

EVALUATION STUDY SERIES NO. 1

**EVALUATION STUDY OF
MINOR IRRIGATION SCHEME-
CONSTRUCTION OF NEW WELLS**

AND

**INSTALLATION OF PUMPSETS THEREON
IN SHOLAPUR DISTRICT, MAHARASHTRA**

(1969-70—1972-73)

**AGRICULTURAL REFINANCE AND DEVELOPMENT
CORPORATION**

BOMBAY

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PREFACE

The starting point for undertaking the evaluation of projects assisted by Agricultural Refinance and Development Corporation (ARDC) is the implicit need to establish a system of evaluating on a continuing basis their financial and economic benefits. With this end in view, the Evaluation Cell was set up in ARDC in January 1974. The evaluation studies undertaken by ARDC have before it the objective of assessing the economic benefits accruing from investments refinanced so as to compare *ex-ante* expectations with *ex-post* achievements, particularly at the farmers' level. To begin with, the specific objectives of evaluation studies undertaken are to: (a) assess the benefits from the schemes at the farmers' level in terms of an increase in output and incremental income, (b) quantify actual costs and benefits realised by the farmers and compare them with optimal levels, (c) compare the actual with the anticipated project benefits and analyse the divergence between the two, if the divergence is significant, (d) estimate aggregate project benefits in terms of additional output, increase in on-farm employment and national income and (e) assess benefits to small farmers.

With the above objectives in view, ARDC took up during the first phase programme of work, 4 projects for evaluation studies. Since a substantial part of ARDC assistance has gone to minor irrigation and land development projects, it was decided to cover two schemes relating to minor irrigation and two relating to land development. Thus, the following 4 schemes one each in Maharashtra, Haryana, Karnataka and Andhra Pradesh were chosen for evaluation studies:

- (1) Minor irrigation scheme for construction of new wells, repairs to old wells and installation of pumpsets thereon in four talukas of Sholapur district (1969-73)—Maharashtra;
- (2) Installation of shallow tubewells under Karnal-I scheme (1967-72) — Haryana;

- (3) Bhadra land development project — Scheme for reclamation and development of land (1966-72) — Karnataka; and
- (4) Nagarjuna Sagar land development project — First credit scheme (1964-69) — Andhra Pradesh.

The evaluation of agricultural projects is being undertaken for the first time and for evolving appropriate techniques in sampling and evaluation methodology, there were no previous studies to look into for guidance. The studies taken up during the first phase programme may, therefore, have to be viewed as pilot studies undertaken with a view to evolving suitable techniques of evaluation. The techniques will have to be suitably modified on the basis of experience gained during the first round of studies and made to suit peculiar features of different projects financed by ARDC. It is hoped that these studies will be found useful and provide a broad framework in evolving a methodology for evaluating benefits from agricultural development schemes.

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9 June 1977

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IMPORTANT SURVEY DATA

| Item | Unit | Assump- tions in the scheme | Borrower | Non-bor- |
|--|-----------------|--------------------------------------|-------------|------------------------|
| | | | beneficiary | rower be- neficiary |
| | 1 | 2 | 3 | 4 |
| I LAND | | | | |
| i) Total cultivated holding | Acres and cents | | 17.60 | 16.19 |
| ii) Area of the plot in which well is situated | „ | | 6.24 | 12.23 |
| iii) Area actually irrigated by investment | | | | |
| a) Net | „ | 8.00 | 4.94 | 2.29 |
| b) Gross | „ | 15.00 | 5.61 | 4.05 |
| II BENEFITED AREA | | | | |
| A) Crop Data | | | | |
| i) Cropping intensity | Per cent | 188 | 114 | 177 |
| ii) Cropping pattern of important crops (Gross cropped area) | | | | |
| a) Jowar | Acres and cents | 10.00 | 2.98 | 0.96 |
| b) Paddy | „ | 1.50 | 0.27 | 0.07 |
| c) Groundnut | „ | 1.00 | 0.28 | 0.12 |
| d) Chillies | „ | 1.50 | 0.07 | 0.01 |
| e) Sugarcane | „ | 1.00 | 0.38 | 0.55 |
| B) Farm Receipts and Expenditure | | | | |
| i) Per acre of net cropped area : | | | | |
| a) Value of gross produce | Rs. | 1,164 | 937 | 3,071 |
| b) Cost of cultivation | „ | 748 | 293 | 736 |
| Of which seeds, fertilizers, manures and pesticides | „ | | 121 | 414 |

| Item | Unit | Assump- | Borrower | Non-bor- | |
|---|----------|---------------------------|-------------|------------------------|---|
| | | tions in the scheme | beneficiary | rower be- neficiary | |
| | | 1 | 2 | 3 | 4 |
| c) Net farm income@ | Rs. | 416 | 655 | 2,342 | |
| d) Incremental income | „ | 219 | 520 | 2,207 | |
| ii) Per cultivator: | | | | | |
| a) Value of gross pro- duce | „ | 9,310 | 4,631 | 7,043 | |
| b) Cost of cultivation Of which seeds, fertilizers, manu- res and pesticides | „ | 5,982 | 1,446 | 1,687 | |
| c) Net farm income @ | „ | | 598 | 949 | |
| d) Incremental income | „ | 3,328 | 3,235 | 5,370 | |
| | „ | 1,755 | 2,569 | 5,054 | |
| III INVESTMENT DATA | | | | | |
| i) Cost of investment: | | | | | |
| a) Well | „ | 4,500 | 5,902* | 6,091* | |
| b) Pumpset | „ | 3,500 | 3,164+ | 2,595+ | |
| c) Total | „ | 8,000 | 9,066 | 8,686 | |
| ii) Amount financed by LDB: | | | | | |
| a) Well | „ | | 4,957 | | |
| b) Pumpset | „ | | 3,465 | | |
| c) Total | „ | | 8,422 | | |
| IV FEASIBILITY TESTS | | | | | |
| i) Net present worth | „ | | 13,210 | | |
| ii) Benefit-cost ratio | | | 1.58 | | |
| iii) Internal rate of return | Per cent | | 29 | | |
| V REPAYMENT CAPACI- TY AND ACTUAL RE- PAYMENTS | | | | | |
| i) Repayment capacity | Rs. | 1,828 | 2,047 | | |
| ii) Total amount repaid | „ | | 686 | | |
| Of which : | | | | | |
| a) Towards LDB loan | „ | 1,260 | 558 | | |
| b) Towards amount borrowed during the year | „ | | 80 | | |
| c) Towards other debts | „ | | 48 | | |

@ Inclusive of net income from sale of water.

* Inclusive of ring, pipelines, etc.

+ Inclusive of accessories, deposit with State Electricity Board, pump foundation and switchroom, etc.

SUMMARY AND CONCLUSIONS

The minor irrigation scheme in the four talukas viz. Sangola, Akkalkot, North Sholapur and South Sholapur of Sholapur district related to the construction of new wells, renovation of old wells and installation of pumpsets thereon. The geographical area of the four talukas is 4.87 lakh hectares of which the net area sown in 1968 constituted 85 per cent. The average annual rainfall in the area ranges from 530 mm to 690 mm. The area covered is, therefore, semi-arid and is prone to drought conditions very frequently. The area experienced severe drought conditions during the three consecutive years 1970-71 to 1972-73, just prior to the year covered by the study, viz. 1973-74. Of the total net area sown of 4.13 lakh hectares in the four talukas in 1968, the net area irrigated was 0.36 lakh hectares of which the area irrigated by wells was 0.31 lakh hectares. Of the gross cropped area in 1968, 52 per cent was under jowar, followed by groundnut and bajra (about 11 per cent each). Of the gross cropped irrigated area of 0.39 lakh hectares, 44 per cent was under jowar, 11 per cent under wheat and 7 per cent under sugarcane.

ii) The Maharashtra State Co-operative Land Development Bank (LDB) submitted in 1968 a scheme to ARDC envisaging long-term finance to agriculturists in the above four talukas for construction of 330 new wells, renovation of 780 old wells and purchase of 1110 pumpsets for installation on these wells. The financial outlay of the scheme was worked out at Rs. 69.30 lakhs on the basis of average cost of Rs. 4,500 for new well, Rs. 2,000 for renovation of old well and Rs. 3,500 for pumpset; however, LDB was allowed in cases of genuine requirements to enhance the amount upto Rs. 6,000 for a new well, Rs. 2,500 for renovation of an old well and Rs. 4,000 for purchase of a pumpset, within the overall outlay of the scheme. The rate of interest charged to the ultimate borrower was 8½ per cent. No interest was to be paid in the first year and in the second year the interest was to be paid for the first two years with interest at 4 per cent on the deferred first year's interest. Principal and interest were to be repaid in 10 equated annual instalments from third year onwards. The

normal concessions such as subsidy to small-holder cultivators given under *Taccavi* scheme were also to be made available to the cultivators coming under the scheme.

iii) The economics of the scheme was worked out on the representative holding of 8 acres. The cropping pattern assumed 3 acres each under jowar and groundnut and 2 acres under bajra before investment. The gross cropped area was assumed to increase to 15 acres after investment with about two-thirds of the area under jowar and the remaining area under paddy, groundnut, chillies and sugarcane. The cropping intensity was assumed at 188 per cent. The cost of cultivation was assumed at 29 per cent of the value of gross produce before investment and at 64 per cent after investment. The incremental income in the area benefited by the investment was assumed at Rs. 1,755 or Rs. 219 per acre of net cropped area. The equated annual instalment of principal and interest towards repayment of loan of Rs. 8,000 was assumed at Rs. 1,260 from the third year onwards.

iv) ARDC agreed to subscribe to the special development debentures to be floated by the LDB from time to time subject to the limit of 90 per cent of each issue of the above debentures with the stipulation that ARDC's aggregate contribution would not exceed Rs. 62.37 lakhs and the balance would be contributed by the State Government. While sanctioning the scheme, ARDC stipulated following conditions among others:

a) The spacing between two wells should not be less than 300 metres; and

b) Diameter of a well should be about 30 to 40 ft.

v) The scheme was implemented by the LDB during 1969-70 to 1972-73 and by the close of the scheme, loans amounting to Rs. 41.55 lakhs were given to cultivators for construction of 308 new wells, renovation of 472 old wells and purchase of 480 pumpsets for installation on the 129 new wells and the 351 renovated wells. The scope of the evaluation study was, however, restricted to 129 cultivators in the 69 villages of the four talukas who availed of composite loans under the scheme for construction of new wells and installation of pumpsets there-

on. The loan amount disbursed to these 129 cultivators accounted for nearly 26 per cent of the total amount disbursed under the scheme.

vi) A two stage random sampling design was adopted with village as the first stage unit and cultivator as the second stage unit. A sample of 22 villages was selected and all the 59 cultivators from these villages who availed of the composite loan under the scheme were selected for the field study. For the purpose of working out the incremental income arising out of the investment to the borrower beneficiaries detailed data were to be collected from the borrower beneficiaries to arrive at the net farm income from the benefited area in the pre-investment period. However, these details were not obtained from the borrower beneficiaries since the recall period was long and they were not likely to remember all the activities in the farm. Instead, a control sample of cultivators cultivating only rainfed area (rainfed area cultivators) was selected to reflect the position of the borrower beneficiaries in the pre-investment period. Besides, a sample of cultivators who had undertaken similar investment on their own during the period of the scheme, i.e., non-beneficiary cultivators with similar investment (non-borrower beneficiaries), was also selected for comparative analysis. A sample of 16 non-borrower beneficiaries and a sample of 45 rainfed area cultivators were selected for the purpose of the study. A general schedule in four parts was canvassed among the selected cultivators and farm data and other particulars were collected for the reference year 1 July 1973 to 30 June 1974.

vii) The data emerging from the study and the results therefrom are subject to limitations such as the pilot nature of the study and after-effects of the drought spell in the earlier three consecutive years felt in the reference year.

viii) In the course of the field investigations it was found that of the 59 borrower beneficiaries selected for the study, 20 appeared to have not utilized the loan taken for the composite investment. A loan borrowed under the ARDC scheme is taken for the purpose of the study as not utilized, if the cultivator did not use the composite investment for irrigation pur-

poses during the reference period for reasons such as well not dug and pumpset purchased but not installed on the well covered by the scheme. Hence, the discussions on the feasibility of investment, etc. are based on the data relating to the 39 borrower beneficiaries who had undertaken the investment.

ix) The salient features of the results of the study based on the 39 borrower beneficiaries who had undertaken the investment are as follows :

1. The total cultivated holding of the average borrower beneficiary was 17.60 acres. The area of the plot in which the well was situated was 6.24 acres of which 4.94 acres was irrigated by the well during the reference year.

2. The economics of the minor irrigation scheme assumed that a dugwell with a pumpset installed thereon would irrigate a representative holding of 8 acres. However, data collected by the Exploratory Tubewells Organization of the Government of India indicated that in the region of the scheme area, a well with a pumpset thereon could irrigate on an average 6 acres of land in winter and $1\frac{1}{2}$ acres in summer. According to a study conducted in 1967-68 in Sholapur district, the average net area irrigated per well was 5.86 acres. For the borrower beneficiary in the present study the average net area irrigated through a dugwell worked out to nearly 5 acres. These data suggest that the average net area that could be irrigated by the investment in the region would be around 6 acres and hence the assumption under the economics of the scheme of 8 acres appeared to be on the high side.

3. The gross cropped benefited area of the average borrower beneficiary was 5.61 acres of which 53 per cent was under jowar; the cropping intensity was 114 per cent. The average non-borrower beneficiary irrigated a net area of 2.29 acres and attained a cropping intensity of 177 per cent. The cropping intensity of 188 per cent assumed in the economics of the scheme in the post-investment period thus appeared to be higher than that achieved by the average borrower beneficiary.

4. The value of gross produce per acre of net cropped benefited area in the case of non-borrower beneficiaries was more

than three times that of the borrower beneficiaries and the cost of seeds, fertilizers and manures used per acre of net cropped area by the former category of cultivators was higher than that used by the latter category of cultivators. These appeared to show that an average non-borrower beneficiary was more enterprising. It is also likely that the loan liability being less for them than for the borrower beneficiaries, they could divert more funds for improved methods of cultivation.

5. The cost of cultivation of the average borrower beneficiary in the benefited area in the post-investment period was 31 per cent of the value of gross produce. The cost of cultivation after investment assumed at 64 per cent of the value of gross produce thus seemed to have been over-estimated. This appeared to be on account of unrealistic assumptions made in the economics of the scheme regarding area irrigated by investment, cropping intensity, cropping pattern, etc.

6. Incremental income per acre of net cropped area worked out to Rs. 520 for the borrower beneficiaries. The per acre incremental income of the non-borrower beneficiaries at Rs. 2,207 was significantly higher than that of the borrower beneficiaries. In the case of non-borrower beneficiaries the area benefited by investment was comparatively small and the cropping intensity was relatively high and as a result these cultivators benefited more by way of per acre incremental income.

7. The net present worth (NPW), benefit-cost ratio (BCR) and internal rate of return (IRR) worked out on the basis of data collected in the study to assess the financial feasibility of the investment showed that the investment was worthwhile.

8. The repayment capacity worked out after making allowance for increased consumption was Rs. 2,047 for the average borrower beneficiary. Though the annual instalment towards the principal and interest on the LDB loan was Rs. 1,284 for the average borrower beneficiary, the amount actually repaid by him towards the LDB loan during the reference year was only Rs. 558. The repayment capacity of the average borrower beneficiary was found to be in excess of the total repayments

made towards LDB and other loans during the year. While interpreting the phenomenon of wide margin between the repayment capacity and the amount repaid, one has to bear in mind that the scheme area experienced severe drought conditions for three consecutive years just prior to the reference year and the incremental income and the repayment capacity were worked out under certain assumptions. It is possible that the allowance for increased consumption provided while working out the repayment capacity was on the low side and required upward revision because of pent-up demand due to drought conditions of the earlier years and thereby lowering the repayment capacity.

9. As per the data collected on employment, it is found that an estimated 1,700 man days of employment was created in constructing a new well and a further 61 man days per acre of benefited area or about 300 man days per investment was created per year from increased farm activities.

10. The average borrower beneficiary incurred an expenditure of Rs. 5,902 on construction of a new well (including pipelines, etc.) and Rs. 3,164 on purchase of a pumpset (inclusive of accessories and deposit with the State Electricity Board, pump foundation, switchroom, etc.), the total expenditure on the composite investment working out to Rs. 9,066. Similar expenditure incurred by the average non-borrower beneficiary on a well was Rs. 6,091 and on a pumpset Rs. 2,595 and the total expenditure thus amounted to Rs. 8,686.

11. About 93 per cent of the total cost of investment of the average borrower beneficiary was financed through borrowings from the LDB under the scheme. Out of the 39 wells, 24 wells were circular and the rest were either square or rectangular in shape. The cross sectional area of 28 wells was more than 700 sq. ft. corresponding to a diameter of 30 ft. or more which was the minimum diameter of the well assumed under the scheme. All the wells had depth of less than 50 ft.; depth of 5 wells ranged from 40 to 50 ft, of 24 from 25 to 40 ft. and of 10 less than 25 ft. 28 borrower beneficiaries reported the wells to be incomplete mainly in respect of two items, viz., excavation of the well to the required depth and construction of parapet

wall and/or cement coping. The total amount required to complete the incomplete work was reported to be more than Rs. 2,000 on an average.

12. The data on time taken at various stages of disbursement of the LDB loan amount showed that the LDB took on an average more than 5 months from the date of application to sanction of the loan, about 3 months more for disbursing the first instalment from the date of sanctioning the loan and about 15 months more for disbursing the last instalment thereafter.

13. In a drought prone area, the danger of misutilization is always greater on account of the risk involved in sinking a well in hard rock areas without a dependable picture about the availability of groundwater. The best course of action is to ensure timely technical guidance and intensive supervision at the time of execution of the works.

14. It is hoped that the findings of this evaluation study would provide a more realistic basis for the preparation and implementation of the schemes of this type in future in areas prone to drought conditions.