

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.

1.5 Jowar is grown extensively in these four talukas. In 1968, 52 per cent (2.21 lakh hectares) of the gross cropped area was under jowar followed by groundnut (11.8 per cent) and bajra (11.0 per cent). The total gross area irrigated was 0.39 lakh hectares in these four talukas. The gross cropped area irrigated under jowar was 0.17 lakh hectares (43.6 per cent) followed by wheat (11.2 per cent) and sugarcane (7.2 per cent).

1.6 In 1968, the total number of wells existing in these four talukas was 25,426 of which 23,578 wells were used for irrigation purposes. The net area irrigated in 1968 by the 23,578 wells in these four talukas was 30,847 hectares. A majority of these wells (13,561) were in Akkalkot taluka. Of the 1,848 wells not in use, 1,622 wells (88 per cent) were in Sangola taluka.

The Scheme

1.7 The Maharashtra State Co-operative Land Development Bank (LDB) submitted in 1968 a scheme envisaging long-term finance to agriculturists in the four talukas of Akkalkot, Sangola, North and South Sholapur of Sholapur district for construction of 330 new wells, renovation of 780 old wells and purchase of 1,110 pumpsets for installation on these wells. The scheme was originally to be implemented in 1968 and 1969. Under this scheme, the entire work of construction of new wells, repairs to old wells and installation of pumpsets thereon was to be carried out by the concerned agriculturists themselves. However, the cultivators were to be guided in the selection of sites of new wells by the technical staff of the State Government and the LDB and necessary technical advice regarding construction/repairs and improvement to the existing wells and installation of pumpsets was also to be provided by them. The Government and the LDB were also to ensure provision of construction materials like cement, electricity connection and inputs like improved seeds, fertilizers, etc., on a priority basis to the participating cultivators.

1.8 In this connection, the Chief Groundwater Survey Officer of the State Agriculture Department carried out a quick survey in the four talukas of Sholapur district and recommended the sites favourable for digging new wells to the LDB. These wells

were expected to have yields of 10,000 to 30,000 gallons/day or even more during *kharif* season, about 8,000-20,000 gallons/day or even more during *rabi* season and 5,000-15,000 gallons/day or even more during summer.

1.9 ARDC stipulated a condition while sanctioning the scheme for refinance that the spacing between two wells should not be less than 300 metres and that the diameter of a well should be about 30 to 40 feet. The depth of a well was expected to range between 50 to 60 feet.

1.10 The financial outlay of the scheme at Rs. 69.30 lakhs was calculated on the basis of an average cost of Rs. 4,500 per new well (construction), Rs. 2,000 per old well (renovation) and Rs. 3,500 per pumpset. To meet certain contingencies and cases of genuine hardships, the LDB was allowed to enhance the amount of loan to individual cultivator subject to the maximum of Rs. 6,000 for a new well, Rs. 2,500 for renovation of old well and Rs. 4,000 for purchase of a pumpset, within the overall financial outlay of the scheme. The normal concessions such as subsidy to small holder cultivators given under *Taccavi* scheme were also made available by the State Government to the cultivators coming under this scheme.

1.11 The security for the loan was to be first mortgage of the land owned by the loanee-cultivator. The practice of the LDB was to arrive at the value of the land at 500 times the land revenue assessment which usually was rupee one per acre. To the value so arrived, the LDB added the full cost of development and of this 50 per cent was advanced as loan. Where the cultivator could not give sufficient security to cover the loan amount issued even on this basis but the work was considered to be economic, the State Government stood guarantee for the losses that might arise due to the deficit in security.

1.12 The rate of interest charged to the ultimate borrower was 8½ per cent per annum though the economics of the scheme was worked out on the basis of interest rate at 9 per cent per annum.

1.13 The economics of the scheme was worked out on certain basic assumptions regarding the area that could be brought

under the command of a well and pumpset, the cropping pattern before and after the investment, per acre yields, price per unit of crops produced, per acre cost of cultivation, family expenses, etc. The economics of the scheme assumed that it would take 12 years for the borrower beneficiary to clear the debt burden. Since the construction of a well takes time (about a year), the cultivator would start getting full benefits of the investment from the second year onwards. During the first year he was not required to pay any interest while during the second year he was required to pay the interest for the first two years with interest on the deferred first year's interest at 4 per cent. Beginning with the third year he was required to repay the principal and interest in 10 equated annual instalments.

1.14 The estimated outlay on the scheme was placed at Rs. 69.30 lakhs. 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 a stipulation that ARDC's aggregate contribution would not exceed Rs. 62.37 lakhs and the balance would be contributed by the State Government.

1.15 Though originally the ARDC scheme was to be completed during the years 1968* and 1969*, due to certain reasons, the scheme targets envisaged earlier had to be scaled down and the scheme rescheduled. The LDB had also sanctioned single purpose loans for construction of new wells and renovation of old wells, under their normal scheme. In view of the difficulties experienced in attaining the envisaged programme under the ARDC scheme, such sanctioned loans were transferred to the ARDC scheme. The scheme thus implemented during 1969-70 to 1972-73 consisted of a sizeable number of single purpose loans also.

1.16 Loans sanctioned to the cultivators are advanced in two instalments. Before receiving the first instalment of the loan, the borrowing cultivator has to give an undertaking that the well would be constructed or repaired within 12 months from the date of receipt of the first instalment of the loan and that

* These were subsequently modified to the co-operative year.

the amount of the first instalment would be fully utilized within a period of six months from the date of receipt of the same. The cultivator could grow any crops on an area of not less than 2 acres of land under the command of the well for at least three consecutive years after completion of the well. In order to get the second instalment, the loanee-cultivator has to obtain a certificate in a prescribed form from the concerned State Government official or the LDB's Inquiry Officer. This certificate gives the details of the survey number in which the well is dug, the diameter and the depth of the well on the date of inspection by the official concerned and estimated value of works done.

1.17 When the newly dug well is in such a condition that it can never be used for irrigation purposes either on account of salinity or insufficiency of water or any other cause, the well is treated as a failed well. Concessions in the form of remission of total interest and/or remission of 20 per cent of the outstanding loan, are granted for failed wells. Generally, 1 per cent of the wells come under the category of failed wells. In individual cases of hardships, remission of the amount of loan upto 50 per cent or even more is permitted when it is found that the concerned cultivator is not in a position to bear the expenditure on the construction of the well which has failed on account of his indigent circumstances and due to factors beyond his control.

1.18 The subsidy equivalent to 25 per cent of the actual cost of construction of a new well subject to the maximum of Rs. 500 per well, is granted to small holders provided that the small holder borrower has constructed the new well within the stipulated period of twelve months from the date of receipt of the first instalment and irrigated an area of not less than 2 acres of land under the command of the well for atleast three consecutive years after completion of the well. For this purpose, a small holder is defined in terms of Section 2(29) of the Maharashtra Agricultural Lands (Ceiling on Holding) Act, 1961, as an agriculturist cultivating less than one-ninth of the ceiling area and earning his livelihood principally by agriculture or by agricultural labour. The subsidy is in the form of

remission of an equivalent amount of loan advanced, and is first sanctioned provisionally. On the provisional sanction of the subsidy and disbursement thereof to the LDB by the State Government, the amount of subsidy is immediately adjusted by the LDB to the overdue loan instalment of the borrower or the loan instalment next falling due, as the case may be, without waiting for the receipt of the full and final completion certificate to be issued in this behalf by the Government official concerned. The final payment of subsidy on completion of well capable of irrigating the stipulated area calls for a thorough inspection of the well and irrigation potential created. For failure to irrigate the stipulated area, except in circumstances beyond the control of the cultivator, e.g. area affected by famine, well water unsuitable for irrigation, etc., the LDB would start recovery proceedings against the cultivator and the amount recovered, if any, would be adjusted towards subsidy immediately. The amount of subsidy recovered and adjusted as above by the LDB is then refunded to the Government.

1.19 Loans for purchase of new oil engines, electric motors, etc., are granted by the LDB subject to a maximum limit of Rs. 4,000 per oil engine/electric motor and pumpset. The loan is not given in cash but the LDB issues a certificate to the borrower to the effect that loan not exceeding a particular amount will be disbursed in his favour for purchase of oil engine/electric motor and pumpset. The borrower produces the certificate to any authorised agent of the manufacturer on the approved list maintained by the Government and gets the equipment.

1.20 Subsidy at a rate of 25 per cent of the cost of oil engine/, electric motor, pumpsets and accessories, exclusive of taxes, etc., subject to the maximum limit of Rs. 800 in each individual case, is granted to small-holder cultivators provisionally, immediately after completion of the installation of the pumpset and putting it into use for irrigation purposes. The terms and conditions of the subsidy are similar to those under the well scheme.

1.21 During the operation of the normal scheme for wells and pumpsets of the LDB, it was noticed that due to large-scale misutilization of loans granted by the LDB, the purpose

for which the loans and subsidies were granted was defeated. The issue of wrong certificates without on the spot verification of the work done by the supervisory staff of the LDB and the concerned government officials was one of the main factors in such cases. In order to minimise the misutilization of loans to the extent possible, the Government had directed in 1965 that the completion certificates issued by the supervisory staff and the extension officers should be rechecked by the superior staff of the LDB, before disbursing further instalment of the loan. The Government had also directed that the LDB should take effective steps to recover the dues from the concerned cultivators and also take follow-up action against the staff concerned.

CHAPTER 2

METHODOLOGY OF THE STUDY

Sampling Frame

The data on physical and financial targets and achievements under the scheme taken up for the study in Sholapur district are presented in Table 2.1.

It is observed that though originally the programme envisaged construction of 330 new wells, renovation of 780 old wells and installation of 1,110 pumpsets thereon, loans for only 308 new wells, 472 old wells and 480 pumpsets were disbursed upto the close of the scheme in 1972-73. Since the object of giving a composite loan for a well and pumpset was to enable the cultivator to bring larger irrigated area under the command of the well, the final achievement of disbursing only 480 loans for pumpsets showed that only about 43 per cent of the originally envisaged target could be achieved. This is inevitable in a scheme of this nature as the progress depends mainly on the farmers' initiative and their loan absorptive capacity and competence to utilize the loan. Out of the 480 pumpsets mentioned above, 129 pumpsets were installed on new wells and the remaining 351 pumpsets on old wells. Thus, 179 loanees for new

Table 2.1 : FINANCIAL AND PHYSICAL TARGETS AND ACHIEVEMENTS

Type of investment	Targets		Achievements	
	Financial (Rs.in lakhs)	Physical (Number)	Financial (Rs.in lakhs)	Physical (Number)
	1	2	3	4
New wells	14.85	330	13.61	308
Renovation of old wells	15.60	780	10.45	472
Pumpsets	38.85	1110	17.49	480@
Total :	69.30		41.55	

@ Out of these 480 pumpset loanees, 129 pumpset loanees are included in 308 loanees for new wells and 351 are included in 472 loanees for renovation of old wells; thus, 179 loanees for new wells and 121 for renovation of old wells did not avail of loans for purchase of pumpsets.

wells and 121 loanees for renovation of old wells did not avail themselves of the loans for purchase of pumpsets.

2.2 Loans disbursed at Rs. 41.55 lakhs accounted for nearly 60 per cent of the original target of Rs. 69.30 lakhs envisaged under the scheme. Out of the amount of Rs. 41.55 lakhs, Rs. 10.45 lakhs and Rs. 12.74 lakhs were disbursed for 472 cases of renovation of old wells and installation of pumpsets on 351 of the renovated wells, respectively. Similarly Rs. 13.61 lakhs and Rs. 4.75 lakhs were disbursed for construction of 308 new wells and installation of pumpsets on 129 of the new wells, respectively.

2.3 Since the borrower beneficiaries availing themselves of composite loans for renovation of old wells and installation of pumpsets thereon were likely to irrigate land in which the old wells were located by other traditional means in the pre-investment period, it was felt that the benefits (measured in terms of incremental income) accruing to such borrower beneficiaries would be considerably less and that these benefits could not be compared with the benefits accruing to those borrower beneficiaries availing of the composite loans for constructing new wells and installation of pumpsets thereon. Similarly the area brought under the command of a well (new/old) without a pumpset would be considerably less. Thus, in view of the inherent disparities in the incremental income that could be derived by the borrower beneficiaries of old wells with pumpsets and those who availed of loans for wells only, it was decided to limit the scope of the evaluation study to those borrower beneficiaries who had availed of the LDB loans for the composite investment of construction of new wells and installation of pumpsets thereon.

2.4 A village-wise list of borrower beneficiaries who had borrowed for this type of composite investment was obtained from the LDB and a sample of 59 borrower beneficiaries was selected. The total amount disbursed for the composite investment of 129 new wells and pumpsets thereon worked out to Rs. 10.82 lakhs and constituted about 26 per cent of the total loans disbursed under the scheme. The sample of 59 borrower beneficiaries selected for the study out of the above 129 borro-

wer beneficiaries availed themselves of loans amounting to Rs. 2.98 lakhs for new wells and Rs. 2.24 lakhs for pumpsets; the total amount of composite loans disbursed to the 59 selected borrower beneficiaries accounted for nearly 13 per cent of the total amount disbursed under the minor irrigation scheme as a whole and about 48 per cent of the total amount disbursed to 129 borrower beneficiaries for the composite investment.

2.5 For the purpose of the study, the following definitions have been adopted :

i) *A borrower beneficiary* is a cultivator who had taken the composite loan from the LDB for the construction of a new well and installation of a pumpset thereon under the relevant provisions of the ARDC scheme taken up for the study.

ii) *A non-borrower beneficiary* is a cultivator who had not borrowed under the ARDC scheme but had invested in the construction of a new well and installation of a pumpset thereon on his own through some other source of finance during the period covered by the ARDC scheme.

iii) *A rainfed area cultivator* is one who had neither borrowed under the ARDC scheme nor had irrigated any part of his cultivated holding by any source of irrigation during the year 1973-74.

iv) *Reference year for the study* means the period from 1 July 1973 to 30 June 1974.

v) *Period of the ARDC scheme* means the period 1969-70 to 1972-73, during which loans under the ARDC scheme were disbursed by the LDB in the four talukas of Sholapur district.

vi) A loan borrowed under the ARDC scheme is taken as 'not utilized' for the purpose of the study, if the cultivator did not use the composite investment for irrigation purposes during the reference period for reasons such as well not dug and pumpset purchased but not installed on the well covered by the scheme.

Selection of Villages

2.6 For the present evaluation study, a two stage random sampling design was adopted, with village as the first stage

unit and borrower beneficiary/non-borrower beneficiary as the second stage unit. From the village-wise list of borrower beneficiaries for the composite investment, supplied by the LDB, it was found that there were in all 129 such borrower beneficiaries from 69 villages in the four talukas covered in the scheme under study. These 69 villages were classified into following three categories :

Category A : Villages with one borrower beneficiary only (39 villages).

Category B : Villages with two borrower beneficiaries only (13 villages).

Category C : Villages with more than two borrower beneficiaries (17 villages).

A sample of 22 villages, six villages each from Category A and Category B and 10 villages from Category C, was selected for the study. These villages under each category were allocated to the four talukas, viz. Akkalkot, Sangola, South Sholapur and North Sholapur, in proportion to the number of beneficiary villages in each taluka. The villages in a taluka under the category were selected at random.

Selection of Cultivators

2.7 All the borrower beneficiaries from the selected 22 villages were covered for the study. For assessing the net benefits accruing from the investment to the ultimate borrower beneficiaries, it was necessary to obtain the pre-investment position of the selected borrower beneficiaries. However, a large number of borrower beneficiaries had availed themselves of the first instalment of the loan for digging a new well in 1969-70 and, as such, collecting precise data on pre-investment position from these borrower beneficiaries would have posed a problem because of long recall period. In order to circumvent this difficulty, a sample of cultivators of corresponding size group of land holdings who did not borrow under the scheme and cultivated only rainfed area in the reference year was selected from the selected villages. This sample of rainfed area cultivators, therefore, was taken to yield norms for the pre-investment

period under the presumption that the position of the borrower beneficiaries would have been the same as that of rainfed area cultivators, if they had not undertaken the investment.

2.8 In addition to this sample of rainfed area cultivators, another sample of non-borrower beneficiaries who had constructed on their own a new well and installed a pumpset thereon during the period of the ARDC scheme was also selected with a view to obtaining the comparative picture of benefits accruing from the composite investment to such non-borrower beneficiaries and to the selected borrower beneficiaries. The underlying point was to find out to what extent the borrower beneficiaries have realized the benefits of investment as compared with non-borrower beneficiaries.

2.9 For the selection of non-borrower cultivators, all the cultivators in the selected villages were listed in the Listing Schedule and separate lists were prepared for non-borrower beneficiaries and for rainfed area cultivators. Originally, it was planned to select a sample of non-borrower cultivators from all the 22 selected villages; however, non-borrower cultivators were selected from only 13 of the above villages. A sample of four cultivators was to be drawn from each of the lists of non-borrower beneficiaries and rainfed area cultivators of a village. In some of the villages, however, the requisite number of non-borrower cultivators could not be obtained and hence in the final sample, 16 non-borrower beneficiaries and 45 rainfed area cultivators were selected.

Schedule Canvassed for the Study

2.10 For the purpose of the study, a General Schedule in four parts was canvassed to selected cultivators. Information on land cultivated, assets and liabilities as on 30 June 1973, changes in assets after investment and capital expenditure during the reference year and the size of the household as on 30 June 1973 was covered in Part I. The details of composite investment and corresponding loan and overdues of the borrower beneficiaries were collected in Part II of the General Schedule. Detailed information on cropping pattern, gross produce, cost of cultivation and cash receipts from other sources, etc. during the

reference year was obtained in Part III. Miscellaneous information on improved farm practices adopted during the reference year by the selected cultivators, plans for development of the existing holding and undertaking new ancillary activities in farm business during the year 1974-75, etc., was covered in Part IV.

Estimation Procedure

2.11 The estimation procedure adopted for the study is as follows :

Let X_{ijkl} stand for the value of the characteristic X for the i^{th} cultivating household of k^{th} village of j^{th} taluka of i^{th} category of villages. Then, an unbiased estimate of the characteristic for borrower beneficiaries is given by :

$$\bar{X} \dots = \frac{1}{H} \sum_{i=1}^3 \sum_{j=1}^4 \frac{N_{ij}}{n_{ij}} \sum_{k=1}^M H_{ijk} \frac{1}{h_{ijk}} \sum_{l=1}^M X_{ijkl}$$

where :

H = Estimated total number of borrower beneficiaries covered by the scheme.

$$= \sum_{i=1}^3 \sum_{j=1}^4 \frac{N_{ij}}{n_{ij}} \sum_{k=1}^M H_{ijk}$$

N_{ij} = Number of villages from j^{th} taluka of i^{th} category,

n_{ij} = Number of villages selected in the sample from j^{th} taluka of i^{th} category,

H_{ijk} = Number of borrower beneficiaries from k^{th} village of j^{th} taluka of i^{th} category,

h_{ijk} = Number of borrower beneficiaries selected in the sample from k^{th} village of j^{th} taluka of i^{th} category.

The corresponding estimates for non-borrower beneficiaries and those with rainfed area cultivators are given by :

$$\bar{X}' \dots = \frac{\sum_{i=1}^3 \sum_{j=1}^4 \frac{N_{ij}}{n_{ij}} \sum_{k=1}^{n_{ij}} H'_{ijk} \frac{1}{h'_{ijkl}} \sum_{l=1}^{h'_{ijk}} X'_{ijkl}}{\sum_{i=1}^3 \sum_{j=1}^4 \frac{N_{ij}}{n_{ij}} \sum_{k=1}^{n_{ij}} H'_{ijk}}$$

where :

H'_{ijk} = Total number of non-borrower/rainfed area cultivators of k^{th} taluka of j^{th} village of i^{th} category.

Limitations of Data

2.12 While analysing the data emerging from the study and generalizing the results, the following limitations have to be borne in mind :

- i) For three consecutive years preceding the reference year, the four talukas covered by the evaluation study experienced severe drought conditions. As revival of the economy to normalcy after such a long spell of drought conditions takes considerable time, the after-effects of the drought spell appeared to have been felt in the reference year. Hence, the reference year cannot strictly be taken as a normal year;
- ii) This evaluation study, as already indicated, is a pilot study and confined to only those borrowers who had taken composite loans from the LDB for digging a new well and installing a pumpset thereon;
- iii) While canvassing the General Schedule to the 59 borrower beneficiaries, 20 loans appeared to have not been utilized for the purpose for which the loan was availed of. As such cases could not be ascertained earlier, the selection of the borrower beneficiaries was done on the assumption that all those taking the composite loan under the scheme had undertaken the in-

vestment. The data presented in Chapter 3 relate to those borrower beneficiaries who had undertaken the investment, while the data presented in Chapter 4 relate to all borrower beneficiaries irrespective of whether they had undertaken the investment or not; and

iv) The sample of 59 borrower beneficiaries was selected from 22 villages; however, the 39 borrower beneficiaries who had actually utilized the loan for the purpose for which it was availed of were from 18 villages. Further, non-borrower beneficiaries were selected from only 13 of the above 22 villages. Under the circumstances, the estimates for non-borrower cultivators are not strictly comparable with those of borrower beneficiaries though a rough comparison could be attempted.

CHAPTER 3

ASSUMPTIONS UNDER ECONOMICS OF THE SCHEME VIS-A-VIS RESULTS OF EVALUATION STUDY

Net Area Irrigated under the Investment

The economics of minor irrigation scheme under study assumed that a dugwell with a pumpset installed thereon would irrigate a representative holding of 8 acres each in *kharif* and *rabi* seasons and 2 acres in summer. The term 'representative holding' connotes that portion of the total farm area which is likely to benefit directly from the proposed investment and generate incremental income.

3.2 The data available in the District Statistical Abstract, Sholapur, showed that in 1968, i.e. just prior to the ARDC scheme, the net area irrigated by 23,578 wells in the four talukas covered by the ARDC scheme was 30,847 hectares giving a net area of 3.24 acres irrigated by an average well. However, this average cannot be treated as a norm since the area brought under the command of the irrigation well depends on factors such as geology of the soil, mode or device used for lifting water from the well, availability of water during different seasons and in a year the prevalence or otherwise of drought condition. Data collected by the Exploratory Tube-wells Organization of the Government of India indicated that in the scheme region a well with a pumpset could irrigate on an average 6.00 acres of land in winter and 1½ acres in summer. According to the study, Production-and-Repayment-Capacity-Oriented Lending for Farm Investment, prepared by V. M. Jakhade and M. V. Gadgil, the average net area irrigated per well with a pumpset thereon in Sholapur district was 5.86 acres in 1967-68. These data suggest that, on an average, a dugwell with a pumpset thereon would irrigate a net area of about 6 acres and the assumption under the economics of the scheme of 8 acres appeared to be on the high side.

3.3 According to the survey data, the cultivated holding as on 30 June 1973 per borrower beneficiary who had undertaken the investment was 17.60 acres and the net area irrigated through the composite investment (i.e. the benefited area) was 4.94 acres (Table 3.1).

Table 3.1: SIZE OF CULTIVATED HOLDING AS ON 30 JUNE 1973 AND EXTENT OF IRRIGATION DURING 1973-74

(In acres per beneficiary)

Type of cultivator	Area of plot wherein well was located	Area irrigated by investment	Total cultivated holding
	1	2	3
Borrower beneficiaries	6.24	4.94	17.60
Non-borrower beneficiaries	12.23	2.29	16.19

The average area of the plot in which the well was located was found to be 6.24 acres. Considering the after-effects of severe drought conditions experienced in the three years preceding the reference year, and also the average area of the plot in which the well was located, the average net area that could be irrigated by the investment in the region would be around 6 acres.

3.4 The average size of the cultivated holding of the non-borrower beneficiaries at 16.19 acres was found to be slightly less than that of the borrower beneficiaries. The average net area irrigated by the investment reported by these cultivators was only 2.29 acres though the average area of the plot in which the well was dug was as much as 12.23 acres. The net area that could be brought under irrigation by the investment was reported to be 2.69 acres. The size of the well dug, availability of water, drought conditions of previous years, etc., might have contributed in varying degrees for the net area irrigated by the investment being low in the case of the average non-borrower beneficiary. One may also draw the inference that the irrigation capacity of wells constructed under the scheme was higher (which would also mean that the work done was

of relatively better standard) than that of those wells of non-borrower beneficiaries.

Cropping Intensity

3.5 The economics of the scheme assumed that by undertaking the investment the cultivators would be in a position to increase the cropping intensity by raising crops in three seasons. In the post-investment period, the scheme assumed that the gross cropped area under jowar would be 10 acres (3 acres during *kharif* and 7 acres during *rabi*), sugarcane as a perennial crop would occupy 1 acre throughout the year, paddy and chillies would be grown during *kharif* on $1\frac{1}{2}$ acres of land each and groundnut would be grown on 1 acre of land during summer. Thus, after investment, the cropping intensity as measured by the percentage of gross cropped area to net cropped area would be 188.

3.6 The data on cropping intensity for borrower beneficiaries who had undertaken the investment and non-borrower beneficiaries are given in Table 3.2.

Table 3.2 : CROPPING INTENSITY (BENEFITED AREA)

Type of cultivator	(Area in acres per beneficiary)		
	Net cropped area	Gross cropped area	Cropping intensity (Per cent)
	1	2	3
Borrower beneficiaries	4.94	5.61	114
Non-borrower beneficiaries	2.29	4.05	177

The cropping intensity in the benefited area of 4.94 acres for borrower beneficiaries worked out to 114 and in the benefited area of 2.29 acres for non-borrower beneficiaries it worked out to 177.

3.7 In this connection, it is pertinent to note that the relevant Resolutions of the Government of Maharashtra on wells scheme and on pumpsets scheme stipulated that the borrower beneficiaries should bring 2 acres of land under irrigation of

the well with a pumpset thereon for three consecutive years after completion of the investment but did not specify the cropping pattern. If the broad objectives of the schemes like the one under study are to be achieved, it appears necessary to stipulate the minimum net area to be brought under irrigation and the cropping pattern.

Cropping Pattern

3.8 The economics of the scheme assumed the following cropping pattern before and after the investment:

Table 3.3 CROPPING PATTERN ASSUMED

Crop	Pre-investment		Post-investment	
	Gross cropped area (Acres)	Percentage to total gross cropped area	Gross cropped area (Acres)	Percentage to total gross cropped area
	1	2	3	4
Jowar	3.00	37.50	10.00	66.67
Bajra	2.00	25.00	—	—
Groundnut	3.00	37.50	1.00	6.67
Paddy	—	—	1.50	10.00
Chillies	—	—	1.50	10.00
Sugarcane	—	—	1.00	6.67
Total:	8.00	100.00	15.00	100.00

The data relating to percentage of gross cropped area under different crops grown by the cultivators during 1973-74 in the irrigated and rainfed areas showed that if the cropping pattern in the unirrigated area of borrower beneficiaries is taken to represent that in the pre-investment period, the cropping pattern assumed in the economics of the scheme did not appear to be realistic. The gross cropped area under jowar was assumed to be 37.5 per cent of the total gross cropped area before investment, but actually the jowar crop accounted for about 75 per cent of the gross cropped area in the rainfed area of the borrower beneficiaries who had undertaken the investment. As much as 37.5 per cent of the gross cropped area was assumed to be under groundnut but the area under the crop in the rainfed

area of the borrower beneficiaries was negligible. Taking the cropping pattern of the rainfed area cultivators to represent the pre-investment position of borrower beneficiaries, it was found that about 60 per cent of the gross cropped area of such cultivators was under jowar and only 2 per cent under bajra; none of these rainfed area cultivators reported any area under groundnut.

3.9 The economics of the scheme assumed that after investment about 67 per cent of the gross cropped area would be under jowar followed by 10 per cent each under paddy and chillies and 7 per cent each under groundnut and sugarcane. The survey data of borrower beneficiaries revealed that of the gross cropped benefited area the percentage of gross cropped area under jowar was about 53, followed by about 7 under sugarcane and about 5 each under paddy and groundnut; the area under chillies was only about 1 per cent. In the post-investment period, the cropping pattern adopted on the benefited area by the borrower beneficiaries and non-borrower beneficiaries was quite different. About 53 per cent and 7 per cent of the total gross cropped area of the borrower beneficiaries in the benefited area were found to be under jowar and sugarcane, while the corresponding percentages were 24 and 14 for non-borrower beneficiaries.

Value of Gross Produce and Cost of Cultivation

3.10 The value of gross produce per acre of net cropped area and per cultivator are presented in Table 3.4. Though the average net irrigated area per borrower beneficiary actually undertaking the investment was nearly 5 acres as against 2.29 acres per non-borrower beneficiary, the value of gross produce per acre of gross cropped benefited area in the case of the latter was found to be more than double that of the former. Further, because of higher cropping intensity, the value of gross produce per acre of net benefited area for non-borrower beneficiaries was found to be substantially higher than that for borrower beneficiaries. As a result, the total value of gross produce per beneficiary in the benefited area for the latter group of beneficiaries was nearly one and half times that for the former group of beneficiaries.

3.11 The cost of seeds and fertilizers/manures used per acre of gross cropped area benefited through the investment at Rs. 97 and Rs. 137, respectively, for non-borrower beneficiaries was found to be higher than the corresponding cost at Rs. 49 and Rs. 55 for borrower beneficiaries. This appears to show that the non-borrower beneficiaries were more enterprising. It is also likely that the loan liability being less for them when compared with that of the borrower beneficiaries, they could divert more funds for improved methods of cultivation. Also, from the fact that more than 60 per cent of the non-borrower beneficiaries possessed irrigation wells even prior to June 1969 as against about 40 per cent of the selected borrower beneficiaries who had completed the investment, it could be inferred that the former had longer experience of irrigated farming and their cropping pattern and farming techniques were relatively better stabilized.

3.12 The economics of the scheme assumed that in the pre-investment period the value of total gross produce from the representative holding of 8 acres would be Rs. 2,208 and after allowing for the cost of cultivation at Rs. 635, the net income would be Rs. 1,573. During the post-investment period, the total value of gross produce from the same representative holding of 8 acres was expected to be Rs. 9,310 and after allowing for the cost of cultivation of Rs. 5,982, the net income was estimated at Rs. 3,328. Thus, the economics of the scheme assumed the cost of cultivation at about 29 per cent and 64 per cent of the corresponding total value of gross produce in the pre-investment and post-investment period.

3.13 Data on farm receipts, cost of cultivation and net income per cultivator and per acre of net cropped area are presented in Table 3.4 on next page.

The cost of cultivation for rainfed area cultivators worked out to about 20 per cent of the total value of gross produce; the corresponding percentage for the benefited area of borrower beneficiaries and non-borrower beneficiaries was 31 and 24, respectively. Thus, if the cost of cultivation for rainfed area cultivators is taken to reflect the cost in the pre-investment period and that on benefited area is taken to reflect the cost in the

Table 3.4 : FARM RECEIPTS, COST OF CULTIVATION AND NET FARM INCOME.

(Amount in Rs.)

	Benefited Area		Rainfed Area	
	Borrower beneficiaries	Non-borrower beneficiaries	Borrower beneficiaries	Rainfed area cultivators
	Average Per Cultivator			
1. Value of gross produce	4631	7043	2832	2043
2. Cost of cultivation	1446	1687	504	406
3. Net income from farm	3185	5356	2328	1636
4. Net income from custom service	50	14	—	—
5. Total net income	3235	5370	2328	1636
	Average Per Acre of Net Cropped Area			
1. Value of gross produce	937	3071	260	169
2. Cost of cultivation	293	736	46	34
3. Net income from farm	644	2336	214	135
4. Net income from custom service	11	6	—	—
5. Total net income	655	2342	214	135

post-investment period of the borrower beneficiaries, it appears that the cost of cultivation assumed in the economics of the scheme before and after investment was over-estimated. This appeared to be on account of unrealistic assumptions regarding area irrigated by investment, cropping intensity, cropping pattern, etc.

3.14 As already indicated above, the economics of the scheme assumed that on 8 acres of representative holding, the net farm income would be Rs. 1,573 in the pre-investment period and Rs. 3,328 in the post-investment period thereby suggesting that the net farm income would increase by about 112 per cent. However, compared with the per acre net farm income of rainfed area cultivators, that of borrower beneficiaries on the benefited area was high by as much as 385 per cent. Assuming that in the absence of the investment the borrower beneficiaries

would have adopted the same cropping pattern on the benefited area as they had adopted on rainfed area cultivated by them, it is found that the net farm income per acre of benefited area exceeded that of rainfed area of borrower beneficiaries by 206 per cent.

Incremental Income

3.15 The benefits through investment to the borrower beneficiary are measured on the basis of net incremental income derived as the excess of post-development net farm income on the benefited area over the pre-investment net farm income on the same area. For the estimation of pre-investment net farm income it is, therefore, necessary to collect relevant data from the respondent borrower beneficiaries. In the present evaluation study, the required data to arrive at the pre-investment net farm income were not collected from the borrower beneficiaries since the recall period was long and hence they were not likely to remember all the activities on the benefited area in the pre-investment period. Instead, a control sample of non-beneficiary cultivators with rainfed area only (rainfed area cultivators) was selected to represent the position of borrower beneficiaries in the pre-investment period. In the course of the study, it was found that a large portion of the cultivated holding of borrower beneficiaries was unirrigated and as such, the position of borrower beneficiaries on unirrigated cultivated holding might also be taken to reflect that of borrower beneficiaries on the benefited area in the pre-investment period. Thus, there are two ways to arrive at the incremental income on the benefited area of borrower beneficiaries, hereinafter called Method A and Method B, as follows:

Method A: Incremental income arrived at as the excess of net farm income on the benefited area of borrower beneficiaries over the net farm income on the same extent of the area of rainfed area cultivators; and

Method B: Incremental income arrived at as the excess of net farm income on the benefited area of borrower beneficiaries over the net farm income on the same extent of the unirrigated cultivated holding of borrower beneficiaries.

3.16 On similar lines, the incremental income of non-borrower

beneficiaries can be derived. The data relating to incremental income per acre of benefited area so arrived at are presented in Table 3.5.

Table 3.5 : INCREMENTAL INCOME ON BENEFITED AREA
(In Rs.)

Method	Incremental Income per Acre of Benefited Area	
	Borrower beneficiaries	Non-borrower beneficiaries
A	520	2207
B	441	2076

It emerges from a perusal of the data given in the above table that the per acre incremental income of the non-borrower beneficiaries was significantly higher than that for the borrower beneficiaries. In the case of non-borrower beneficiaries, the area irrigated by the 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.

Cost of Investment

3.17 The total cost incurred by the average borrower beneficiary who had undertaken the investment is given in Table 3.6.

Table 3.6 : AVERAGE COST OF INVESTMENT
(Amount in Rs.)

Item	Borrower beneficiary	Non-borrower beneficiary
A. WELL		
i) Excavation		
a) Total	5,449	5,103
b) Of which labour cost	3,880	4,271
ii) Ring, pipelines, etc.	453	988
iii) Total cost of well	5,902	6,091
B. PUMPSET, ACCESSORIES, ETC.		
i) Pumpset and accessories		
a) Total @	2,599	2,524
b) Of which pumpset	2,411	2,367
ii) Pump foundation, switchroom, etc.	565	71
iii) Total cost of pumpset accessories, etc.	3,164	2,595
C. TOTAL COST OF INVESTMENT	9,066	8,686

@ Including deposit with Maharashtra State Electricity Board.

The total cost amounted to Rs. 9,066 of which the cost of construction of well and related items of expenditure such as ring, casing, bores, pipelines and pit/water tanks amounted to Rs. 5,902 and the balance of Rs. 3,164 was spent on pumpset and accessories, pump foundation and switchroom. The cost of excavation of well alone amounted to Rs. 5,449 of which more than seven-tenths constituted the labour cost (including family labour). The cost of investment in the case of the average non-borrower beneficiary amounted to Rs. 8,686 of which the construction of well and expenditure on related items amounted to Rs. 6,091 and the balance of Rs. 2,595 accounted for the purchase of pumpset, accessories, etc; excavation cost amounted to Rs. 5,103 of which the labour cost constituted 84 per cent. As regards adequacy of loan amount to the average borrower beneficiary, the figures work out as follows :

Table 3.7 : ADEQUACY OF LOAN AMOUNT

	(In Rs.)		
	Well	Pumpset	Total
Anticipated cost of investment	4,500	3,500	8,000
Actual average loan amount	4,957	3,465	8,422
Actual expenditure incurred by borrower beneficiary	5,902	3,164	9,066

Return on Investment

3.18 An attempt is made, on the basis of the data collected on the cost of investment under study and the net benefits from the benefited area accrued to the borrower beneficiary during the reference year 1973-74, to work out the net present worth (NPW) and benefit-cost ratio (BCR) on the basis of the discount rate of 8½ per cent, and internal rate of return (IRR), to assess the financial feasibility of the investment. The above have been worked out on the assumptions that: (1) the wells were constructed during the first year and pumpsets installed during the second year; (2) the life of the well would be 25 years; (3) the life of the pumpset being taken as 7 years, new pumpsets of the same value would be installed four times during the life of

the well, the scrap value of the first three pumpsets at the end of their life time being taken as nil and the fourth pumpset assumed to have a salvage value of four-sevenths of the cost of the pumpset; and (4) the benefits would start accruing from the second year of the investment and would remain same as found for the year 1973-74 throughout the period assumed. Table 3.8 presents the relevant data.

Table 3.8 : RETURN ON INVESTMENT

Type of cultivators	NPW (Rs.)	BCR	IRR (Per cent)
Borrower beneficiaries	13,210	1.58	29

A perusal of the table indicates that the investment was worthwhile. Thus, it can be inferred that it was highly profitable for the cultivators to borrow loans at 8½ per cent rate of interest under the scheme and increase their farm income by irrigating, on an average, an area of 4.94 acres or more through the investment under study.

Repayment Capacity

3.19 The repayment capacity of the borrower beneficiary in the present study is calculated on the basis of the formula recommended in the Report of the Review Team on Economic Appraisal and Utilization Studies. Under this formula, the repayment capacity is to be worked out with reference to two parameters — the size of pre-investment farm income and the level of incremental income; the latter is divided into two percentage parts, one representing the allowance for higher consumption and the other the repayment capacity. For a given level of incremental income, the allowance for higher consumption goes on declining with an increase in the level of pre-investment farm income, with stipulations of a floor at Rs. 300 and ceiling at Rs. 1000. The data relating to the repayment capacity so worked out on the alternative basis of

incremental income derived in the present study for borrower beneficiaries are presented in Table 3.9. The data on annual instalment amount to be paid towards the LDB loan and also on total repayments towards the LDB and other loans by the borrower beneficiary are presented therein.

Table 3.9: REPAYMENT CAPACITY OF BORROWER BENEFICIARIES

(In Rs. per beneficiary)

Amount borrowed from LDB	Equated annual instalment	Amount actually due in 1973-74	Repayment capacity		Amount repaid during the year 1973-74			
			Method A@	Method B+	Towards LDB loan	Towards other old debts	Towards borrowings during 1973-4	Total
1	2	3	4	5	6	7	8	9
8,422	1,284	1,616	2,047	1,913	558	48	80	686

@ Pre-investment income taken on the basis of income of rainfed cultivators.
+ Pre-investment income taken on the basis of income of borrower beneficiaries on rainfed cultivated holding.

The data presented above show that the repayment capacity (after making allowance for increased consumption) was more than sufficient to meet the annual instalment of the LDB loan in the case of borrower beneficiaries.

3.20 The data on amount repaid during the reference year showed that the amount repaid towards the LDB loan was very much short of even half the amount of annual loan instalment. On comparing the amount repaid with the repayment capacity, it was found that the repayment capacity was very much in excess of the amount repaid during the reference year. While interpreting the above phenomenon of wide margin between the repayment capacity and the total 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 under study and the incremental income and the repayment capacity were worked out on the basis of certain assumptions. It is possible that the allowance for increased

consumption provided while working out the repayment capacity was too much on the low side and required upward revision because of pent-up demand due to the drought conditions of earlier years, and thereby resulting in the downward revision of the repayment capacity.

Employment

3.21 Besides enabling the borrower beneficiaries to increase agricultural output and thereby realise increased farm income, the composite investment studied provided additional employment, initially in a temporary lot through the construction of dugwells and subsequently on a continuing basis through the intensive farm operations in the post-investment period.

3.22 As per the field data collected, construction of a well involved on an average about 1700 man days (including family labour) and intensive cultivation in the post-investment period created additional employment per year of 61 man days per acre of benefited area or 300 man days per investment.

CHAPTER 4

IMPORTANT FEATURES OF FARMERS' POSITION

In addition to the data required to examine the validity of the basic assumptions underlying the economics of the scheme, data on various other aspects of the scheme such as some physical features of the investment, extent of land mortgaged as security for the LDB loan and other sources of finance tapped by the borrower as also the changes in the assets position of the borrower cultivators were collected in the survey. The discussions below relate to all the 59 selected borrower beneficiaries i.e. including those who had not utilized the loan for the purpose for which it was taken.

Some Features of Wells

4.2 The Exploratory Tubewells Organization (ETO) after conducting a survey in the area, had observed that, in general, the diameter of the wells varied from 20 to 35 ft. and depth from 20 to 50 ft. Since the wells in this region were likely to get dried up in summer after a short duration of pumping, ETO had suggested that with a view to facilitating maximum percolation, wells should be constructed rectangular or elliptical and the depth of wells should be about 50 to 60 ft. The survey carried out by the Chief Groundwater Survey Officer of the State Government had also indicated that the wells in the region had a cross-sectional area of about 600 to 1000 sq. ft. which was considered favourable for good yield and suggested that the yield could be increased by tapping the deeper aquifers by means of bore holes from bottom of the well to a depth of about 100 ft.

4.3 Data on physical dimensions of the wells collected from the selected respondents in the study showed that of the 59 wells reported to have been dug under ARDC scheme, 33 were round in shape and only 26 were either square or rectan-

gular. The cross-sectional area of 32 wells was 700 sq. ft. or more, while in the case of 15, it was between 500 and 700 sq. ft. and for 12, less than 500 sq. ft. All the wells constructed had a depth of less than 50 ft.; the depth of 5 wells ranged from 40 to 50 ft., of 30 from 25 to 40 ft. and of 24 less than 25 ft. The selected non-borrower beneficiaries had dug 16 wells; of these only 7 were square or rectangular in shape, 10 had a cross-sectional area of 700 sq. ft. or more and the depth of only one well exceeded 50 ft. and that of 14 ranged from 25 to 50 ft.

4.4 Of the 59 wells dug by the borrower beneficiaries, more than half the number were reported to be incomplete in one respect or the other. The two main items in respect of which the wells were reported to be incomplete were excavation of the well to the required depth and construction of work of parapet wall and/or cement coping. The reason attributed to the former was presence of hard rock which made further excavation expensive and for the latter, inadequacy of funds for undertaking the work. The total amount required to complete the incomplete work was reported at about Rs. 2,100 on an average. It may be mentioned here that in the region not many cultivators undertook such expenditures. Of the cultivators selected for the study, only 12 borrower beneficiaries and 8 non-borrower beneficiaries reported that they had undertaken stone work in order to prevent the side walls from collapsing and of these, the work undertaken by 4 borrower beneficiaries and 5 non-borrower beneficiaries in this respect was reported to be *pucca*. Similarly, the work on drilling bores was undertaken by only 5 borrower beneficiaries.

Specific Questions on Investment

4.5 Replies to specific questions on the investment showed that nearly two-thirds of the number of borrower beneficiaries constructed the well under personal supervision. Though the survey number of the plot in which the well was to be located had been indicated by the Chief Groundwater Survey Officer, the exact location was selected after consulting *Panadi* (water diviner), knowledgeable persons in the village and/or the

technical officer of the LDB. About one-third of the borrower beneficiaries who had constructed the wells under personal supervision encountered difficulty in getting labour and about one-fifth in getting either the required machinery or cement and other construction materials.

4.6 The data on time taken at various stages of the disbursement of the LDB loan amount, showed that from the date of application, it took on an average more than 5 months for processing the application and sanctioning of the loan. It further took about 3 months to disburse the first loan instalment. From the date of disbursement of the first loan instalment for digging the well, it took on an average 15 months to disburse the last instalment of the loan for purchase of pumpset and accessories, etc.

Security for the LDB Loan

4.7 The LDB loans for the investment under study were to be secured by mortgage of owned land of borrower beneficiaries. For this purpose, the land was to be valued at Rs. 500 per acre and in cases where the investment was found to be economically viable but the value of owned land offered by way of security fell short of the loan amount to be given, the State Government was to stand guarantee for the shortfall in security.

4.8 The extent of owned land per average borrower beneficiary was 18 acres of which 12.72 acres was mortgaged to the LDB. Thus, on the basis of Rs. 500 per acre, the value of land offered to the LDB as security by the average borrower beneficiary amounted to Rs. 6,360 against the loan amount of Rs. 8,144 advanced by the LDB.

Outstanding Debt

4.9 Data relating to loan transactions and indebtedness are given in Tables 4.1 to 4.6. The total debt outstanding as on 30 June 1974 per average borrower beneficiary amounted to Rs. 10,835. Of this, nearly 90 per cent was towards the LDB loan for the investment, about 8 per cent towards loans contracted

after the investment and balance of 2 per cent towards loans taken prior to investment (Table 4.1).

Table 4.1 : OUTSTANDING DEBT AS ON 30 JUNE 1974

(Amount in Rs.)

	Borrower Beneficiaries			Non-borrower Beneficiaries		
	Per-centage of reporting cultivators	Amount per culti-tor	Amount per reporting cultiva-tor	Per-centage of reporting cultiva-tors	Amount per cultiva-tor	Amount per reporting cultiva-tor
	1	2	3	4	5	6
i) Outstanding debt towards loans borrowed before investment	22.8	261	1,114	—	—	—
ii) Outstanding debt towards loans borrowed after taking up investment@	100.0	10,575 (9,749)	10,575 (9,749)	59.4	2,029	3,415
iii) Total outstanding debt	100.0	10,835	10,835	59.4	2,029	3,415

Note : Figures in brackets relate to outstanding debt in respect of the LDB loan.

@ From the date of disbursement of the first instalment of the LDB loan.

Of the total outstanding debt, about 95 per cent in the case of the average borrower beneficiary was towards loans borrowed for capital expenditure on farm. The total debt outstanding

towards loans borrowed for current farm expenditure accounted for about 4 per cent (Table 4.2).

Table 4.2 : OUTSTANDING DEBT AS ON 30 JUNE 1974 CLASSIFIED ACCORDING TO SPECIFIED PURPOSES

(Amount in Rs.)

	Current Expenditure on farm		Capital Expenditure on farm		Repayment of debt	
	Proportion of the reporting pose as cultivators	Debt for the purpose as percentage of total debt	Proportion of the reporting pose as cultivators	Debt for the purpose as percentage of total debt	Proportion of the reporting pose as cultivators	Debt for the purpose as percentage of total debt
	1	2	3	4	5	6
Borrower beneficiaries	45.5	3.6	100.0	94.7	—	—
Non-borrower beneficiaries	37.3	39.4	32.4	49.5	4.5	11.1

Co-operatives accounted for about 95 per cent of the total outstanding debt of the average borrower beneficiary, other institutional agencies 3 per cent and other sources 2 per cent (Table 4.3).

Table 4.3 : OUTSTANDING DEBT OWED TO EACH CREDIT AGENCY AS PERCENTAGE OF TOTAL DEBT AS ON 30 JUNE 1974

	Institutional Agencies				Other Agencies		
	Co-operatives	Government	Commercial banks	Total	Agriculturist money-lenders	Relatives	Total
	1	2	3	4	5	6	7
Borrower beneficiaries	95.0	1.1	1.4	97.6	1.8	0.7	2.4
Non-borrower beneficiaries	45.2	21.9	17.3	84.5	—	15.6	15.6

4.10 The outstanding debt as on 30 June 1974 of the average non-borrower beneficiary was in size only about one-fifth of that of the average borrower beneficiary. Half the total outstanding debt of the average non-borrower beneficiary was in respect of loans for capital expenditure on farm, and nearly two-fifths for current expenditure on farm and the balance of about one-tenth for repayment of debt. As much as 45 per cent of the outstanding debt was owed to co-operatives, 22 per cent to Government and 17 per cent to commercial banks; thus, debt owed to institutional agencies accounted for 85 per cent of the total.

Borrowings during the Year

4.11 Only 42 per cent of the borrower beneficiaries studied reported borrowings during the reference year and the amount borrowed per cultivator was Rs. 625 (Table 4.4).

**Table 4.4 : BORROWINGS DURING 1 JULY 1973 TO 30 JUNE 1974
CLASSIFIED ACCORDING TO SPECIFIED PURPOSES**

(Amount in Rs.)

	Borrower Beneficiaries			Non-borrower Beneficiaries		
	Percentage of reporting cultivators	Amount per cultivator	Amount per reporting cultivator	Percentage of reporting cultivators	Amount per cultivator	Amount per reporting cultivator
	1	2	3	4	5	6
i) Borrowings for current expenditure on farm	32.8	248	755	6.2	125	2,033
ii) Borrowings for capital expenditure on farm	11.7	219	1,867	—	—	—
iii) Total borrowings	42.0	625	1,490	6.2	125	2,033

Table 4.5 : BORROWINGS FROM EACH CREDIT AGENCY AS PERCENTAGE OF TOTAL BORROWINGS DURING 1 JULY 1973 TO 30 JUNE 1974.

	Institutional Agencies				Other Agencies			
	Co-ope- ratives	Gover- nment	Com- mercial banks	Total	Agri- cult- urist money- lenders	Rela- tives	Oth- ers	Total
	1	2	3	4	5	6	7	8
Borrower beneficiaries	38.7	8.0	13.7	60.4	28.1	11.3	0.2	39.6
Non-borrower beneficiaries	100.0	—	—	100.0	—	—	—	—

Obviously, many of the borrower beneficiaries did not resort to or get institutional loans for current farm expenditure. Nearly 40 per cent and 35 per cent of the total borrowings of the average borrower beneficiary were for current expenditure on farm and capital expenditure on farm, respectively.

4.12 Only 6 per cent of the non-borrower beneficiaries reported borrowings during the year and the amount borrowed per average beneficiary worked out to Rs. 125. All the borrowings were from co-operatives for current expenditure on farm.

Repayments during the Year

4.13 More than three-fourths of the number of borrower

beneficiaries studied reported repayments during the year (Table 4.6) :

Table 4.6 : NATURE AND EXTENT OF REPAYMENTS DURING 1 JULY 1973 TO 30 JUNE 1974

(Amount in Rs.)

	Total repayments :			Repayments per cultivator towards		Repayments from owned funds as percentage of total repayments
	Percentage of reporting cultivators	Per cultivator	Per reporting cultivator	Old debt	Borrowings during the year	
	1	2	3	4	5	6
Borrower beneficiaries	75.6	721	942	659	62	96.0
Non-borrower beneficiaries	8.2	89	1,092	89	—	100.0

Total repayments amounted to Rs. 721 per average borrower beneficiary, of which nine-tenths formed repayments towards loans contracted prior to the reference period. Of the total repayments, 96 per cent were financed out of owned funds.

Debt as Percentage of Value of Assets

4.14 As on 30 June 1974, the outstanding debt of the borrower beneficiaries constituted about one-fifth of the total value of assets (Table 4.7).

Table 4.7 : INDEBTEDNESS IN RELATION TO TOTAL VALUE OF GROSS PRODUCE AND VALUE OF FARM ASSETS AND TOTAL ASSETS AS ON 30 JUNE 1974

(Amount in Rs. per cultivator)

	Outstanding debt	Value of gross produce	Value of farm assets	Value of total assets	Outstanding debt as percentage of		
					Gross produce	Farm assets	Total assets
	1	2	3	4	5	6	7
Borrower beneficiaries	10,835	7,879	42,084	49,835	137.5	25.8	21.7
Non-borrower beneficiaries	2,029	11,471	43,887	49,408	17.7	4.6	4.1

Farm assets being the most important form of assets, debt as percentage of the total value of assets and the total value of farm assets in the case of non-borrower beneficiaries worked out to only about 4 and 5, respectively. The proportion of outstanding debt to value of gross produce was low at about 18 per cent for non-borrower beneficiaries compared with the corresponding proportion of as much as 138 per cent in the case of borrower beneficiaries.

Total Value of Assets

4.15 The total value of assets as on 30 June 1974 for the average borrower beneficiary and the average non-borrower beneficiary worked out to about Rs. 49,800 and Rs. 49,400, respectively. The pattern of important constituents in the total assets for borrower beneficiaries and non-borrower beneficiaries is shown in Table 4.8. The proportion of the value of each of the important constituent items to the corresponding total value of assets is expressed in percentage term.

Table 4.8 : IMPORTANT CONSTITUENTS OF TOTAL ASSETS
(Per cent)

Type of assets	Borrower beneficiaries	Non-borrower beneficiaries
	1	2
1. Farm assets	84.4	88.8
Of which:		
i) Land	72.4	73.9
ii) Livestock	4.7	8.0
iii) Agricultural implements, machinery, etc.	6.1	6.0
2. Non-farm assets	11.1	10.1
Of which:		
i) Residential buildings	6.4	6.3
ii) Durable household assets	1.5	2.8
3. Financial assets	4.5	1.0

It may be seen from the above table that the pattern of constituent items in the total assets for both the category of cultivators was broadly similar; land formed the most important item of assets of the average beneficiary, its value accounting for nearly three-fourths of the total value of assets. Agricultural implements, machinery, etc. accounted for about 6 per cent of the total. The value of livestock in the case of non-borrower beneficiaries accounted for about 8 per cent of the total value of assets, while it accounted for 5 per cent in case of borrower

4.17 The data on capital expenditure incurred by the selected cultivators on land development during the reference year showed that about 69 per cent of the borrower beneficiaries and 75 per cent of the non-borrower beneficiaries reported capital expenditure on land development of Rs. 568 and Rs. 213, respectively, per beneficiary (Table 4.10).

Table 4.10 : CAPITAL EXPENDITURE INCURRED ON SPECIFIED ITEMS OF ASSETS DURING 1 JULY 1973 TO 30 JUNE 1974

(Amount in Rs.)

	Borrower Beneficiaries			Non-borrower Beneficiaries		
	Percentage of reporting cultivators	Expenditure per cultivator	Expenditure per reporting cultivator	Percentage of reporting cultivators	Expenditure per cultivator	Expenditure per reporting cultivator
	1	2	3	4	5	6
1. Land development	69.2	568	820	75.4	213	282
Of which:						
i) Reclamation	8.6	18	203	9.4	5	50
ii) Levelling	43.2	262	607	70.9	42	59
iii) Bunding	38.0	125	329	70.9	86	122
iv) Orchards and plantations	1.1	—	10	—	—	—
v) Dugwell	31.1	133	428	47.5	72	151
vi) Water channels	12.8	21	164	14.8	4	25
2. Residential bldgs.	16.2	17	108	46.3	37	79
3. Agricultural implements, machinery, etc.	24.1	76	313	70.3	141	201
4. Transport equipment	14.3	34	238	51.1	23	46

About half the capital expenditure on land development of borrower beneficiaries was for land levelling and about one-fourth each for bunding and repairs to dugwells. As regards non-borrower beneficiaries, about two-fifths of the capital expenditure on land development was for bunding followed by repairs to dugwells and levelling of land. Capital expenditure on agricultural implements, machinery, etc. was reported by about seven-tenths of the non-borrower beneficiaries and the expenditure per beneficiary worked out to Rs. 141, while only about one-fourth of the borrower beneficiaries reported such expenditure and the expenditure per beneficiary amounted to Rs. 76.

Adoption of Improved Farm Practices

4.18 The realization of maximum benefits from the investment undertaken with the help of institutional loan depends, among other things, on the availability of crop loan and other inputs required for better agriculture. The data available from the study indicated that during the year 1973-74 only 28 per cent of the borrower beneficiaries reported crop loans from the co-operatives. This obviously means that, for a large majority of the cultivators, outside funds for current farm operations were not available. This has a direct bearing on the capacity of borrower beneficiaries to adopt the improved farm practices. As the data in Table 4.11 reveal, the borrower beneficiaries practically did not use the pesticides.

Table 4.11 : COST OF CULTIVATION OF BORROWER BENEFICIARIES

Item	(In Rs. per acre)	
	Benefited area	Total cultivated area
A. Total variable cost	172	80
i) Seeds	55	23
ii) Fertilizers/Manures	61	23
iii) Pesticides	1	1
iv) Wages paid to hired labour	55	32
B. Total overhead cost	113	51
i) Interest on short-term loans	2	1
ii) Operation of pumpset	84	28
iii) Bullock maintenance	25	19
iv) Irrigation cess	1	1
v) Revenue paid	2	1
C. Total cost of cultivation	285	132

In respect of seeds, the borrower beneficiaries depended on their home-grown seeds and none of the borrower beneficiaries reported purchase of seeds from any institutional agency. Similarly, it appears that most of them did not use fertilizers. Whatever little expenditure was indicated for fertilizers/manures, most of it appeared to be on purchasing farm-yard manure. Under these circumstances, the realisation of full benefits after investment was difficult.