CHAPTER - VII

SUMMARY AND CONCLUSION
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The study was intended to analyse the economics of the dugwell scheme in the SFDA district, Ganjam, considered from the points of view of both the commercial profitability and the social welfare and to see, if the scheme has been able to improve the economic conditions of the beneficiaries. The study further envisaged to measure the inter and intra-regional distribution effects of this mixed investment scheme. Chapter-I, mainly deals with the importance, the objectives, the hypotheses of the study, and the methodology followed for the collection of data, definitions of different concepts of benefits and costs and the criteria to be used in measuring the commercial profitability of the scheme.

12 villages are selected, by random sampling with probability proportional to the number of wells and 118 sample beneficiaries and 60 non-beneficiaries are selected by simple random sampling from these villages. For the purpose of valuation of inputs and outputs the methodology followed for the Farm Management Studies are used. The net present value, the benefit cost ratio and the internal rate of return are used as the criteria for admissibility of the project.
Chapter XI reviews the literature on benefit cost aspects of irrigation. It is revealed that the concepts of costs and benefits adopted by various authors, varied very widely, thereby making the comparison of the results very difficult. It is further observed that the studies on open well irrigation are only a few in number. This chapter states that the study will mainly concentrated on the admissibility of the project by taking into account the existing cropping pattern with alternative shadow wage rates and will try to find out the suitability of different sizes of wells according to specific admissibility criteria.

In Chapter III, an attempt is made to analyse various factors like the size and the shape of the wells, spacing between nearest wells, suitability for different aquifers and the investment costs for different sizes.

It is revealed that, the small farmers have strong preference for small wells having less than ten feet diameter, which constitute about 79% of the total sample wells. This preference is mainly due to the following reasons;

a) Since about 35 percent of the villages are yet to be electrified, the scope for the use of electric pump-sets for lifting water from the wells is limited. Under manual lift, there is likely to be under
utilisation of irrigation potential of the wells having large diameters.

b) Because of excessive sub-division and fragmentation, the average area per fragment is only 0.53 acre which can be served by a well having small diameter.

It is observed that the spacing of the wells, inadequate appreciation of which may lead to external diseconomy in the sense that the water level in a well may be reduced due to a draw from the nearest well of less than optimum distance from it, is not done according to the prescription of the Orissa Lift Irrigation Corporation. Out of 118 wells, 97 wells are located below a distance of 400 feet, a distance much less than the recommended distance of 500 to 800 feet, from their nearest wells. As the guidance regarding the ground water availability seems to be very inadequate, the farmers usually prefer to dig wells very near to the existing wells having water, to minimise the uncertainty of not striking water.

So far as the cost per unit of irrigation water is concerned, it is found that the 'tenda system' is costlier than the power lifts. The cost per acre inch of irrigation in tenda, electric pump set and the diesel pump set are Rs. 19.68, Rs. 8.10 and Rs. 10.89 respectively. However, the tenda system is found to be more efficient
than other forms of manual lifts used in other parts of India. In tenda system, 2.80 days of human labour are required to lift 10,000 gallons of water in comparison to 5.4, 1.2 and 2.75 labour days required to lift the same volume of water through counter poise, picotta and chain pump respectively.

An analysis of the commercial profitability and the factors influencing it, is made in Chapter-IV. It is observed that the well irrigation has been instrumental in bringing about a substantial change in the cropping pattern in Rabi. A comparison of the output per acre in well irrigated and unirrigated area of a few major crops grown during Kharif in the drought year reveals that it is much higher in irrigated lands than in the unirrigated lands. The yields per acre of paddy, maize and ragi in the lands of the non-beneficiaries are 4.64, 2.60 and 2.79 quintals respectively whereas in the lands of beneficiaries, the respective production figures are 10.47, 10.38 and 8.2 quintals.

Further, as between Rabi seasons in respect of the well irrigated farms, the per acre outputs of the principal crops are substantially lower in the drought year than in the normal year. The production per acre of chillies, vegetables and potatoes in 1974-75 are 6.52, 35.92 and 35.25 quintals respectively whereas the
respective comparative figures for the normal year, 1973-74, are 6.95, 56.28 and 41.38 quintals. This fall in output is mainly due to the reduction in the water availability in the drought year.

So far as the returns per acre are concerned the following points are observed:

I) The farm business incomes in case of both the beneficiaries and the non-beneficiaries in Kharif and Rabi seasons are positive. In Kharif 1974-75 and Rabi seasons of both the years, 1973-74 and 1974-75, the farm business incomes per acre in respect of the beneficiaries are found to be Rs. 564, Rs. 1753 and Rs. 1460, while the respective figures in respect of the non-beneficiaries are Rs. 65, Rs. 36 and Rs. 94 only. It is seen that though the farm business incomes are positive, both for the beneficiaries and the non-beneficiaries; for the former these are substantial whereas for the latter, only marginal.

II) The family labour incomes, in case of the non-beneficiaries are negative in all the three seasons, varying between minus Rs. 181 and minus Rs. 19 per acre. The beneficiaries get Rs. 291 per acre as the farm business incomes in Kharif and Rs. 1316 and Rs. 930 during the Rabi season of 1973-74 and 1974-75 respectively.

III) The net incomes in respect of the beneficiaries in Kharif in the drought year are very meagre, being only
Rs.27 per acre, and in case of non-beneficiaries these are negative, minus Rs.320 per acre. In Rabi the non-beneficiaries incur losses in crop production varying between minus Rs.93 to minus Rs.142 whereas the beneficiaries reap substantial profit varying between Rs.911 to Rs.517 in the respective years. As the water availability in the wells goes down in the drought year, the crops are affected thereby reducing the production and net incomes substantially.

(IV) The net additional profit per well is marginally higher in the normal year than in the drought year.

**ECONOMIC BENEFITS AND WELL SIZE:**

There are marked inter size-group differences in the net additional benefits per well, varying between Rs.294 and Rs.687 in the normal year and Rs.101 and Rs.841 in the drought year. The additional benefits of wells having more than 10 feet diameter are not adversely affected by drought. The reduction in additional benefits is only 4 percent. But the reduction in the additional benefits in respect of size groups, below 10 feet diameter vary between 65 per cent to 38 per cent where the rechargeability is low. This suggests that the wells with bigger diameter are better suited to fight drought than the wells with smaller diameter. However the latter
type can still fight drought and prove economical provided suitable aquifers are tapped, which, in turn, depends upon the technical know-how available to farmers that can give proper guidance to them regarding the availability of ground water.

COMMERCIAL PROFITABILITY

It is observed that the commercial profitability of the scheme is positive. The net present values of 118 wells at 8 per cent, 10 per cent and 12 per cent rates of discount are Rs.77.4 million, Rs.54.4 million and Rs.41.8 million respectively. The benefit cost ratios are found to be 1.53, 1.47 and 1.42 respectively at the above three rates of discount. The internal rate of return is as high as 34.4 per cent. These suggest that from the commercial profitability point of view, the dugwell scheme is highly desirable.

WELL SIZE AND PROFITABILITY:

There are large inter-size group variations in profitability though in each case the net present value is positive, benefit cost ratio is more than unity, and the internal rate of return is much higher than the market rate of interest. As between the size groups, the benefit cost ratio varies between 1.35 to 1.78, 1.31 to 1.72, 1.27 to 1.65, at 8 per cent, 10 per cent and 12 per cent rates of discount respectively. It is also
observed that the internal rates of returns vary between 26.4 per cent and 46.6 per cent. Even the lowest of the internal rate of returns exceeds the market rate of interest.

Further, both the internal rate of return and the benefit cost ratio, used for relative measurement of efficiency, indicate that the wells having more than ten feet diameter are much more efficient than the wells of smaller diameter. The two groups, IV and VI having diameter of more than 10 feet have, 45.4 per cent and 46.6 per cent as their respective internal rate of returns whereas in respect of other groups the internal rate of return varies between 26 per cent to 40 per cent. While benefit cost ratios, at 12 per cent rate of discount for the two size groups above 10 feet are 1.65 and 1.63, the benefit cost ratios vary from 1.27 to 1.44 as between other size groups having less than 10 feet diameter.

UNECONOMIC CASES:

Because of the heavy water requirements of heavy duty crops like paddy, grown in Kharif, and the high cost of irrigation in the manual lift, there are losses in 49 cases in Kharif season of the drought year. This suggests that in a large number of wells, the present lift technology has inherent limitations to fight severe drought conditions experienced by heavy duty crops, by
drawing water from the wells.

During 1973-74, poor water management and supply of bad seeds by the governmental agencies were responsible for losses in 10 and 4 cases respectively out of 15 cases where losses were incurred. But during the drought year, water scarcity in wells was responsible for losses in 10 out of 29 cases of loss, though poor water management and poor extension accounted for losses in 12 and 7 cases respectively. This suggests that, in future, water availability in late winter and summer have to be taken into account before deciding about the site for and the size of a well.

**EMPLOYMENT:**

The scheme has substantial employment generating effects. The additional employment generated in 1973-74 was about 88 days per well and in 1974-75 about 115 days. Most of these additional employment was in the form of self employment of the small and marginal farmers.

**SOCIAL COST BENEFIT ANALYSIS:**

For the purpose of social cost benefit analysis, a suitable method is chosen in Chapter V and different accounting prices reflecting the true social costs and benefits are derived under various plausible assumptions for India and Orissa. Specific attempts are made to find out the accounting prices of unskilled labour, foreign
exchange and the investment, for the use in the case study in Chapter VI.

The dug well project is evaluated according to the UNIDO method, mainly from the point of view of three objectives,

a) Aggregate consumption objectives
b) Regional redistribution objectives and
c) Objective of redistribution to the target groups.

It was observed that the net present values are positive in all cases and the income redistributed in favour of region and the small farmers and agricultural workers are substantial. It is further observed that the net present value is highly sensitive to the changes in the rate of discount, and the value of the marginal saving propensity of the small farmers, but not so sensitive to the changes in the premium on foreign exchange. A change in the rate of discount from 8 per cent to 10 per cent reduces the net benefit from Rs.148 million to Rs.128 million, whereas a change in the premium on foreign exchange from 40 per cent to 60 per cent reduces the net benefit from Rs.148 million to Rs.138 million (when the accounting price of investment $P$, equals 2.4). Further, a change in the saving propensity of the small farmers from 0.24 to 0.14 reduces the benefit from Rs.202 million to Rs.179.6 million whereas a change in the premium on foreign exchange from 40 per cent to 50 per cent reduces the benefit from Rs.202
WELL SIZE AND SOCIAL BENEFITS:

The net present value in respect of each group is found to be positive. Since the NPV is an absolute measure of efficiency, a relative measure, benefit cost ratio is taken into account. It is observed that, as in the case of commercial profitability, the benefit cost ratios are much higher for the well size group having diameter of more than ten feet than the groups having diameter less than 10 feet. For example the Groups IV and VI, having diameter more than 10 feet, have benefit cost ratios of 6.13 and 5.19 respectively whereas the benefit cost ratio varies between 3.29 and 4.79 in case of other groups with less than 10 feet diameter. It indicates that there can be substantial increase in social benefit by investing more on wells having higher diameter.

It was envisaged to test the following four hypotheses.

1. The commercial profitability of the dugwell scheme is high and there are significant inter size group differences in the commercial profitability of the dugwell scheme.

2. The social benefits of the scheme are much higher than the private benefits.

3. The dugwell scheme has significant inter and intra regional redistribution effects.

4. This mixed investment scheme has significant employment generation effects.
In Chapter IV, it is found that the net present value of the benefits, even at 12 per cent discount is positive, being Rs. 41.8 million and the benefit cost ratio equals 1.42. The internal rate of returns of 34 per cent, considered from the point of view of the Indian economy, seems to be fairly high. It is also found that as between size groups there are wide divergences in the benefit cost ratio and the internal rate of return, the former varying between 1.78 and 1.35, 1.71 and 1.31, 1.65 and 1.27 at 8 per cent, 10 per cent, and 12 per cent rates of discount respectively and the latter varying between 46.6 per cent and 26.4 per cent. So both the aspects of our first hypothesis are proved.

It is observed from Chapter VI, that the minimum social benefit, at the most conservative estimates is Rs. 106 million at 12 per cent rate of discount which far exceeds the commercial profit of Rs. 41.8 million at the same rate of discount. So the second hypothesis that the social benefits are much higher than the commercial profits, gets proved.

It is observed from Chapter VI that the incomes redistributed to Orissa at 8 per cent, 10 per cent and 12 per cent rates of discount are Rs. 274.2 million, Rs. 224.8 million and Rs. 190.6 million respectively at the lowest value of Y, which far exceed the net present value of the benefits to the Indian economy thereby indicating
that substantial income is redistributed in favour of Orissa. This scheme, therefore, has favourable inter-regional redistribution effects. Substantial income accrues to the small farmers and agricultural workers, the target groups, whose per capita income levels are substantially below the 'poverty line'. This income accrual helps to improve the intra-regional income redistribution. So the third hypothesis that this scheme has significant inter and intra-regional redistribution effects, is proved.

The additional days of employment generated per well vary between 88 to 115 respectively in the normal year and the drought year. Considering the small amount of investment, the additional employment generated seems to be substantial. Hence the fourth hypothesis is also proved.

RECOMMENDATIONS:

1. Since the present ground water survey seems to be inadequate, extensive and intensive ground water surveys are needed for the guidance of the farmers regarding the site of a well and the distance to be maintained from the nearest well. Planned investment on well irrigation may prove more economical than the haphazard digging of wells practised at present.

2. The extension, both in the form of guidance regarding the cropping pattern and the crop and water management,
should be more intensive and effective to increase the benefit by reducing the costs and increasing the gross returns, per unit of output.

3. In future, investment on wells having diameter of more than ten feet should be encouraged so as to increase both the commercial profit and social benefit.

4. Since the lands of the small farmers are highly fragmented and each fragment on an average is only about half an acre, there is preference for wells of smaller diameter. In the existing organisational structure, the small farmers may not come forward to take up wells having large diameter because of the fear of under utilisation of irrigation potential. If the Government can ensure planned water sharing and integrated crop management for each farmer, i.e. each getting water for his land from the nearest well and having a crop most suited for the type of land, the small farmers will be willing to take up bigger wells. The agricultural extension officer will cooperate with % and provide guidance to the small farmers in drawing up of the scheme of cooperative water management practices. The beneficiaries of the irrigation from others' well will only share the operational cost of irrigation in case of indigenous lift and operational cost and a part of the fixed cost in case of the power lift. The rates for water should be fixed after a mutual discussion of the beneficiary farmers.

This will ensure optimum utilisation of the irrigation
potential created, leading to higher economic and social benefits. This has been successfully attempted in the village Samsapur under Athagarh Block of the Cuttack District.

5. Consolidation of holdings will be more useful for the small farmer as he will have all his lands in one area. This may prompt him to take up a well of large diameter as he will be able to utilise the full irrigation capacity of the well.