part of the seventeenth century, they also found prosperous trade centres at Pipli (Balasore), Hariharpur and Balasore. The English traders of the East India Company, who established their factory and trade centre at Balasore in 1633, continued their activities till 1688.

Large ships of the Company used to call at Balasore port regularly. Main-exports from Orissa were textile products, saltpetre and turmeric.[4] The English people left Balasore as they had a hitch with the local Mughal Governor.

In the meantime the Mughal Emperor granted the English traders the right to trade freely in Bengal without payment of customs. They were encouraged "to settle down at Sutanati and founded Calcutta, which consequently affected adversely the prosperity of the port of Balasore"[5].

The decline of trade in Orissa can be attributed to the advent of the English traders and the establishment of British rule in India. Due to historical reasons they established and developed their trade centre in Calcutta., Orissa was among the regions in the country which was subjugated by the Britishers at a later date. Orissa came under British occupation in 1803 only. Prior to that the English traders had established their trade and administrative centres in Calcutta, Madras and elsewhere. The port of Calcutta had developed. A network of roads, railways and waterways were developed in Bengal mainly to connect the Calcutta port with its hinterland. The flourishing ports and trade centres in Orissa declined in importance and some disappeared altogether.

Ports like Balasore and Chandbali carried on coastal trade with Calcutta for some time, and later Balasore faced extinction. Puri was a flourishing port in the thirties of the present century and vied with Vishakhapatanam in the volume of its traffic[6]. It is now defunct. The same is the fate with Gopalpur. Cuttack which used to be one of the greatest inland water ports of the country till the close of the nineteenth century, serves a very limited purpose now[7].

There has been very little development of railways in Orissa. The only railway line across the Orisss coast was constructed by the Britishers mainly for strategic and administrative reasons, just to connect their settlements in Calcutta and Madras. It was not meant to develop communications and trade inside Orissa. Neither there was any development of road communication nor any improvement of water ways. The Jagannath Road, which was the only interprovincial road, did not provide continuous link, as the same was disconnected due to the existence of major rivers. A few canals *e. g.*, the High Level canal and the coast canal, which were constructed during the early part of the British rule and were used for navigation pursoses, were also neglected. Major portions of the Canals were abandoned due to lack of repairs and improvement.

Value and Direction of Orissa's Trade :

Orissa has trade relationship mostly with its neighbouring States e. g, Andhra Pradesh, Bihar, Madhaya Pradesh and West Bengal. She has also limited trade transactions with some other states like Tamilnadu, Karnataka, Uttar Pradesh and Kerala. No estimate seems to have been made regarding the volume and direction of Orissa's trade with other countries of the world. However, a survey made in 1969-70 shows the value and direction of trade of Orissa with other States in India, though no estimate has been made in the survey regarding the composition of such trade. West Bengal is the greatest trade partner of Orissa and Madhya Pradesh comes next.

The over all picture of trade given in Table I below reveals an adverse balance of trade for Orissa to the extent of more than Rs. 1100/- crores.

TABLE—I

Imports and exports of Orissa from and to other States in India.

States	Imports		Exports		Total Value of Trade transaction in Lakhs of Rupees
	Value in Lakhs of Rupees	Percentage	Value in Lakhs of Rupees	Percentage	
Andhra Pradesh	1842 45	10 96	1570.58	10.02	3413.03
Bihar	2361.80	14.04	2352.47	15.01	4714.27
Kerala	—	—	157.31	1.01	157.31
Madhya Pradesh	4204.31	25.00	3920.12	25.02	8125.13
Tamilnadu	1009 02	6 00	893.58	5.70	1902.60
Karnataka	168.16	1.00	—	—	168.16
Uttar Pradesh	504.50	3.00	470.51	3.00	975-01
West Bengal	6726.84	40.00	6305 02	40.24	13031.86
Total	16817.08	100.00	15670.29	100.00	32487.37

SOURCE : Distributive Trade in Orissa 1969-70, Table No —20 and 21 pp. 108-111. Bureau of Statistics and Economics, Govt. of Orissa.

Favourable condition for the growth of trade :

Growth of trade in an area depends on various factors. First of all there must be sufficient quantity of merchandise to be trade with. There should be large volumes of materials in raw or finished and semi-finished form to be exported outside. Similarly the area must provide a good market

for the commodities to be imported from outside. Secondly there should be direct and indirect encouragement and patronisation on the part of Government for development of trade.

There should of course be banking and financial facilities to facilitate trade. But the most important factors for the growth of trade are the development of communication and port facilities. Orissa's past glory in trade, commerce and colonization were due to its improved communications and the existence of the flourishing ports on its coast. The ports disappeared; the communication and transport systems were not modernised in keeping with the scientific and technological changes of modern times. As a result, the trade in Orissa, both internal and external, suffered a setback, leaving the State and its people poorer and underdeveloped compared to other States in the country.

Potentialities for the growth of trade in Orissa.

Orissa is endowed with vast amount of natural resources and as such she has great potentialities of trade.

Agricultural potentials :

The agricultural potentialities consist mainly of paddy, rice, raw jute, oil seeds and cashew nuts. Most of the produce are exported outside Orissa in raw form. Value and volume of trade are likely to increase if the agricultural produce are processed. The jute factory being constructed by the I. D. C. at Dhan-mandal will surely augment the export of our jute goods. Besides, there have been suggestions for establishing a few solvant extraction plants for extraction of oil from rice bran with utimate capacity of 2,18,000 tons. per annum The Indian Institute of Foreign Trade have also recommended the establishment of modern mechanised cashew processing plants. About 38,000 acres of area now under plantation mostly in the Puri and Ganjam districts, could be increased. There is scope for establishing a few cashew processing units at Puri, Chhatrapur and Khurda.[9] Similarly the extensive cultivation of ground-nut in Cuttack and Dhenkanal districts can be utilised for producing vegetable oil. There is scope for establishing fruit processing and conning plants in Koraput district.

Forest Potentials :

About 40% of the State's area is covered with forests rich in comercially valuable wood species, e. g., bamboos, Sal seed, Kendu leaves, and

the minor forest produce like Sabai grass, lac, hill brooms and mulberry etc. There is great demand for sal seed oil in Japan and the scope can be exploited by establishing a few more sal seed oil extraction units besides the one at Rairangpur.[10]

Mulberry plantation can also be increased and the possiilities of exporting mulberry silk to the U. S, A., Japan and West European countries can be exploited,[11]

Besides meeting the demands inside Orissa and the other States in India, Kendu leaves offer great scope for export to Ceylon, Bangladesh and Pakistan.

Mineral Potentials :

Mineral resources of Orissa offer the greatest potentialities of trade, both internal and external. We have rich deposits of iron, chromite, manganese ores, graphite and china clay, which are in great demand both inside the country and in the world market. The value of exports will further increase if the minerals are processed and converted into metallurgicals products; e. g, sponge iron, pig iron, ferro-chrome, ferro-silicon and ferro-va nadium etc. The demand is also likely to increase, There are suggestions for establishing a mini steel plant at Bonai, Nayagarh or Paradeep, a ferro-manganese plant, a ferro-vanadium plant at Rairangpur, nickle plant at Sukinda, besides providing additional capacity in the existing ferro-chrome plant at Jajpur Road and the Kalinga Iron Works at Barbil.[12] Steps should also be taken to apply modern technology in mining to improve the quality of ore so that demand in foreign market will increase.

Orissa has also the potentialities of exploiting the demand for engineering goods; e. g, cast iron products, steel pipes, steel furniture, wires and cables, transmission line towers in the world market.

Marine potentials :

Orissa has a traditional trade in marine fish with Calcutta. A major portion of quality fish caught from the sea and the Chilika lake is either sold in Calcutta market or exported outside.

The enormous possibilities that exist in fisheries and the processing industries associated with it have been exploited only marginally. Orissa is backward compared to the states of Kerala, Andhra Pradesh and Tamil-nadu in respect of catch of fish per square mile. The per capita production of marine fish in Orissa is the lowest in India. According to an estimate the potentialities of the indigenous fishing zone, which is commercially

very important, can lead to at least 30 tonnes of catch per square miles as against 8 tonnes at present[13]. There are also possibilities of increasing the landing of fish from the deeper zones of the sea by using mechanised trawlers and modern technology.

Processed frozen prawns, frog legs, eyster meat and crab meat have a very great demand in overseas market. This possibility can be exploited by improving the capacity of the existing freezing factories and establishing new ones.

Handloom and Handicrafts :

Mulberry and tassar silk fabrics, cotton handloom fabrics, applique works, silver filigree and traditional jewellery, wood and stone carvings and the horn products of Orissa have a wide demand both inside and outside the country.

Development of communications is imperative :

The feregoing discussion shows that there are potentialities of expanding the trade of Orissa with the rest of the country as well as with other countries of the world. Assuming that the potentialities are exploited to the optimum level, trade is not expected to develop unless there are developments of communications and port facilities.

Development of communications and the exploitation of reseurces should go together. Otherwise either the communication facilities would remain under-utilised or the marketing of the produce will pose a problem. Construction of Paradeep port, building of the Express Highway and the exploitation of the mineral resources of Daitary–Gandha-mardan complex were done simultatnously to avoid lopsided and unbalanced growth.

Railways—In view of the high propulsion charges due to the continuous rise in the prices of petrol, oil and lubricants, transporting of goods by road has become very costly. Railways will continue to be the greatest carrier of goods both for internal and international trade. As has been stated earlier the growth of railways in Orissa has been sporadic and inadequate. Only the coastal areas and the fringes of the State have been touched by railways the interior districts, which are rich in mineral and forest resources do not have an opening through railways either to the coastal Orissa or to the trade centres of the neighbouring States. There have been suggestions and demand from different quarters in Orissa for opening these areas to the market. Various expert committees have recommended for the same. The ICAER, have recommended direct railway

link between Bansapani and Paradeep through Nayagarh, Gandhamardan, Tomka, Daitary and Jakhapura for better exploitation and low-cost transportation of the mineral resources of Badjmada-Bansapani areas and the Daitary-Gandhamardan complex. Direct link from Sambalpur to Talcher will ease the movement of general cargo to and from Paradeep and relieve congestion on Jharsugada-Rourkela-Calcutta route.[14] The interior areas of Phulbani and Kalahandi should also have railway connection. The two narrow gauge railway lines in Orissa, i. e, Rupsa-Bangiriposi and Naupada Gunupur lines serve a very limited purpose now.

The lines should be extended and converted into broad gauge. Rupsa-Bangiriposi line can be linked with Tatanagar by joining the orissing link between Bangiriposi and Gorumahisani. Gunupur may also have a connection with the Titlagarh-Vizianagaram line.

The traditional considerations of traffic should not weigh heavily in matters of laying new railway lines widening the existing narrow ones in case of an underdeveloped but potentially rich state like Orissa. These will open up new vistas of development not only for Orissa but also for the nation as a whole and will be rewarding in the long run.

Inland water transport :

Orissa had a fairly prosperous inland waterways even till the early British rule. The rivers Mahanadi, Baitarani, Brahmani, Subarnarekha and Budhabalang along with the Orissa coast canal, High level canal and the Taldanda canal provided about 700 Kilometers of navigable waterways. The waterways were so important that they formed a part of a Master Plan linking Calcutta with Madras. Cuttack used to be one of the greatest inland water ports of the country.[15] Orissa had a prosperous trade with other parts of the counfry, specially with Bengal through the Orissa coast canal, which was linked with Calcutta port. Water ways suffered a set back during the 20th century due to various reasons. They could not compete with other modes of surface transport because the technological changes by way of mechanised transport were not introduced in the waterways. This mode of transport was neglected and the canals were not properly maintained. The Orissa coast canal and the High level canal are now almost abandoned.

The Orissa coast canal, which is an inter-state Canal, joins the river Hoogly in West Bengal with the river Matai in the district of Balasore. Out of a total length of 132 miles, 76 miles lie in Orissa and 56 miles in

West Bengal. The Central water and power commission and the Estimates committee of Lok Sabha have repeatedly recommended the revival of this canal.[16]

Government of Orissa have proposed to include this project in the sixth five year Plan of the State as a centrally sponsored scheme. It is estimated to cost Rs. 2.86 crores of rupees.[17] The High level canal in Cuttack district, which extended up to the river Salandi at Bhadrak, could be revived, remodelled and connected with the coast canal. In that case there will be a viable inter-provincial water transport system connecting a prosperous area of Orissa with Bengal. In fact, this canal system may form part of the garland canals proposed to be constructed by the Govt. of India with assistance from World Bank connecting the major river systems of the country.

The river Mahanadi should be made navigable up streams as far as possible by making necessary constructions. Such possibilities of making the rivers Brahmani and Baitarni navigable should be explored while constructing Rengali, Bhimkund multipurpose projects across these rivers. That will reduce the cost of transport of bamboo, timber and other forest produce from interier to coastal Orissa.

Draft five year plan for Orissa, 1978-83 makes a provision for a scheme providing direct water link between Chandbali and Paradeep by connecting the missing links and improving the water ways[18]. The area is thickly populated and is rich in agricultural potentials. Imports and exports will increase if the communication system improves through water ways, because there can be very little road development in this low-lying and flood stricken area.

Road Communications :

The inter-State roads have oponed up opportunities of transporting goods between different States in India. More of inter-state roads should be widened and strengthened and declared as Highways by the Govt. of India. The feeder roads should be strengthened by the State Government. Due to inadequate railway system and water transport in Orissa, road transport is bound to play a vital role in the transport of meterials in the interior of Orissa both for internal, inter-state trade, as well as international trade.

Development of ports and growth of trade :

Paradeep port project was initiated by the Government of Orissa in 1962 and was taken over by the Government of India in 1965. It was

declared as a major port in 1966 and was opened to traffic with effect from 1-11-1966[19]. It is India's deepest and largest all-weather port. The master plan of the port provides for 19 general cargo berths, 2 iron ore berths and one oil berth besides dry docks and work-shop provisions. But the port started only with one mechanised iron ore berth and it continued to function as a none-commodity port (iron ore) for a long time. The first general cargo berth was opened to traffic on 15-4-1975. The port was opened to linear traffic on 2-1-1976. The statistics in Table-II below of traffic handled by Paradeep port from 1972 to 1977 shows its steady progress[20].

TABLE-II

Year	Iron Ore	General Cargo		Transhipment	Total	Grand Total
		Imports	Exports			
1972-73	18,73,517	1,167	1,48,288	—	149455	20,22,972
1973-74	20,29,938	1,319	2,56,785	—	258104	22,88,042
1974-75	21,98,872	827	3,45,991	60,573	407391	26,06,263
1975-76	27,07,125	50,755	4,19,661	1,38,418	608834	33,15,959
1976-77	23,22,774	1,50,577	8,26,308	18,955	995840	33,18,614

With the commissioning of the general cargo berth in 1975 there has been diversification of traffic. The general cargo traffic increased in 1976-77 by about 61% over that of 1975-76. The recent decision of the Govt. of India to construct another cargo berth will go a long way to meet the growing traffic. The port now serves not only as an outlet for the mineral ore of Orissa but also as an export point for the pig iron and and coal from Drugapur in West Bengal, Sugar from U. P. and Iron steel products from the Tatas. Orissa has also started exporting pig iron, ferro-chrome and G. I. Pipes from the port. Imports include food grains, fertilisers, cargo and transhipments to other coastal ports.

But the potentialities of Paradeep for handling traffic are greater. The potentialities can be achieved to a great extent if the inadequacies and limitations of the port are removed and the communications links with the hinterland suggested earlier are established.

Development of minor ports :

False Point Harbour in Cuttack district was a flourishing port till the first decade of the present century. It was the main entrance to bringing

food to Orissa during the famine of 1866. The Famine-commissioners reported that it was the best harbour on the whole of Indian peninsula between the Hoogly and Bombay. It was one of the important trade centres of Orissa dealing with imports, exports and coastal trade. The chief export was rice to Mauritias and Ceylon in sailing vessels and to the Madras Presidency. There was gradual silting up of the harbour. The railways, which were opened in 1899, emerged competitiors in carrying trade. There was also dislocation of shipping due to the out break of the 1st World War. The port was finally abandoned in 1924 due to all these factors[21].

Till recently Chandbali and Puri minor ports were serving the needs of coastal trade. Chandbali was the most important minor port in Orissa. Its traffic comprised mainly of rice, Paddy and dried fish exports to Calcutta. The traffic has dwindled from about 28,000 tonnes in 1953-54 to almost nil in 1972-73. The jetties have become unserviceable since 1960-61. In the thirties the port of Puri was competing with Vishakhapatnam in its volume of traffic. It is now defunct. Gopalpur and Chandipur had disappeared earlier.[22]

Gopalpur has bright prospects to be a minor port-cum-fishing harbour. An expert committee of the ministry of shipping and transport recommended in 1969 to develop Gopalpur as minor port. Govt. of India accorded technical approval to this project in 1974. It has a hinterland of 64,000 square kms. in Ganjam, Koraput, Kalahandi, Bolangir and Phulbani districts. The export potential will increase when Rare Earth and other industries develop around Gopalpur. The total cost is estimated to be Rs. 9.10 crores including Rs. 8.25 crores for the commercial harbour only[23]. It should be a centrally sponsored scheme as the resources of the State Govt. are not adequate.

Chandbali was an active minor port till the other day. Dhamra on the same river route, only, a few miles away from Chandbali towards the sea, is being developed as a fishing harbour. It won't be difficult to revive Chandbali port again. But to develop Chandbali into a full-fledged minor port, railway connection is necessary from Bhadrak to Chandbali. Gopalpur can serve as a subsidiary port in between Paradeep and Vishakhapatnam, where as Chandbali can serve as a subsidiary in between Haldia and Paradeep major ports. They can serve the inter-State trade need through coastal freighters.

Conclusion :

Growth of trade depends upon the availability of natural resources and the exploitation of the same. Agricultural and industrial prosperity develop potentialities of trade, but the growth of trade is directly linked with development of communications and port facilities. Orissa has agricultural, forest, mineral, matallurgical, marine and other kinds of potential resources for trade. If exploited properly, there will be enough of surplus materials for being sold outside the state, and even outside the country. But the major hurdle is the poor communication system for transporting the materials. If there is systematic development of railways, water ways and roads, along with the development of major and minor ports in Orissa, internal as well as international trade are sure to expand. But it calls for a co-ordinated and integrated development of various aspects for achieving better and quicker result.

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FISH PRODUCTION AND EXPORT OF ORISSA AND THEIR IMPACT ON SMALL FISHERMEN

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Fish makes a valuable supplement to our diet which is generally unbalanced, unwholesome and unpalatable. Consequently, the changes in its production and distribution have significant repercussions. The paper attempts to highlight the impact of such changes.

Production, Productivity and Consumption of fish :

The production of fish in Orissa has shown a steady upward trend, rising from 16000 tonnes in 1960-61 to 58000 tonnes in 1978-79. The proportion between marine fish and inland fish has also undergone a change. In 1960-61 marine fish accounted for 5000 tonnes against 11000 tonnes of inland fish while in 1978-79, the former was 30000 tonnes against 28000 tonnes of the latter[1]. The fisheries sector contributes about 2% of the State's income at present against its share of 1% in 1967[2]. This sector including the ancillary industries employs about 1.5% of Orissa's population[3].

The area capable of development for finishing operation in Orissa is estimated at 8040 spr. miles comprising 3000 squaremiles of off-shore fisshing 3000 square miles of deep sea fishing, 1150 sqr. miles of estuarine and 890 sqr. miles of reservior and river pools. The yearly yield potential of demersal fish for Orissa is estimated 65000 tonnes by the Exploratory planning Project[4]. The present fish catch does not appear to be proportional to the culturable water. The equipment used for fishing in Orissa is not adequately modernised. Eighty one percent of marine fisheries is accounted for by the traditional boats. The average fish catch per worker in Orissa during the quinquennium, ending 1959-60 was 1.54 M. T., against India's average of 1.93 M. T.[5]

The average percapita consumption of calories in Orissa is 1960 against India's average of 1970. Eighty six percent of calorie consumption of an Oriya is supplied by cereals and starchy roots. The average percapita

daily consumption of fish in Orissa is estimated at 5.8 grams against India's average of 7 grams.

In spite of low percapita consumption of fish in Orissa 50 percent of the marine fish and about 5000 tonnes of inland fish per year are exproted from the State to Calcutta. This is perhaps due to the price differential between Calcutta and Cuttack markets (vide Table 1).

Landing and Marketing of Fish :

There are 35 fish landing centres along Orissa coast, 8 in Balasore District, 7 in Cuttack District, 9 in Puri District and 11 in Ganjam District.

Most important landing centres are Chandipur (4000 tonnes per annum) Paradeep (5000 tons), Puri (5000 tons) Gopalpur (2000 tons) Ganjam (1500 tons) and Astrang (2000 tons), 80% of domestic production of marine fishes is consumed in fresh form and the remaining part is converted into cured and frozen products.

In Paradeep only provisional jetties and other facilities have been provided in the inner harbour basin for the fishing fleet as a temporary measure. A new harbour for mechanised boats is under construction at Dhamara which will provide facilities for boat repair and maintenance.

There are three principal marketing out-lets for the marine fish.

(1) Nearly half of the production (about 10000 tonnes) is marketed through Howrah wholesale market in Calcutta. Fish purchased at landing centres by middlemen are supplied to the above on consignment basis. Demand is steady at Calcutta and its price influences domestic price.

(2) Second out-let is the local markets in Orissa. All the fish here is consumed fresh. Though there is high unsatisfied demand in the locality, it cannot compete with Calcutta.

(3) The third out-let is the shrimp freezing companies which purchase prawns directly or indirectly.

Export of prawns has commenced from 1969/70 and its quantity has gone up from mere 4 tonnes in 1969/70 to 376 tonnes in 1972/73, 392 tonnes in 1973/74, 823 tonnes in 1974/75, 1064 tonnes in 1975/76, 2073 M. Tonne in 1976.77 and 2148.7 M. Tonne in 1977-78. The value

has gone up from Rs. 24,1 million in 1974-75 to Rs. 84.8 million in 1977-78[6].

Export out-side Orissa (In Tonnes)

Year	Marine	Fresh	Brackish	Total
1975-76	13000	2000	3000	18000
1976-77	15000	2200	3600	20800
1977-78	1600	7000	4000	22000
1978-79	17500	2500	4000	24000

Courtesy : Director of Fisheries, Cuttack.

Problems and their solution :

Problem in fishery relate to both production and distribution and they affect the interests of the small fishermen and consumer as well.

The area of the continental shelf of Orissa is about 6% of the shelf area of India while the marine fish production is 1.7% of all India's production a sigh of underexploitation. The E. F. P. at Paradeep has concluded that the sustainable yield of the demarsal stock is in the order of 65000 tonne per year. Though resource potential does not constitute constrain for further development, the rapid expansion of trawl fishery may constitute a threat to the traditional fisheries.

The main constraints relating to most of fishing crafts are the low grade mobility, low capacity and poor sea-worthiness Though long term policy requires replacing them by mechanized boats, in the fore-seeable future they are to be retained with marginal improvement.

Most of the crafts are under-equipped in respect of fishing gear. A 25% increase in net is expected to raise yield by 5000 tonnes per year and raise income of a catamaran by Rs 265/- per year. The mechanised boats at Chandipur making one day trip are making a loss of Rs. 5000/- P. A. They could make 2 to 3 days trip by equipping them with insulated fish boxes on board for preservation of fish by ice.

Marketing distribution, handling and processing pose no great con-traints for development. There is some problem of fish distribution from remote landing centres because of bad road.

Calcutta market where annual demand is estimated at 80000 tons, against a supply of 40000 tons, provides a steady and assured market for Orissa fish. Quality of Orissa's fish of course, is not always good. Yet, the

high difference between Calcutta price and the wholesale price at beach indicates the high profit of the traders at the cost of the fish catchers.

The remate fishing centres face distribution constraint. For example Dhamra where a fishing harbour is being built is not connected with road or proper navigational facility, Handling of fish on board the traditional craft does not pose a problem. But the handling of shrimp needs further attention.

Large bank loans are given to the cooperatives, but the cooperatives are burdened with complex functions which they are not capable of handling. A cooperative should be an association of fishermen which acts as an agent in strengthening their position.

Of all the problems, upkeep of the interest of the small fishermen is the most urgent. Along the coasts there are one million small scale fishermen engaged in the trade in India[7].

Sometimes there is conflict between small fishermen and the big mechanized boat owners "It is a matter of urgency for the responsible authorities to decide upon the question of fishing limits for mechanized trawlers to protect the traditional fisheries[8].

The development and bargaining power of the small fishermen suffer as the educated tend to leave the fishing sector.

Growth of institutional patterns above the village level has created interference of Govt. agencies in village affairs. There is growing reliance on Govt. action, but little identification with the commitment to collective goals as expressed in Govt. policies[9].

In the policies of the Govt. too, a contradiction is discerned; "The development of socio-economic uplift of traditional fishermen and objective of increased fish production to achieve higher foreign exchange earnings or selected fishery production are not necessarily compatible"[10].

The export-oriented fishery policy has led to unthinking use of mechanized craft has created conflict among modern and traditional fish-catchers and posed the danger of unemployment.

Due to the ploughing effect of trawler, fish eggs and larvae are destroyed, thus disturbing the process of biological regeneration. The noise and turbidity caused by the sediments up-turned discourage the

entry of fresh fish shoals from deeper waters. The ecological balance of the shallow water just off the coast that jam with fish life is lost.

The trawlers are owned by "moneyed unwanted elements" not by traditional fishermen. The entry of big houses like Union Carbide and Tatas worsened the situation. Deep sea fishing has been an eyewash while their actual operation is in shallow sea.

There has been no effective law for protective zone for the small fishermen. On march 29, 1978, the Agricultural Secretary, Central Govt. directed States to reserve an exclusive zone of 5 km. Mr. Surjit Singh Barnala on Feb. 26 announced that state govts. are being sent a model bill for demarcation of operational zones for different types of fish vessels.

To sum up, the craze for revolutionising fishery has created numerous tricky problems. Larger and larger trade with spectacular profit has induced mechanization, but their unregulated use has caused :

(1) Depletion of fish stock in shallow ocean,

(2) Resultant declining catch affecting economic condition of the traditional fisher men,

(3) Obstructing desirable expansion of employment. The evaluation organisation of the planning commission points out that traditional fishing provides, seven times greater employment opportunity than the mechanized boats.

(4) Fall in supply of fish in the local market resulting in the rise in price and deprivation of the cheaply available protein to the common men.

(5) Bitterness and conflict between traditional fishermen and trawler users.

(6) Over-fishing with consequent ecological imbalance and check to fish growth.

The problems of production, distribution and consumption are vitally interlinked. It is therefore, necessary to seriously ponder over the problems of expansion of production and trade conjointly keeping the interest of the toiling members of the system and the common man above all. Few suggestions are offered below for the planned growth of fishery reconciling the interests of the producers, local consumers and the State.

1. Resource potential along our coast should be thoroughly studied and licence for the use of trawlers be issued accordingly.

2. There should be demarcation of operational zones for different categories of crafts to avoid conflict and ecological imbalance created by indiscriminate use of trawlers.

3. Modernisation of fishing in form of use of gillnetter requiring less power complementary to traditional fishing should be emphasized.

4. Competition among the fishermen and disposal of the out-put should be thoroughly examined. Middle-men exploitation, if any, has to be rooted out. The existing 28 marine fishermen cooperatives in Orissa are to be revitalised and their traditional members should have effective say in its management.

5. In sanctioning loans for use of trawler and other mechanized boats, preference should be given to persons coming from the traditional fishing community.

TABLE—I

Wholesale and Retail Price of Rs. / Kg.

Species	Whole sale (Beach)	Retail (Cuttack)	Retail (Calcutta)
Marine :—			
Prawn	40-50	N. A. (Exportable)	N. A.
Prawn (Medium)	13/-	-do-	-do-
Prawn (small)	3/-	5/-	6/-
Hitsa	7/-	10/-	15/-
Pamlet	2-50	4-50	5/-
Polynomads	5/-	7/-	8/-
Seer fish	1-50	3/-	4/-
Purches (Bhekti)	7/-	10/-	12/-
Cal fish	1-50	3/-	4/-
Inland. Calcutta. Lafiorohila Labio calbasa	6-50	10/-	15/-

NOTE :— Per Kg. cost of transport 0-60 paise and Packing 0-30 paise.

SOURCE :— FAO—Project for the Development of Small Scale fisheries—preparatory phase, Vol. 2, pp. 7-25.

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1. *Courtesy. Director of Fishery, Cuttack.*
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RAPPORTEUR'S REPORT ON ECONOMICS OF IRRIGATION

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Nowhere agricultural development has become possible without the availability of the crucial input-irrigation water. Irrigation alone has made it possible to use two other inputs, i. e., exotic seeds and chemical fertilizer. In modernising agriculture with the major objective of achieving an agricultural production boon irrigation is considered as the necessary condition and the later two are considered as the sufficient conditions.

Irrigation is both production and protection. It acts as insurance against recurring famine due to weather uncertainty and the canal irrigation system introduced in coastal Orissa during the British regime was the direct outcome of the Great Bengal Famine. Irrigation is land augmenting as it makes possible multiple cropping. It contributes directly to increase in production per unit of land and also creates the conditions of shifting to crops that yield larger cash return. Even in monoculture subsistence farming areas, where one or two crops are grown round the year primarily for domestic consumption, irrigation guarantees stability of output and hence income and employment. Irrigation creates substantial employment opportunities in the rural sector both directly and indirectly through multiple cropping and allied farm practices.

Thus there is no denial of the fact that the progress of an economy, more so when the economy is largely dominated by the rural sector, primarily depends upon a modernized and production agricultural sector with irrigation as the pre requisite infrastructure.

Provision of irrigation water, however, does not itself determine nor guarantee agricultural progress. Optimal income generation considerably depends upon the proper selection of the irrigation project, economic utilization of irrigation water and a rational selection of product-mix and a host of other psycho-sociological factors. Economic assessment of irrigation must entrace these aspects in its purview.

On "Economics of Irrigation" altogether ten papers were received. Professor B. Misra's Key-note Paper is an exhaustive commentary on the state of irrigation in Orissa. The paper is an important land-mark as it highlights some of the very urgent issues associated with irrigation that are usually lost sight of in the traditional evaluation of any irrigation project. The paper has shown how in Orissa less than fifty percent in the case of major and medium and only sixty percent of the minor irrigation is actually utilized. Such low utilization of irrigation water is due to improper and inadequate maintenance of canals and lack of field channels. He condemns such huge loss of a key input that occurs year after year due to the absence of any budgetory allocation at the Panchayat level and inadequate financial allocation at the State level.

Since the maintenance expenditure in the case of minor irrigation is much lower than major and medium irrigation Prof. Misra prefers the former.

The paper highlights, on the basis of CRRI research findings, that if the distribution system is improved through construction of field channels production can be augmented by nearly fifty percent. The paper also deals with the various combination of produce-mix that generates highest profit based on research findings Prof. Misra recommends a Potato-maize-rice rotation that not only utilizes the lowest irrigation water but also generates the highest net return to the farmer. It is time that the farmers should understand that water is a manageable input.

The section dealing with return from irrigation and irrigation rate is a brilliant commentary on the non-existence of correlation between the irrigation rates and net return from irrigation. Prof. Misra advocates that if there is any element of subsidy in the fixation of irrigation rate it should be 'open' and not 'concealed'. He makes out a case for fixing irrigation rates between 5 to 12 per cent of the gross income, the upper limit being applicable to commercial crops. He remarks strongly that irrigation schemes should not impose any burden on general resources.

Professor B. C. Parida's paper discusses the irrigation potential created in various districts of Orissa and shows how various constraints have led to a substantial loss of this vital resource. He has pleaded for minor irrigation projects in preference to major and multipurpose irrigation projects.

Sri T. Satapathy in his paper, "Some Aspects of Benefits of Canal Irrigation" has shown that the benefits of irrigation are substantial and in his case-study there is ample evidence of it.

The papers of Sri K. Das, S. Misra and B. Nayak, U. C. Nayak and P. K. Mahapatro and S. Panda are case-studies of minor irrigation projects.

Sri K. Das has pleaded that the entire increase in the crop production index is due to an increase in irrigation potential alone and has completely over-looked the contributions of increase in net sown area, changes in the farm technology and introduction of exotic high yielding seeds to the growth of production In the second part of his paper, he has made an attempt to build theoretical model to determine the 'Benefit' from a particular irrigation project. All his labour in model-making seems to be lost when he finally remarks, "... from the point of view of regional justice, this rule of benefit-cost-ratio should not be adhered to very strictly in a state so poor as Orissa."

The paper jointly produced by S. Misra and B. Nayak deserve an ace for their analysis of human factor in reaping the benefits from any project. The leadership and managerial capabilities do contribute substantially to reaping the benefits from any particular project.

Dr. P. K. Das's paper, "Impact of Irrigation of Tenancy" analyses the impact of irrigation on the tenancy arrangements. The paper is quite interesting as it reveals the trend of a shift in the rental arrangement more disadvantageous to the share cropper after the introduction of irrigation. Unless proper steps are taken the economic gains of irrigation shall largely be cornered by the land owners.

Dr. Hota's paper gives a glossary of benefits that need to be calculated in the framework of benefit-cost analysis for correctly assessing the benefits of irrigation. But the list is so exhaustive that it is practically impossible to account for those in any project evaluation.

Sri P. K Mahapatra in his case-study of tribal agriculture has made out a case for introducing more dugwells to benefit the tribals. But he remarks that the mere provision of irrigation water will not ameliorate the conditions of the tribals. Any serious attempt must encompass an all-out effort with packages of inputs and marketing facilities and a continuous extension effort.

Sri U. C. Nayak, in his case-study of Pattamundei L. I. Projects, compares the profitability (B/C ratios) of tube wells and lift from river bed projects and prefers the latter to the farmer. He also indicates that in

neither projects there is optimal utilisation of water as the ayacut area could be increased substantially to the economies of farm-size.

Sri S. Panda in his paper 'Effects of Irrigation' has discussed the benefits derived from irrigation by different classes in the society. He has highlighted that irrigation has conferred benefits on the land-owning class. He has pleaded that improvement in irrigation has to be accompanied by change in the agrarian property relations so that welfare of the rural population can be promoted.

Sri N. Nanda in his paper on "Development of Irrigation in Orissa" has pointed out that there has been net loss in respect of irrigation works as working expenses and interest charges have not been met. However, he pleads that investment on irrigation should be increased so as to raise agricultural production.

From the papers received it is seen that most of the paper writers have advocated for minor irrigation, particularly exploitation of sub-soil water. The economic justifications are enormous. But what is equally important is the determination of a suitable policy, right from now, regarding the rational use of this vital subsoil resource so that in future its indiscriminate use does not affect another section of the farming community adversely.

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