PEO Study No.89

STUDY OF TUBEWELL IRRIGATION AND GROUNDWATER DEVELOPMENT PROGRAMME - 1974

1. The Study

The necessity of assured water supply posed in the 1960s by the advent of new agricultural technology involving the use of high-yielding seed varieties, accelerated use of chemical fertilizers and multiple cropping pattern provided the early impetus for the ground water development programme. This, combined with the widespread droughts in 1965-66 and 1966-67, led to the introduction of the Centrally-Sponsored Scheme for groundwater development in 1966-67 in 9 States. Geo-hydrological units were set up in 8 States to supplement the Centrally-Sponsored Scheme. The programme was further facilitated by the rapid electrification of rural areas and the increased availability of institutional finance. The Fourth Plan envisaged that the programme of minor irrigation would be dovetailed with the rural electrification schemes for energising clusters of wells or tubewells. The estimated Fourth Plan outlay of Rs.1353 crores on groundwater schemes (Rs.253 crores from the public sector plus Rs.650 crores from financial institutions plus 450 crores from the cultivators themselves) was expected to lead to a net increase in the irrigation potential of 4 million hectares. The Programme Evaluation Organisation, at the instance of the Planning Commission, initiated in 1970-71 an evaluation study of the Tubewell Irrigation and Ground Water Development Programme and brought out its Report in 1974.

2. Objectives

i) To assess the growth and use of tubewells in the rural areas for irrigation in the context of groundwater development and its potential;

ii) To examine the problems of organisation, administration and co-ordination of the programme;

iii) To assess the extent and nature of benefits derived and the impact of tubewell irrigation on the agricultural situation in the relevant areas; and

iv) To study the extent and coverage of the rural electrification programme with reference to energising pumpsets and tubewells and the availability of equipment and technical personnel at various levels for implementing the programme.

3. Sample Size/Criteria for Selection of Sample

The study was conducted in 8 States, namely Punjab, Haryana, Uttar Pradesh, Bihar, West Bengal, Andhra Pradesh, Tamil Nadu and Karnataka. 15 districts - 3 from Uttar Pradesh, one each from Karnataka and West Bengal and two each from the remaining 5 States - were selected on the basis of the concentration of private and state owned tubewells in relation to the size of the districts. Within each selected district, 2 blocks were selected with probability proportional to the number of wells. From each selected block, three villages were selected by probability proportional to the number of tubewells. From each selected village, 15 households - 7 whose land was irrigated from private tubewells, but not from State tubewells (with or without other sources), 3 whose land was irrigated from State tubewells, but not from private tubewells (with or without other sources), 2 whose holdings were irrigated from canals only and 3 having irrigated land, but not covered under any of the above categories - were chosen for detailed interviews. Irrigation sources, namely, private tubewells, State tubewells, electric pumpsets and diesel pumpsets were also selected upto five in number in each selected village. For each village, two private tubewells, one electric pumpset and one diesel pumpset were picked. That State tubewell which possessed the highest command area was selected from each selected village. Thus the Study Report embodied the information garnered from the selected households and the irrigation sources scattered over 8 States, 15 districts, 30 development blocks and 90 villages.

4. Reference Period

The agricultural year, 1969-70 was the reference period of the study. The study was intended to evaluate the progress made by the programme during 1967-68 to 1969-70.

5. Main Findings

1. Ground water development potential and efforts in India varied significantly among the states. Whereas the investigations for construction of tubewells were taken up in the undivided Punjab as early as in 1910, in Uttar Pradesh, the construction of tubewells was started in 1931. In Bihar, the programme received an impetus only during 1966-67 and 1967-68. The average expenditure on groundwater development was considerably stepped up in all the selected states during 1966-67 to 1969-70 as compared to the Third Plan period ranging from 48% in West Bengal to as high as 503% in Bihar.

2. The Geological Survey of India and the Exploratory Tubewell Organisation, which had functioned separately, merged together and, thereby constituted the single central agency involved in systematic exploitation of ground water sources. At the State level, the existing ground water organisations were strengthened and re-organised into an integrated set-up with geo-hydrological, engineering and administrative wings. In many states, perfunctory consultation was provided mainly on an informal basis and quite often Schemes were taken up for execution on an adhoc basis without looking into details of feasibility.

3. Departmental, institutional and private agencies were assisting private ground water irrigation programme. The engineering section of the Agriculture Department was mainly entrusted with the execution of the programme. In Andhra Pradesh and Tamil Nadu, the PWD was also involved in exploratory boring and drilling. The institutional agencies included executing agencies like Minor Irrigation Corporation, State Agro-Industries Corporations, etc. as well as financial agencies, like Co-operative Central Banks, Land Development Banks, Agriculture Refinance Corporation (ARC), Agriculture Finance Corporations, Commercial Banks etc. Private agencies provided custom service for boring and drilling. Their service was generally satisfactory and the rates quite competitive.

4. Rural electrification provided tremendous boost for agricultural production by maximising the use of ground water resources. The charges for energy supplied to agriculture were conditioned by consumption guarantee in all the States except Punjab and Bihar. The concessional tariff rates in force in the selected States contributed to the recurring financial losses to the State Electricity Boards.

5. During 1967-68 to 1969-70, the proportion of irrigated area under ground water sources increased in most of the selected villages. The sample data for 1969-70 revealed that tubewells accounted for 60.1% of the net irrigated area, followed by surface sources (29.7%), wells with pumpsets (5.7%) and open wells (4.5%). The average command area under tubewells was 4.41 hectares whereas it was 2.65 hectares for wells with pumpsets. The major part of the irrigated area was under tubewells in Bihar, Haryana, Punjab, Uttar Pradesh and West Bengal and under surface irrigation sources in Andhra Pradesh and Tamil Nadu. Groundwater sources were coming up in areas which had previously been served by surface sources only.

6. Information collected from 988 cultivators of different States revealed that over two-third of them owned groundwater sources of one type or the other. This proportion was relatively higher among the owner cultivators as compared to the tenant cultivators. Again, this proportion increased with the size of operational holdings. Tubewells were owned by 46.3% of the selected cultivators. This proportion was above 60% in Andhra Pradesh, Punjab and Tamil nadu, whereas, it was only 1.7% in Karnataka. About a tenth of the selected cultivators owned wells with pumpsets and about 13% of them owned wells without pumpsets.

7. Of the selected cultivators reporting ground water sources, 28.6% could avail of surface sources as well. The main reasons for going in for own groundwater sources were the need for supplementary irrigation, relatively undependable irrigation from canals, inadequate water to cover the complete command area of surface sources, the changed cropping pattern requiring more irrigation and the adoption of multiple cropping.

8. About two-fifth of the selected cultivators experienced problems due to undulating terrain, sandy soil, village tracks and lack of co-operation from fellow cultivators in the construction and maintenance of field channels. About three-fourth of the katcha channels were satisfactorily maintained whereas this proportion was very low for pucca ones.

9. A total amount of Rs.36.2 lakhs was incurred on all ground water sources by the selected cultivators for the construction, installation and major replacements of pumpsets. Two-third of this amount was incurred by medium size cultivators. They preferred to spend relatively more on tubewells and wells with pumpsets. The average cost of construction of tubewells registered

a decline from Rs.5433 in 1965-66 to Rs.4412 in 1969-70. Component-wise, a little more than one-fourth of the expenditure on tubewells was on boring/drilling and slightly more than half was on machinery like pumpset/motor, etc.

10. Of the above said Rs.36.2 lakhs, about a fourth was financed by various agencies. About 55% of this financial assistance was made by the Co-operatives, 39% by the departments and the remaining 6% by commercial banks and public corporations. The small cultivators received a larger proportion of financial assistance from departmental agencies whereas the bigger cultivators received greater assistance from the co-operative sector. During 1965-66 to 1969-70, the share of departmental agencies decreased while that of the co-operatives registered an increase. The rate of interest was the lowest for departmental agencies (6.1 per cent), followed by the co-operatives (8.3 per cent) and commercial banks and corporations (9.5 per cent). Loans were reported to be delayed in about two-fifth of the cases.

11. Following the development of ground water, there was an increase in the cropped area under paddy and wheat during 1967-68 to 1969-70. For other cereals and pulses, the cropped area recorded a decline or remained constant except for maize. There was a decline in the cropped area under the commercial crops like oilseeds and cotton. Crops not grown earlier were being raised in some of the selected villages after ground water exploitation. 765 of the selected cultivators, mostly from Bihar, Punjab, Haryana and Uttar Pradesh, reported introduction of new crop rotations. Also, the intensity of cropping marked an increase during the period. The intensity was higher among smaller cultivators than among the bigger ones.

12. Technical guidance and consultancy facilities were reported to be available in 49 of the 90 selected villages. Assistance was given by departmental and private agencies for the siting of tubewells, actual boring and drilling operations, minor repairs and maintenance of equipments. The departmental agencies, due to the hefty operating costs of heavy equipments, charged high rates for boring/drilling. Failures of boring/drilling, due mainly to hard strata and inadequate water, were reported from 39 of the 90 selected villages.

13. Under-utilization of ground water sources, mainly due to the lack of sufficient land under command, was reported from 61 of the 90 selected villages. This was especially high in Tamil Nadu, Karnataka, Punjab and

Haryana. Sale of surplus water was reported by 719 out of 988 cultivators. The rates charged by cultivators were higher than those charged by the State mainly because the latter contained an element of subsidy.

14. The cultivators continued to be not fully aware of the inputs and agronomic practices in respect of specific crops. Extension education regarding prudent water management was insufficient. There seemed to be a tendency to over-irrigate crops where adequate irrigation facilities were available. Problems of drainage and water-logging were also reported.

15. In 1969-70, the tubewells owned by the selected cultivators worked, on an average, for 83 days as compared to 102 days for wells with pumpsets. The number of working days for tubewells was 49 and 34 respectively for rabi and kharif while 67 and 35 days were correspondingly reported for wells with pumpsets. The duration of operation increased with increase in the size of the operational holdings whereas the intensity of irrigation i.e. the working hours per hectare of irrigation, maintained an inverse relation with the size of operational holdings. The irrigation intensity worked out to 115.1 hours per hectare of irrigated area for tubewells and 136.6 hours for wells with pumpsets. The motors used for water lifting were also used for non-irrigation purposes such as threshing, chaff-cutting and cane crushing.

16. The return and cost analysis of different sources of irrigation showed, on the whole, that electrically operated tubewells performed better than other sources, while next in the order of performance came wells with pumpsets, diesel-run tubewells and wells. The diesel-run sources did not perform well anywhere except in Punjab and Uttar Pradesh.

6. Major Suggestions

1. There are many areas and agencies which urgently need to be co-ordinated. The channel of communication between the State and the Central agencies should be improved and the regional set-ups of the central agencies should be strengthened. These regional set-ups must be backed by functional committees and boards at the State level. Again, the programmes of the survey agencies and those of the developmental agencies must be co-ordinated. Co-ordination is also necessary between the co-operatives, the development banks and the commercial banks.

2. The Survey agencies should, inter-alia, assume the responsibility for providing consultancy services to the development agencies and financing institutions. The time-lags in finalising the reports of the survey agencies must be reduced, possibly, by institutionalising continuous interaction between the Central Survey agencies and user organisations.

3. There is a need to exercise some control and supervision over the standard of works executed by private agencies.

4. Steps should be taken to rationalise the rates charged by the government-sponsored development agencies by eliminating the undue element of subsidy in them. Private agencies may be encouraged to acquire rigs and to attend to custom service.

5. The concessional tariff rates charged by the State Electricity Boards may be reviewed in the context of the overall costs for all types of loads.

6. There is a great need for well-directed research and extension efforts in the area of water management.

7. Community or co-operative ownership of the sources of irrigation may be experimented to overcome the problem of their under-utilization.

8. A policy decision should be taken with regard to the exploitation of ground water resources which would not only prescribe limits on its utilization, but also define the manner in which these resources should be shared on an equitable basis between farmers in the area.