

# **IMPACT OF MINOR IRRIGATION ON SMALL AND MARGINAL FARMERS**

**In Hazaribagh District (Bihar)**

**BANK OF INDIA**  
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## F O R E W O R D

As part of project management, Bank of India has been undertaking ex-post evaluation studies of selected priority sector schemes on a systematic and regular basis with the primary objective of identifying the constraints/shortcomings in implementing schemes and assessing their impact on the economic well-being of the beneficiaries. Another objective of evaluation studies is to draw valuable lessons from the experience gained in implementing schemes for improving the project performance in the future. These studies have come out with many suggestions some of which have been put in operation by the Bank by incorporating suitable modifications in the design and modalities of implementation of schemes.

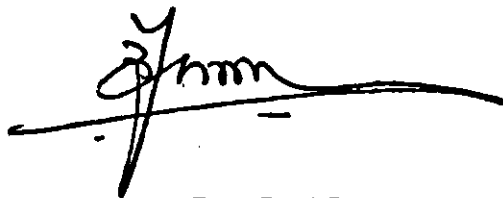
The present evaluation study relates to minor irrigation scheme implemented by the Bank in Hazaribagh district of Bihar during 1980-83. The principal objective of the scheme was to augment the income of the small and marginal farmers in the district so as to bring them above the poverty line by transforming their small holdings producing subsistence crops mainly for family consumption into viable economic units oriented to generate marketable surplus, through the provision of irrigation. Under the scheme the eligible farmers were given loans for construction of dug-wells and installation of pumpsets. When the scheme was closed in June 1983, the Bank had disbursed Rs. 61.77 lakhs covering 895 units as against Rs. 53 lakhs covering 600 units envisaged in the scheme. National Bank for Agriculture and Rural Development (NABARD) had provided refinance of Rs. 43.35 lakhs under the scheme.

The study is based on a field survey of 96 sample farmers - 80 borrower-farmers and 16 non-borrower-farmers - drawn randomly from 12 villages in Hazaribagh, Barkatha, Barkagaon and Chatra blocks of the district. The study revealed a significant increase

(ii)

in the intensity of land use, shift in the cropping pattern towards market oriented crops and improvement in the adoption of modern farm technology by the sample beneficiaries in the post-investment period. The study also revealed that the beneficiaries could earn an incremental income of Rs. 333 per acre in 1982-83. However, the net income realised by the beneficiaries showed wide variations mainly due to the differences in size of holdings and the area brought under irrigation. Although the impact of the scheme on individual beneficiaries has been uneven, the collective impact of the scheme was found to be significant as in some villages covered in the survey there was evidence of a break-through in the production of wheat and potato and the consequent spurt in marketable surplus clearly, triggered by the spread of irrigation.

The study has identified certain shortcomings in the implementation of the scheme and made suggestions to avoid their recurrence in future. I am sure, banks and financial institutions will find these suggestions useful.

A handwritten signature in black ink, appearing to read 'T. Tiwari', with a long horizontal flourish extending to the right.

T. TIWARI

CHAIRMAN & MANAGING DIRECTOR

Bombay

8.8.1985

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This study has been undertaken by Dr. S. A. Shetty, Chief, Monitoring & Evaluation Division, Management Information & Statistics Department, Head Office, with the field assistance of the staff of Hazaribagh Regional Office and Hazaribagh, Barkatha, Barkagaon and Chatra branches of the Bank.

## CHAPTER - 1

### SUMMARY AND RECOMMENDATIONS

1.1 This ex-post evaluation study of minor irrigation scheme financed by Bank of India in Hazaribagh district, Bihar, has been undertaken at the instance of National Bank for Agriculture and Rural Development (NABARD) to assess its impact on the farm business of the beneficiaries and to ascertain the extent to which the scheme had enabled the beneficiaries to augment their family income and cross the official poverty line. Another objective of the study is to review the repayment performance of the beneficiaries and identify the reasons associated with it. The study also seeks to draw useful lessons from the experience gained in the process of implementing the scheme so that the shortcomings committed, if any, in the past are not repeated in the future.

1.2 The minor irrigation scheme refinanced by NABARD had envisaged financing 600 units - 400 with wells and rahats and 200 with wells and pumpsets, involving a total outlay of Rs. 71 lakhs. The Bank was to provide a loan of Rs. 53 lakhs and the balance of Rs. 18 lakhs was to be contributed by the borrowers. The NABARD had agreed to provide refinance to the tune of Rs. 47.92 lakhs for the scheme. When the scheme ran its full term at the end of June 1983, financing under the scheme had exceeded the target, the total number of units financed being 895 and the amount disbursed by the Bank being Rs. 61.77 lakhs. The NABARD had provided refinance of Rs. 43.35 lakhs.

1.3 The scheme was designed for the benefit of small and marginal farmers in the district who were unable to make optimum utilisation of their land for want of irrigation. Under the scheme each identified farmer was eligible for a loan not exceeding Rs. 10,000 for construction of a dug-well and installation of a pumpset. Since the beneficiaries of the scheme belonged to

the weaker sections of the rural society, they were eligible for subsidy from the government ranging between 25 per cent and 66.6 per cent of the cost of investment.

1.4 The principal objective of the scheme was to augment the farm income of the small and marginal farmers by raising farm output through the provision of irrigation. The scheme envisaged that each beneficiary farmer would bring a minimum 2 acres of land under irrigation and practice multiple cropping along with the improved farm practices. Eight branches of the Bank in the district namely Hazaribagh, Chatra, Barkagaon, Barkatha, Chauparan, Hunterganj, Simaria and Pratapur participated in implementing the scheme.

#### Field Survey

1.5 The study is based on a representative sample of 80 beneficiary farmers drawn randomly from 12 villages financed by four - Hazaribagh, Chatra, Barkagaon and Barkatha - of the eight participating branches. The relevant data required for the study have been obtained from the sample beneficiaries by personal interviews through questionnaires specially designed for the purpose. The farm business and management data collected from the sample beneficiaries pertained to the year 1982-83 which constituted the reference year of the study.

1.6 The impact of minor irrigation has been assessed by a comparison of the pre-investment and post-investment situation of the sample beneficiary's farms and by a comparison of with and without-investment situation. The first approach has been adopted in a limited way to assess the impact of irrigation on the intensity of land use and cropping pattern. For a comparison of with and without-investment situation, a control sample of 16 non-borrower farmers with more or less comparable size of holdings but who had no irrigation facilities was selected and interviewed



during the survey. The control sample represented without-investment situation. The assumption implicit in this approach is that the profile of the beneficiary's farms would be comparable, in terms of selected parameters to those of the control sample if the former had not invested in minor irrigation.

### Study Findings

1.7 Of the 80 sample beneficiaries covered in the survey, 54 turned out to be marginal farmers with holdings below 2.5 acres each. The remaining 26 beneficiaries designated as small farmers owned land varying between 2.51 acres and 5 acres each. Although the scheme had stipulated that each eligible borrower must have a minimum 2 acres of land, the implementing branches did not appear to have exercised adequate care to adhere to this stipulation. For, as many as 25 sample beneficiaries (31.25 per cent) had land holdings of less than two acres each.

### Cost of Investment

1.8 The Bank had financed 70 sample beneficiaries under the scheme for construction of dug-wells and 7 beneficiaries for purchase of pumpsets. In three cases, the Bank had given composite loans for construction of wells and installation of pumpsets. Thus, the Bank loans were used by the sample beneficiaries for construction of 73 wells and purchase of 10 pumpsets. Thirteen beneficiaries had installed pumpsets with their own resources. Thus, 23 beneficiaries had wells with pumpsets, while 57 used rahat to lift water for irrigation.

1.9 The Bank loans for construction of wells averaged Rs. 6,725 as against the estimated average cost of Rs. 8,822. The balance of Rs. 2,097 or about 24 per cent of the cost of construction of wells was borne by the beneficiaries themselves. Although the overall share of Bank loans accounted for 75 per cent of the actual cost of construction of wells, in some cases the Bank loans

fell short of the stipulated norm. In 21 cases (26.25 per cent) the cost of construction had exceeded Rs. 10,000 each mainly because of bigger wells with diameter exceeding 10' - the norm stipulated by the NABARD under the scheme - preferred by the borrowers. In some cases the actual cost of construction had increased due to factors beyond the control of the beneficiaries such as existence of hard pan below the surface, necessitating blasting, failure of the Block office to supply the promised quota of cement at controlled rates, forcing beneficiaries to secure the supplies at higher prices in the open market, etc.

#### Area Brought Under Irrigation

1.10 As per survey data, the total area brought under irrigation by the sample beneficiaries in 1982-83 was 162.56 acres which mean an average irrigated area of 2.03 acres. The area irrigated by individual beneficiaries varied widely between 0.40 acres to 6 acres. The area brought under irrigation by the marginal farmers averaged 1.60 acres and that by the small farmers 2.93 acres. As is to be expected, the average area brought under irrigation by the beneficiaries who had installed pumpsets is estimated to be higher at 2.96 acres compared with the average area of 1.66 acres brought under irrigation by the beneficiaries who did not install pumpsets.

1.11 The scheme had envisaged that each beneficiary would bring a minimum 2 acres of land under irrigation in the post-investment period. The survey data revealed that only 31 sample beneficiaries (38.75 per cent) could irrigate more than 2 acres each in 1982-83. In other words, 49 beneficiaries (61.25 per cent) failed to irrigate two acres each which implied a wide gap between expectation and actual performance. Of these, 20 beneficiaries had lower than 2 acres of land holding each. Of the remaining 29 having more than 2 acres of land, 22 did not have pumpsets. Clearly, the benefit of the scheme in terms of area brought

under irrigation had varied a great deal among the beneficiaries.

1.12 The gap between expectation and performance could be attributed to three reasons: i) low size of holdings as 25 per cent of the sample beneficiaries owned less than 2 acres each, ii) low discharge of water in 10 per cent of cases and iii) dependence on traditional device for lifting water for irrigation in about 28 per cent of cases.

1.13 With the provision of irrigation, the intensity of land use by the sample beneficiaries increased sharply from 101.78 per cent in the pre-borrowing period to 159.76 per cent in the post-borrowing period. The marginal farmers had achieved a higher intensity of land use estimated at 171.69 per cent compared with 148.68 per cent by the small farmers in 1982-83. Similarly, the beneficiaries who had installed pumpsets had achieved a higher intensity of land use estimated at 175.10 per cent against 151.01 per cent achieved by others who had installed rahat for lifting water. The control sample of non-borrowers had a low intensity of land use estimated at 108.96 per cent in 1982-83.

#### Cropping Pattern

1.14 The impact of minor irrigation was quite visible in the cropping pattern adopted by the beneficiaries in the post-investment period. While foodgrains accounted for 80.48 per cent of the total cropped area of the beneficiaries in 1982-83, the same accounted for a higher share of 93.44 per cent in the case of control sample. In other words, the sample beneficiaries had devoted a higher proportion of the area to cash crops than the sample non-borrowers. The shift in preference for more remunerative crops like wheat, sugarcane, potato and vegetables was evident from a comparison of the cropping pattern of the beneficiaries in the pre-borrowing period with that of

the post-borrowing period. The share of area under non-foodgrains had more than doubled from 8.80 per cent in the pre-borrowing period to 19.52 per cent in 1982-83.

1.15 A comparison of the cropping pattern of the marginal and small farmers revealed that the tendency to raise commercial crops was more pronounced in the case of the former than the latter. This is evident from the higher share of the area devoted to wheat, sugarcane, potato and vegetables by the marginal farmers compared with that devoted to each of the above crops by the small farmers. A shift away from purely subsistence farming to partly commercial farming has been clearly accelerated by the improvement in irrigation facility.

1.16 Provision of irrigation had also triggered a process of modernisation of farming practices by the beneficiaries. This was amply borne out by the survey data. While, the use of improved/ high yielding seeds was totally absent in the pre-borrowing period, 28 beneficiaries had adopted high yielding varieties of crops including wheat, rice and maize in the post-borrowing period. In fact, the progress in the adoption of high yielding varieties of crops would have been much better had there been adequate supply of high yielding varieties of seeds. Similarly, while only 12 sample beneficiaries (15 per cent) were applying fertilisers in the pre-borrowing period, the number increased to 72 (90 per cent) in the post-borrowing period. The survey data revealed that about 85 per cent of fertilisers used by the marginal farmers and about 72 per cent by the small farmers was accounted for by the irrigated area implying that expansion of irrigation was the driving force behind the rise in fertiliser usage in the post-borrowing period.

1.17 What stands out prominently from an analysis of the cropping pattern and use of modern farming practices by the

sample beneficiaries is the growing importance of wheat in the project area. In some villages covered in the survey almost all the farmers including non-borrowers, obviously encouraged by the beneficiaries preference for wheat in the post-investment period, had started growing wheat, indicating the operation of the 'demonstrative effect' in farming even in backward areas of Bihar. There is also some evidence of break-through in the production of potato in some villages in the wake of spread of irrigation.

#### Impact on Farm Income

1.18 The gross farm income earned by the beneficiaries in 1982-83 worked out to be Rs. 1,938 per acre compared with Rs. 984 per acre by the control sample. The estimated farm income of the beneficiaries concealed wide variations ranging between Rs. 1,145 per acre and Rs. 3,316 per acre. The marginal farmers had earned higher farm income of Rs. 2,074 per acre as against Rs. 1,792 per acre by the small farmers. Moreover, as is to be expected, the beneficiaries who had installed pumpsets could earn higher farm income of Rs. 2,040 per acre compared with Rs. 1,889 per acre by the beneficiaries who had used rahat for lifting water.

1.19 The cost of production incurred by the beneficiaries in 1982-83 averaged Rs. 1,029 per acre and varied between Rs. 231 per acre and Rs. 1,858 per acre. The cost incurred by the marginal farmers averaged Rs. 1,130 per acre as against Rs. 920 per acre by the small farmers. On the other hand, the cost of production incurred by the control sample turned out to be low at Rs. 408 per acre.

1.20 The net income of the beneficiaries averaged Rs. 909 per acre compared with Rs. 576 per acre in the case of the control sample. The net income earned by the beneficiaries ranged between Rs. 339 per acre and Rs. 1,874 per acre. As revealed by the survey data, the marginal farmers had earned a higher net income of

Rs. 944 per acre compared with Rs. 872 per acre by the small farmers. It is therefore clear that investment in minor irrigation had enabled the beneficiaries to realise an incremental income of Rs. 333 per acre in 1982-83.

1.21 An analysis of the impact of irrigation on employment revealed that the demand for farm labour had increased in the post-borrowing period. The man-days of employment in the beneficiary's farms averaged 91 days per acre, comprising 67 days of family labour and 24 days of hired labour compared with 71 days per acre including 63 days of family labour and 8 days of wage labour in the control sample. Thus, on average, the provision of irrigation had created 20 man-days of additional employment per acre.

#### Impact on Poverty Alleviation

1.22 While the scheme had helped to raise the family income of the beneficiaries, the estimated incremental income was not adequate to lift all of them above the poverty line. It was observed that 14 beneficiary households (17.50 per cent) had income above the ceiling limit of Rs. 3,500 per annum in the pre-borrowing period. Excluding these households, the number of families which had earned income above this level in 1982-83 turned out to be 35 (53 per cent). After adjusting for repayment of Bank loans, only 28 beneficiaries (42 per cent) were left with income above Rs. 3,500 in 1982-83. However, in terms of Rs. 4,500 income level after adjusting for changes in the price level between 1979-80 and 1982-83, only 14 households (21 per cent) could manage to cross the poverty line. Thus, the impact of the scheme on poverty alleviation has been found to be modest.

1.23 The recovery performance under the scheme as revealed by the survey data was not found to be satisfactory. In 1982 repayment as a percentage of demand was 28.20. Interestingly,

the repayment performance of the marginal farmers was better than that of the small farmers. Recovery rate in respect of marginal farmers was 32.14 per cent as against 23.42 per cent in the case of small farmers. It was found that 18 beneficiaries - 14 marginal farmers and 4 small farmers - had fully repaid the loan by December 1982, much before the expiry of the repayment period. Among the 62 others, 3 were regular in repaying the loan instalments and 37 had paid only a part of the instalments. Further analysis proved that 22 beneficiaries were wilful defaulters as they had the capacity to repay the instalments, but they failed to do so.

1.24 Poor recovery of loan under the scheme could be attributed to the following factors i) low farm income realised by many beneficiaries ii) diversion of surplus income for investment in farm assets by many beneficiaries in the post-investment period and iii) proportionately shorter repayment period fixed by the Bank.

1.25 An analysis of financial viability of the scheme based on survey data revealed that the investment in minor irrigation even in small and marginal farms can yield handsome return. The estimated IRR turned out to be high: 36 per cent and 42 per cent respectively, in the case of marginal farmers without pumpsets and with pumpsets. They were 40 per cent and 45 per cent respectively in the case of small farmers without pumpsets and with pumpsets. However, high return on investment in minor irrigation could be attributed partly to non-inclusion of the cost of family labour in the estimated cost of production.

### Recommendations

1.26 While the financial target under the scheme has been achieved by the participating branches, the quality of lending leaves much to be desired. Despite the stipulation that

eligible beneficiaries should own a minimum 2 acres of land, the branches had financed farmers owning less than 2 acres without properly assessing the viability of investment and repaying capacity of such farmers. This has resulted in low net income in the post-investment period and poor recovery of loans in the case of many sample beneficiaries. It is suggested that the Bank should ensure that the prospective borrowers have at least 2 acres of land before financing for construction of new wells.

1.27 The loans given by the Bank for construction of well should be adequate to meet the investment cost. If the actual cost exceeds the stipulated cost due to factors beyond the control of the borrowers, the Bank should consider extending supplementary loan on merit.

1.28 The cost of well construction in some cases turned out to be higher than the stipulated amount because of the beneficiaries preference for bigger wells. The Bank should be strict in enforcing the norms stipulated by NABARD in this regard. The borrowers should be advised in advance that the Bank loan will not be available to them if they fail to adhere to the norms stipulated by it.

1.29 In some cases, well water was not fully utilised for irrigation purposes because of their dependence on rahat. The Bank should consider extending additional loan for installation of pumpsets to individual cases on merit. Optimum utilisation of well water for irrigation would lead to higher farm income and better recovery of loans.

1.30 The extent of benefit from minor irrigation will depend not only on the area brought under irrigation but also on the adoption of modern farm inputs and improved farming practices. This involved additional recurring expenditure which most of the borrowers could not afford from their own savings. Although



NABARD had advised the Bank to provide working capital to the beneficiaries or to ensure the availability of such a facility from the cooperatives/regional rural banks/other commercial banks, the Bank had not paid any attention to this aspect of the scheme. Consequently, despite the creation of irrigation potential, the beneficiaries could not take full advantage of it through the application of modern inputs. The Bank should therefore consider extending short term credit at least to those who were regular in repaying the instalments.

1.31 The Bank had fixed repayment period of 5 years for investment in both wells and pumpsets as against the repayment period of 15 years for wells and 9 years for pumpsets stipulated by NABARD. Shorter repayment period has increased the burden of repayment and was one of the reasons for the poor recovery of loans under the scheme. The Bank should therefore consider extending the repayment period for well and pumpset loans from 5 years at present to at least 9 years and 7 years respectively.

1.32 Considering the fact that it takes 2-3 years for the benefits from minor irrigation to stabilise, the Bank should consider providing one year repayment holiday under similar schemes in future.

#### Lessons for future

1.33 The Bank is advised to keep in view the lessons learnt from implementing the scheme. These have been set out below by way of suggestions to improve the efficiency of implementing similar schemes in future:

- i) The Bank should reconsider financing marginal farmers owning less than 2 acres of land for construction of dug-wells;
- ii) It should take care to ensure that the assets

created with the Bank loans are fully utilised. Wherever finance is a handicap to fuller utilisation of assets, the Bank should consider providing additional finance;

- iii) The Bank should avoid fixing short repayment period in the hope of recovering the loan amount early. Such a strategy would prove counter productive. The repayment period must bear a reasonable relationship to the economic life of assets and repaying capacity of the beneficiaries.

OBJECTIVES AND METHODOLOGY

2.1 The principal objective of this study is to evaluate the impact of minor irrigation scheme financed by the Bank on the farm economy of the beneficiaries. The other objectives of the study are as under:

- i) To review the modalities of implementing the scheme;
- ii) To ascertain the extent of utilisation of production assets created with the Bank loans and
- iii) To assess the recovery performance under the scheme and identify the reasons associated with it.

2.2 The study is based on a survey of a representative sample of beneficiaries randomly drawn from 12 villages covered by the scheme. Since it was not possible to cover all the beneficiaries in this evaluation study, a representative sample of beneficiaries was selected. For this purpose, a two-stage sample design with village as the primary unit and borrower as the secondary unit was adopted. It was observed that although 8 branches had participated in implementing the scheme, four branches - Hazaribagh, Barkagaon, Barkatha and Chatra - had together accounted for about 76 per cent of the accounts under the scheme. It was therefore decided to select a representative sample from the borrowers financed by these four branches.

2.3 For selecting a sample, a village-wise list of borrowers financed by these four branches was prepared and from this list the borrowers financed before July 1981 were later identified. Since it takes more than two years for the benefits of minor irrigation to stabilise, it was decided to exclude from the survey the borrowers financed after June 1981. The population of the borrowers for the purpose of the study constituted 326 farmers from which 80 were selected randomly for the survey.

2.4 In order to compare the benefits of irrigation with dry land farming, i.e., the condition prevailing in the pre-investment period a sample of 16 non-borrowers who were raising rain-fed crops was selected. The sample of non-borrowers comprising small farmers with holding of less than 5 acres each constituted a control sample for this study. This sample of non-borrowers was selected for interviews from the same villages where the sample beneficiaries were interviewed.

2.5 A structured questionnaire was used to obtain the relevant data from the sample farmers through personal interviews. Farm business data were collected from the sample farmers for one full agricultural season, 1982-83 which constituted the reference year of the study. In addition, the data regarding the area under crops in the pre-borrowing period were collected from the sample beneficiaries in order to compare the intensity of land use and cropping pattern of the beneficiaries between the pre-borrowing and post-borrowing period.

### Methodology

2.6 The impact of minor irrigation on the borrowers' farm business has been assessed through two approaches: i) a comparison of with and without-investment situation and ii) a comparison of pre-investment and post-investment situation. The latter approach has been adopted in a limited way to ascertain mainly the impact of irrigation on the intensity of land use and cropping pattern of the beneficiary farmers. The control sample engaged in raising rain-fed crops is assumed to represent a without-investment situation. The impact of minor irrigation has been assessed mainly through a comparison of the selected parameters of the sample borrower's farms with those of the control group in 1982-83. The underlying assumption is that if the sample beneficiaries had not invested in minor irrigation, the profile of their farm business - intensity of land use, cropping pattern,

extent of use of modern farm inputs etc. - would be similar to that of the control sample.

2.7 Although the ultimate impact of any investment is assessed in terms of incremental business income, there are other measures of impact which cannot altogether be ignored in evaluating the impact of any scheme. In this context, it is necessary to distinguish between two sets of factors that determine the overall impact of an investment: i) factors which are within the capability of the investors to determine and ii) factors which are beyond the control of the investors. For instance, pricing of farm inputs and outputs which has a bearing on the level of farm income is beyond the control of farmers. Similarly, natural factors like rainfall, sunshine, floods etc. which play an important role in determining the size of crop harvest and consequently farm income, are factors beyond the control of farmers. Because of the influence of several factors on the farm harvest and income, it is desirable to assess the impact of minor irrigation in terms of more than one parameter. The following parameters have therefore been adopted to ascertain the impact of minor irrigation in this study: i) the area brought under irrigation; ii) the intensity of land use; iii) the cropping pattern; iv) the adoption of farm technology and v) the incremental farm income.

2.8 An attempt has also been made to assess the financial viability of the scheme by estimating Internal Rate of Return (IRR) based on realistic assumptions regarding the farm input-output price relationship and economic life of assets created with Bank loans.

2.9 The gross farm income has been estimated from four sources: i) value of produce (quantity of crop produced multiplied by prices realised); ii) value of by-products;

iii) sale of water for irrigation purposes and iv) income from hiring out pumpsets.

2.10 The cost concept used in the study covers the following items: i) expenditure incurred on purchase of manure, fertilizers, pesticides, seeds; ii) wages of hired human and bullock labour; iii) cost of diesel/kerosene/electricity for operating irrigation pumpsets and expenditure incurred on repairs, maintenance of farm implements, machinery including pumpsets and maintenance of draught animals; iv) the cost of manures and seeds obtained from family source imputed at the going market rate and miscellaneous expenditure including land revenue. Besides, interest on working capital at 10.5 per cent rate of interest has been estimated and added to the cost. The cost of family labour engaged in farm operations has not been included in the estimated cost of production.

2.11 For the purpose of analysis, the sample borrowers have been divided into two groups based on the size of holdings: i) those with holdings upto 2.5 acres and ii) those with holdings above 2.5 acres. For convenience, the former group is designated in this study as the marginal farmers and the latter as the small farmers.

MINOR IRRIGATION SCHEME AND ITS IMPLEMENTATION

3.1 In view of the proven groundwater potential in Hazaribagh district, there was good scope for bringing more area under irrigation through its exploitation. Besides, there was a sizeable class of small and marginal farmers in the district whose land remained idle in rabi and summer seasons for want of irrigation facilities. The economic well-being of these poor farmers depended mainly on transforming their subsistence agriculture into a viable economic activity through, among others, improved provision of irrigation. Realising the importance of irrigation to small and marginal farmers and given the emphasis increasingly being placed on alleviation of poverty in the rural development programmes by the government, the Bank formulated a minor irrigation scheme exclusively for the benefit of small and marginal farmers in the district.

3.2 The scheme with an outlay of Rs. 71 lakhs envisaged construction of 600 dug wells - 200 with pumpsets and 400 with rahats. The scheme was launched for implementation in 1979 but the pace of financing picked up only after mid-1980. The scheme ran its full term at the end of June 1983. The principal objective of the scheme was to augment the farm output and income of the small and marginal farmers through the provision of irrigation. Under the scheme, the eligible farmers were given loans for construction of dug wells, purchase of diesel pumpsets and other water lifting devices. The scheme envisaged that each beneficiary farmer would bring a minimum 2 acres of land under irrigation from investment in minor irrigation.

3.3 While the outlay of the scheme was projected at Rs. 71 lakhs, the Bank loan was estimated to be Rs. 53 lakhs. The gap of Rs. 18 lakhs between the estimated outlay and the Bank loan was expected to be met by the borrowers with their own resources.

The borrowers and their family members contribution in labour towards the construction work was taken as margin money. The NABARD had agreed to provide refinance to the tune of Rs. 47.92 lakhs for the scheme. When the implementation of the scheme was completed, the Bank had financed 895 units involving a total loan of Rs. 61.77 lakhs. The NABARD had provided refinance of Rs. 43.35 lakhs.

3.4 The scheme provided a loan of Rs. 8,000 for construction of a dug well with rahat. The limit for a composite loan for construction of well and installation of pumpset was Rs. 10,000.

3.5 The rate of interest charged was 10.25 per cent i.e., 3.75 per cent above the refinance rate of 6.50 per cent.

3.6 Repayment period was stipulated at 9 years inclusive of one year grace period.

3.7 The NABARD had advised the Bank to ensure that the farmers availing themselves of loans for minor irrigation would have access to short-term credit either from the Bank or from other lending agencies like primary cooperative societies/RRBs/other commercial banks.

3.8 To ensure adequate availability of groundwater in wells, the NABARD had advised the Bank to maintain a minimum distance of 150 metres between two dug wells.

3.9 It had also advised the Bank to ensure that adequate after-sales service and repair facilities are available in close proximity to the villages covered under the scheme.

#### Implementation

3.10 The Bank did not face any major problem in implementing the scheme. Eight branches in the district namely Hazaribagh,



Chatra, Barkagaon, Barkatha, Chauparan, Hunterganj, Simaria and Pratapur participated in implementing the scheme. The staff in these branches was strengthened to cope with the additional work arising from the scheme. The senior staff of the Bank at the district headquarters made frequent visits to interior branches to appraise the progress of implementation and provided the local staff with guidance and valuable suggestions to ensure smooth financing of the scheme.

3.11 Implementation of the scheme coincided with the launching of the Integrated Rural Development Programme (IRDP) in the district. Since the major objective of the minor irrigation scheme was identical with that of the IRDP, that being alleviation of poverty through the creation of productive assets, it was felt that collaboration with the official development agencies would ensure smooth implementation of the scheme. Consequently, the task of identifying eligible borrowers was left to the official machinery in charge of overseeing the progress of IRDP. The implementing branches started accepting the loan applications forwarded by local BDOs. The collaboration with the official agencies in the implementation of the scheme also facilitated the procurement of subsidy from the government.

3.12 After scrutinising the loan applications received from the BDO's, the Bank staff made pre-sanction visits to verify the authenticity of information supplied by the applicants in the loan proposals. The loans were sanctioned only after the branches were fully satisfied that the investment in minor irrigation in each case was viable.

3.13 Loans for construction of dug wells were released by the branches in 4-6 instalments. After sanctioning the loan, the applicant was asked to undertake construction of field work with the help of his family labour. The first instalment in cash was

released after assessing the progress of field work. Subsequent instalments were released in stages with the satisfactory progress of construction work. In the case of pumpset, the applicant was asked to buy it from the dealer after the loan was sanctioned. The dealer received the payment for pumpset from the Bank by cheque.

3.14 The borrowers reaction to the adequacy of Bank loans and their mode of disbursement was ascertained during the field survey. Many had complained that the loans given by the Bank under the scheme fell short of requirement. As regards the mode of disbursement, some had felt that loans should have been disbursed in not more than 4 instalments.

3.15 Before disbursing the loan, the following documents were executed by the Bank: i) legal/equitable mortgage of land or charge on land by declaration under Public Demand Recovery Act of Bihar State ii) Hypothecation of rahat/pumpset iii) DI&CGC cover iv) letter of guarantee v) D.P. Note vi) Bearer's letter vii) Instalment letter and viii) continuing security letter.

3.16 While financing of the scheme proceeded smoothly, certain constrains in the creation and utilisation of irrigation assets surfaced, raising the cost of investment and impairing the full utilisation of irrigation potential created. Some beneficiaries had discovered hard rock formation in the underground, necessitating blasting and digging of wells deeper. Some had complained that they did not get the promised quota of cement from the Block, forcing them to buy cement in the open market at higher prices. Besides escalating the cost of construction of wells, these factors had delayed the completion of well construction. Some had also experienced shortage of kerosene. They had complained that the monthly quota of 2 litres of kerosene they could obtain from fair price shops was inadequate for irrigation purposes.

They were forced to supplement kerosene supply from purchase in the open market at higher rates.

3.17 In regard to pumpsets, too, things did not proceed smoothly to all sample beneficiaries. It was observed that service facilities for pumpsets in some villages covered in the survey were far from satisfactory. For major repairs they had to bring their pumpsets to district headquarters. Another common complaint voiced by some beneficiaries was that the dealers were charging for servicing of pumpsets during the guarantee period.

## CHAPTER - 4

### IMPACT OF MINOR IRRIGATION

4.1 This chapter is devoted to an analysis of the impact of minor irrigation on the sample borrowers farm business. The impact of minor irrigation has been evaluated in terms of the following parameters: i) additional area brought under irrigation in the post-borrowing period (1982-83); ii) intensity of land use; iii) cropping pattern; iv) extent and spread of adoption of modern farm technology and v) net farm income. Attempts have also been made to assess the impact of irrigation on the employment of both family and hired labour in sample farms. Finally, financial viability of investment in minor irrigation has been assessed by estimating Internal Rate of Return (IRR) based on realistic assumptions regarding the cost-price relationship, economic life of productive assets etc.

#### Distribution of Sample Land Holdings

4.2 The land holdings of sample borrowers ranged between one acre and 5 acres, and averaged 2.52 acres. According to the survey data, 5 farmers (6.25 per cent) owned one acre each, 14 farmers (17.50 per cent) owned between 1.01 and 1.50 acres each, 21 farmers (26.25 per cent) owned between 1.51 and 2.00 acres each and another 14 farmers (17.50 per cent) owned between 2.01 and 2.50 acres each. Thus, 54 sample beneficiaries (67.50 per cent) owned land ranging between one and 2.50 acres each and the remaining 26 beneficiaries (32.50 per cent) owned between 2.51 and 5.00 acres each.

4.3 In view of variations in the size of holdings, it appeared sensible to analyse the impact of minor irrigation in respect of sample beneficiaries with holdings upto 2.50 acres and those with holdings above 2.50 acres separately. For convenience, the first group has been designated as the marginal

farmers and the second as the small farmers. The average size of holdings of the sample marginal farmers turned out to be 1.82 acres and that of the small farmers 3.94 acres. None of the sample beneficiaries had leased in or leased out their land in 1982-83.

4.4 The land holdings of the control sample of non-borrowers varied between 1.50 acres and 5.00 acres and averaged 2.70 acres.

#### Household Characteristics

4.5 Besides being economically poor, most of the sample beneficiaries belonged to the socially depressed community. As the survey data presented in Table 4.1 revealed, 75 (93.75 per cent) of the 80 sample beneficiaries belonged to the backward community, including scheduled castes and scheduled tribes. Evidently, the Bank finance for minor irrigation development reached mainly the economically poor and socially backward communities in the district. Among the 16 sample non-borrowers, 15 (93.75 per cent) belonged to the backward community.

TABLE 4.1

DISTRIBUTION OF SAMPLE HOUSEHOLDS  
ACCORDING TO CASTE/COMMUNITY AND EDUCATION LEVEL

Categories of beneficiaries	Caste/community				Education level				
	Back- ward	For- ward	Oth- ers	Total	Illi- tera- te	Pri- mary	Sec- ond- ary	Co- ll- ege	Total
Marginal farmers	51	2	1	54	12	4	33	5	54
Small farmers	24	2	-	26	2	3	14	7	26
Sample beneficiaries	75	4	1	80	14	7	47	12	80
Control sample	15	-	1	16	10	3	2	1	16

4.6 It can be seen from the same table that 14 sample borrower-households (17.50 per cent) were illiterate households as none of the adult members in these households had any formal education. The remaining 66 households (82.50 per cent) have been divided into the following three groups based on the level of education (highest) acquired by the adult members of these households: i) upto primary level ii) upto secondary level and iii) with higher (college) education. According to this classification, 7 borrower-households (8.75 per cent) belonged to the first category, 47 households (58.75 per cent) to the second category and 12 households (15.00 per cent) to the third category. In the non-borrower sample, 9 were illiterate households, (56.25 per cent), 4 households (25.00 per cent) belonged to the first category, 2 households (12.50 per cent) to the second category and only one household (6.25 per cent) belonged to the third category.

#### Occupation Pattern

4.7 It was observed during the field survey that the income of beneficiary households were derived from more than one occupation. In order to compute family income including income from non-agricultural occupations, it was necessary to ascertain the occupations of family (adult) members and income earned by them from different sources during 1982-83. Income earned by the sample households from diverse occupations is computed in Table 4.2. The survey data revealed that 33 of the 80 sample borrower-households depended entirely on farm income as no adult member in these households was engaged in occupation outside their own farms. In the remaining households, one or more adult members were earning income from diverse occupations. Altogether, 59 members of 47 sample borrower-households were earning income from occupations outside their family farms.

TABLE 4.2AVERAGE INCOME EARNED BY BENEFICIARY-HOUSEHOLDS FROM DIFFERENT OCCUPATIONS

Categories of beneficiaries	Agri-culture labour	Dairy	Serv-ice	Busi-ness	Misc-ellane-ous occu-pation	Total hous-eholds	Average income (In Rs.)	
							Per house-hold	Per earning member
Marginal farmers	2400 (3)	1800 (1)	4367 (12)	1850 (14)	1140 (6)	29 (36)	3333	2685
Small farmers	500 (1)	--	4463 (8)	2189 (14)	--	18 (23)	3714	2907
Sample beneficiaries	1925 (4)	1800 (1)	4405 (20)	2020 (28)	1140 (6)	47 (59)	3479	2771

The figures in brackets indicate number of earning members.

4.8 As can be seen from the table, income earned from agriculture labour in 1982-83 by 4 members averaged Rs. 1,925, and from services by 20 members averaged Rs. 4,405. The income earned by 28 members from business averaged Rs. 2,020 and from dairy by one member was Rs. 1,800. Thus, the income earned by 47 beneficiary households from diverse occupations averaged Rs. 3,479 in 1982-83.

Cost of Investment and Bank Loan

4.9 Although the Bank loan under the scheme was available for construction of wells and installation of pumpsets, only three sample beneficiaries had availed themselves of composite loans for construction of wells and installation of pumpsets. Seventy beneficiaries had secured loans only for construction of wells, while seven beneficiaries had used the Bank loan for purchase of pumpsets. Thus, the Bank loans were used by the sample beneficiaries for construction of 73 dug-wells and

installation of 10 pumpsets. The survey data revealed that 13 beneficiaries had purchased pumpsets with their own resources. Altogether, 23 beneficiaries had wells with pumpsets, while 57 who had not installed pumpsets used rahats to lift water for irrigation.

4.10 The loan given by the Bank for construction of wells varied between Rs. 4,000 and Rs. 10,000 and in one case it amounted to Rs. 16,000. Against an estimated average cost of Rs. 8,822 for construction of wells, shown in Table 4.3, the Bank loan averaged Rs. 6,725. The balance of Rs. 2,097 or about 24 per cent of the cost of construction of wells was borne by the beneficiaries themselves. While the difference between the average cost of construction incurred by the marginal farmers and the small farmers was marginal, the average loan given by the Bank to the former turned out to be significantly lower than that given to the latter. As can be seen from the table, the Bank loans to the marginal farmers for construction of wells averaged Rs. 6,369 as against Rs. 7,607 in the case of small farmers. The result was that while the contribution of the marginal farmers amounted to about 27 per cent of the total cost of construction, it was only about 15 per cent in the case of small farmers.

4.11 In regard to pumpsets too, the average Bank loan given to the marginal farmers is estimated to be lower at Rs. 2,990 compared with Rs. 3,716 given to the small farmers. However, this could be attributed largely to the differences in the brands and the horse power of pumpsets installed by the beneficiaries. Of the 10 pumpsets purchased by the beneficiaries with the Bank loans, 5 operated on kerosene, 3 on diesel and 2 on electricity. Of the 3 pumpsets purchased by the marginal farmers, 2 were of 2 HP and one of 3.4 HP. The small farmers had purchased 7 pumpsets of which 4 were of 2 HP, one 3 HP, another 3.4 HP and another 5 HP.



TABLE 4.3AVERAGE COST OF INVESTMENT IN MINOR IRRIGATION

Categories of beneficiaries	W E L L				(In Rs.) P U M P S E T			
	Bank loan	Total cost	Memb- er's cont- ribu- tion	% of member's contri- bution to total cost	Bank loan	Total cost	Memb- er's cont- ribu- tion	% of member's contri- bution to total cost
Marginal farmers	6369	8754	2385	27.24	2990	2990	--	--
Small farmers	7607	8991	1384	15.39	3716	3716	--	--
Sample beneficiaries	6725	8822	2097	23.77	3498	3498	--	--

4.12 It is quite clear from the survey data that the Bank loan did not fully meet the stipulated 75 per cent of the cost of construction of wells particularly in the case of marginal farmers. As many as 42 sample beneficiaries had complained that the loans given by the Bank were not adequate to cover the cost of construction of wells after adjusting for their own contribution. In many cases, the actual cost of construction had increased due to factors beyond the control of the borrowers, such as discovery of hard rock in the underground, necessitating blasting and shortage of cement forcing beneficiaries to purchase either the whole or part of the cement quota in the black market.

4.13 In a few cases, the cost of construction had escalated on account of bigger size of wells preferred by the beneficiaries. While estimating the cost of construction of wells, the scheme

had assumed the diameter and depth of the well to be 10' and 35' respectively. But diameters of wells constructed by 18 sample beneficiaries were found to be much wider, in the region of 12'-18'. In these cases the actual cost of construction had exceeded Rs. 10,000 each. Similarly, in some cases, wells had to be dug deeper 45'-48' to obtain water. As a result, the average cost of construction of wells by sample beneficiaries had exceeded the limit set by the Bank.

#### Subsidy

4.14 Under the scheme, the beneficiaries were eligible for subsidy from the government ranging between 25 per cent and 66.6 per cent of the cost of investment. The actual subsidy received by the sample beneficiaries varied between Rs. 800 and Rs. 4,850. Altogether, 78 sample beneficiaries had received subsidy which averaged Rs. 2,884. The marginal farmers had received a higher subsidy averaging Rs. 3,054 compared with Rs. 2,525 by the small farmers. The subsidy received from the government was adjusted against the recovery of Bank loans.

#### Area Brought Under Irrigation

4.15 A convenient measure of the impact of irrigation is provided by the area brought under irrigation by the beneficiary farmers in the post-investment period. Total area brought under irrigation by the sample borrowers is estimated to be 162.56 acres, which means an average increase of 2.03 acres under irrigation. The area brought under irrigation by the marginal farmers and small farmers averaged 1.60 acres and 2.93 acres respectively. The relevant data are presented in Table 4.4.

4.16 The survey data revealed that 3 sample marginal farmers and 6 small farmers had some provision of irrigation in the pre-borrowing period which covered 9.47 acres. The area brought under irrigation from investment under the scheme after adjusting

TABLE 4.4

NET AND GROSS AREA BROUGHT  
UNDER IRRIGATION BY SAMPLE BENEFICIARIES

Categories of beneficiaries	PRE-BORROWING PERIOD				POST-BORROWING PERIOD				(Area in acres)	
	Net irrigated area	Ave- rage per bor- row- er	Gro- ss- irri- gated area	Ave- rage per bor- row- er	Net irrigated area	Ave- rage per bor- row- er	Gross irri- gated area	Ave- rage per bor- row- er	% of irriga- ted area to total cropped area	
									Pre-	Post-
									borro-	borro-
									wing	wing
									period	period
<hr/>										
<u>Marginal farmers</u>										
Well only	1.42 (3)	0.47	1.42 (3)	0.47	32.61	0.74	56.15	1.28	1.73	47.02
Well with pumpset	--	--	--	--	15.09	1.51	30.36	3.04	--	69.14
	1.42 (3)	0.47	1.42 (3)	0.47	47.70	0.88	86.51	1.60	1.39	52.97
<hr/>										
<u>Small farmers</u>										
Well only	1.00 (2)	0.50	3.80 (2)	1.90	20.75	1.60	38.34	2.95	7.31	51.09
Well with pumpset	2.00 (4)	0.50	4.25 (4)	1.06	20.10	1.55	37.71	2.90	9.02	48.84
	3.00 (6)	0.50	8.05 (6)	1.34	40.85	1.57	76.05	2.93	8.12	49.95
Sample beneficiaries	4.42 (9)	0.49	9.47 (9)	1.05	88.55	1.11	162.56	2.03	4.71	51.51

Figures in brackets indicate number of beneficiaries.

for the irrigated area in the pre-borrowing period turned out to be 153.09 acres or 1.91 acre per beneficiary.

4.17 As expected, those who had installed pumpsets, had brought larger area under irrigation than others who depended on indigenous device for lifting water. The area brought under irrigation by 23 sample beneficiaries who had installed pumpsets averaged 2.96 acres while the area brought under irrigation by the beneficiaries without pumpsets averaged only 1.66 acres.

4.18 These average estimates concealed significant variations in the area brought under irrigation by the individual beneficiaries. It was observed from the survey data that the minimum area brought under irrigation was 0.40 acre and the maximum 6 acres. Fifteen sample beneficiaries (18.75 per cent) could irrigate less than one acre each and 34 farmers (42.50 per cent) could irrigate between 1.00 and 1.99 acres each. Thus, the area irrigated by 49 or about 61 per cent of the sample beneficiaries turned out to be less than 2 acres each. Among the remaining, 9 farmers (11.25 per cent) could irrigate between 2.00 and 2.50 acres each, 6 farmers (7.50 per cent) between 2.51 and 3.00 acres each, another 6 farmers (7.50 per cent) between 3.01 and 3.50 acres each, 2 farmers (2.50 per cent) between 3.51 and 4.00 acres each and the remaining 8 farmers (10.00 per cent) above 4.00 acres each. Evidently, only 31 beneficiaries (38.75 per cent) could bring irrigation to more than 2 acres each.

4.19 The scheme had envisaged that each beneficiary farmer would bring a minimum 2 acres of land under irrigation in the post-investment period. In terms of this criterion, the performance of the scheme as shown by the survey data with only 39 per cent of the sample beneficiaries succeeding in irrigating more than 2 acres of land each turned out to be far from satisfactory. Main reasons for the shortfall in performance were low size of holdings, low discharge of water in some newly constructed wells and dependence of many beneficiaries on non-mechanical device for drawing water for irrigation.

Intensity of Land Use

4.20 In the pre-borrowing period, most of the land owned by the borrowers remained idle during rabi and summer seasons for want of assured source of irrigation. A majority of the sample farmers were raising crops only in kharif season. As a result, the intensity of land use on the sample farms in the pre-borrowing period was low estimated at 101.78 per cent. However, as is clear from Table 4.5, the intensity of land use by the marginal

TABLE 4.5INTENSITY OF LAND USE

Categories of beneficiaries	(Area in acres)					
	PRE-BORROWING PERIOD			POST-BORROWING PERIOD		
	Net cropped area	Gross cropped area	Intensity of land use (%)	Net cropped area	Gross cropped area	Intensity of land use (%)
<u>Marginal farmers</u>						
Well only	73.88	82.05	111.06	73.88	119.42	161.64
Well with pumpset	21.25	19.90	93.65	21.25	43.91	206.64
	95.13	101.95	107.17	95.13	163.33	171.69
<u>Small farmers</u>						
Well only	51.30	52.00	101.36	51.30	75.04	146.28
Well with pumpset	51.10	47.10	92.17	51.10	77.21	151.10
	102.40	99.10	96.78	102.40	152.25	148.68
Sample beneficiaries	197.53	201.05	101.78	197.53	315.58	159.76
Control sample	--	--	--	38.28	41.71	108.96

farmers was higher at 107.17 per cent compared with only 96.78

per cent by the small farmers.

4.21 With the availability of irrigation, the intensity of land use of the sample beneficiaries rose sharply to 159.76 per cent in the post-investment period. The intensity of land use in the case of marginal farmers rose to 171.69 per cent and in the case of small farmers to 148.68 per cent. It is clear from this comparison that the marginal farmers had utilised the land more intensively than the small farmers.

4.22 The survey data further revealed that the beneficiaries who had installed pumpsets had achieved a higher intensity of land use than those who depended on indigenous device to draw water. The intensity of land use achieved by the former category of sample beneficiaries is estimated to be 175.10 per cent as against 151.01 per cent in the case of the latter category.

4.23 It is interesting to observe that the land utilisation of the control sample engaged in dry farming in 1982-83 was found to be broadly comparable to that of the sample beneficiaries in the pre-borrowing period. The intensity of land use of the control sample is estimated to be 108.96 per cent. Clearly, had the sample beneficiary farmers not invested in minor irrigation, the intensity of their land utilisation would have remained low as in the case of the control sample.

#### Cropping Pattern

4.24 Broadly, there are three ways by which farmers can strive to earn higher return from investment in minor irrigation. These include: i) more intensive use of land through multiple cropping; ii) adoption of remunerative cropping pattern and iii) improvement in yield through the adoption of modern farming practices including the use of fertilisers, pesticides and improved seeds. Investment in irrigation development will not be viable unless farmers

achieve optimum utilisation of land, graduate from subsistence farming to commercial farming and modernise farming operations.

4.25 The impact of irrigation on the cropping pattern of the sample farmers can be assessed from Table 4.6. In the post-

TABLE 4.6

CROPPING PATTERN OF SAMPLE BENEFICIARIES

(Figures in %)

Crops	MARGINAL FARMERS		SMALL FARMERS		TOTAL		Control sample (1982-83)
	Pre-borrowing period	Post-borrowing period	Pre-borrowing period	Post-borrowing period	Pre-borrowing period	Post-borrowing period	
<u>Food grains</u>							
Rice	63.87	38.06	60.86	41.52	62.39	39.73	45.03
Maize	16.48	18.21	16.20	18.69	16.34	18.44	30.13
Wheat	5.38	16.14	4.89	15.53	5.14	15.85	12.95
Small millets	3.24	3.32	7.26	4.73	5.22	4.00	1.80
Pulses	2.45	1.47	1.76	3.54	2.11	2.46	3.53
	91.42	77.20	90.97	84.01	91.20	80.48	93.44
<u>Non-food grains</u>							
Oil seeds	7.01	3.63	5.55	2.86	6.29	3.27	3.96
Sugarcane	--	3.84	0.91	3.54	0.45	3.69	0.77
Potato	1.13	8.91	1.66	2.79	1.39	5.96	1.24
Vegetables	0.20	5.90	0.91	3.39	0.55	4.69	0.09
Others	0.24	0.52	--	3.41	0.12	1.91	0.50
	8.58	22.80	9.03	15.99	8.80	19.52	6.56
Grand total	100.00	100.00	100.00	100.00	100.00	100.00	100.00

borrowing period, 80.48 per cent of the beneficiaries cropped area was accounted for by foodgrains as against about 91.20 per cent in the pre-borrowing period, reflecting increased preference of the sample beneficiaries for cash crops following improvement in the provision of irrigation. While the share of the area

under rice had sharply declined from 62.39 per cent in the pre-borrowing period to 39.73 per cent in the post-borrowing period, the share of wheat almost tripled from 5.14 per cent to 15.85 per cent over the same period.

4.26 In the category of cash crops, the shares of sugarcane and vegetables increased from less than about one per cent each in the pre-borrowing period to 3.69 per cent and 4.69 per cent respectively in the post-borrowing period. The share of the area under potato also rose sharply from 1.39 per cent to 5.96 per cent over the same period. In marked contrast, the share of oilseeds had almost halved to 3.27 per cent in the post-borrowing period from 6.29 per cent in the pre-borrowing period. A comparison of the cropping pattern between the pre-borrowing and post-borrowing period clearly brings out the growing preference of the borrowers towards raising market oriented crops like wheat, sugarcane, potato and vegetables.

4.27 The shift away from subsistence farming to commercial farming is further evident from a comparison of the cropping pattern of the beneficiary farmers with that of the control sample. As can be seen from the table, the cropping pattern of the control sample in 1982-83 was broadly comparable with that of the beneficiary farmers in the pre-borrowing period, suggesting that the changes in the cropping pattern of the beneficiaries were induced mainly by improvement in irrigation. As in the case of beneficiaries in the pre-borrowing period, the cropping pattern of the control sample was dominated by foodgrains which accounted for 93.44 per cent of the total cropped area. While the shares of rice and maize raised by the beneficiaries together accounted for 78.73 per cent of the total area in the pre-borrowing period, the same amounted to 75.16 per cent in the case of control sample in 1982-83. While there were significant variations in the shares of individual crops in the cropping



pattern of the beneficiaries and the control sample, the differences in respect of broad categories of crops were negligible.

4.28 As between the sample marginal farmers and small farmers, the former appeared to have achieved a higher degree of commercialisation in agriculture than the latter. While the share of area devoted to cash crops by the marginal farmers is estimated to be 22.80 per cent, the same turned out to be about 16 per cent in the case of small farmers. Similarly, as can be observed from the table, the share of area devoted by the marginal farmers to wheat was higher and to rice lower than that devoted to these crops by the small farmers.

4.29 These statistics alone do not reveal the real extent of changes in the cropping pattern brought about by the beneficiaries in the wake of improvement in irrigation. In some villages covered in the survey - Amritnagar, Barkagaon, Darikala and Salaiya - hardly any wheat was produced in the pre-borrowing period. But by 1982-83, obviously, encouraged by the practice adopted by the beneficiaries, almost all the farmers in these villages including those who had not availed of Bank loans were raising wheat. In the post-borrowing period 62 sample beneficiaries were growing wheat as against only 18 in the pre-borrowing period. The green revolution appears to be sweeping across many villages in this backward district in the wake of improvement in the provision of irrigation. The story in regard to potato was more or less similar. Forty-two sample beneficiaries were growing potato in the post-borrowing period as against only 12 farmers in the pre-borrowing period. The number of sample beneficiaries growing sugarcane and vegetables also rose from 3 and 5 respectively in the pre-borrowing period to 18 and 16 respectively in the post-borrowing period.

Adoption of Farm Technology

4.30 Besides enabling farmers to practice multiple cropping and raise remunerative crops, the provision of irrigation facilitates adoption of improved farm practices including the use of improved/high yielding seeds, fertilisers etc. Thus, the spread of irrigation paves the way for modernisation of farming practices and for more efficient utilisation of resources. Progress achieved in the application of modern farm inputs is one measure of the impact of minor irrigation.

4.31 In the pre-borrowing period none of the sample beneficiary was growing improved/high yielding crops, but the situation changed with the extension of irrigation in the post-borrowing period. The survey data revealed that altogether 28 sample beneficiaries had adopted high yielding varieties of seeds in the post-borrowing period. As shown in Table 4.7, 14 marginal

TABLE 4.7AREA BROUGHT UNDER IMPROVED/HYV CROPS BY BENEFICIARIES

(Area in acres)

Categories of beneficiaries	No. of beneficiaries	Wheat	Maize	Rice
<u>Marginal farmers</u>				
Well only	8	5.84(31.93)	0.25(1.24)	--
Well with pumpset	7	4.77(13.38)	--	--
	15	10.61(40.25)	0.25(0.84)	--
<u>Small farmers</u>				
Well only	2	1.50(12.40)	--	--
Well with pumpset	11	11.22(97.14)	0.50(3.27)	2.00(6.03)
	13	12.72(53.78)	0.50(1.76)	2.00(3.16)
Sample beneficiaries	28	23.33(46.65)	0.75(1.29)	2.00(1.60)

Figures in brackets indicate % to total area under the respective crops.

farmers and 11 small farmers had raised high yielding wheat in 1982-83. As regards rice and maize, the progress was not encouraging partly because both these crops were raised mainly in rainfed conditions during the kharif season. Only 2 sample beneficiaries each had adopted high yielding varieties of rice and maize. The area covered under high yielding varieties accounted for 40.25 per cent and 53.78 per cent of the total wheat area devoted by the marginal farmers and small farmers respectively. By marked contrast none of the sample non-borrowers had used improved/high yielding varieties of seeds in 1982-83.

4.32 It must be mentioned in this context that many sample beneficiaries who were keen to replace local varieties of rice and wheat could not do so because of shortages of improved/high yielding seeds. They had complained that they could not get timely supplies of improved/high yielding seeds from the Block offices. Despite repeated visits to Block offices, some farmers were sent back with the stock reply that consignment of seeds had not been received. Evidently, the progress in the use of improved/high yielding varieties would have been still better if there was no supply constrain.

4.33 In regard to use of fertilisers, the progress achieved by the beneficiary farmers in the post-borrowing period has been impressive. In the pre-borrowing period only 12 sample borrowers (15.00 per cent) were using fertilisers. This number increased to 72 (90.00 per cent) - 52 marginal farmers and 20 small farmers - in the post-borrowing period.

4.34 It is interesting to note from Table 4.8 that the marginal farmers had applied higher doses of fertilisers estimated at 73.36 kg per acre compared with 45.64 kg per acre applied by the small farmers. The survey data further revealed that about 85 per cent of the total fertilisers used by the marginal farmers

and about 72 per cent by the small farmers was accounted for by irrigated area. Evidently, increase in fertiliser consumption appeared to have been spurred by improvement in irrigation.

TABLE 4.8

FERTILISER USAGE: COVERAGE AND INTENSITY

Categories of beneficiaries	Users of fertiliser	Area benefiting from fertiliser	(Area in acres)	
			Per acre fertiliser used (kg)	% of area benefiting from fertiliser
<u>Marginal farmers</u>				
Well only	42	113.34	75.68	94.91
Well with pumpset	10	43.91	67.37	100.00
	52	157.25	73.36	96.28
<u>Small farmers</u>				
Well only	10	56.49	41.42	75.28
Well with pumpset	10	58.06	49.74	75.20
	20	114.55	45.64	75.24
Sample beneficiaries	72	271.80	61.68	86.13
Control sample	11	14.63	34.65	35.08

4.35 In the case of control sample, it was found that 11 farmers had applied fertilisers in 1982-83 but both in terms of coverage and intensity of application, they were way behind the sample beneficiaries. While the fertilisers used by the borrowers benefited 86 per cent of the total cropped area, they covered only 35 per cent of the cultivated area of the control sample. The average fertilisers applied by the control sample stood at 34.65 kg per acre as against 61.68 kg per acre by the sample beneficiaries. This comparison reinforces the finding

that an assured source of irrigation is a pre-requisite for promoting fertiliser consumption.

4.36 To a lesser extent there was significant increase in the use of pesticides by the sample beneficiaries. In the pre-borrowing period none of the sample beneficiaries was using pesticides. In the post-borrowing period 47 farmers (58.75 per cent) had applied pesticides covering an area of 108.38 acres. As shown in Table 4.9, expenditure incurred on pesticides by

TABLE 4.9  
COVERAGE OF PESTICIDES USAGE

Categories of beneficiaries	No. of beneficiaries using pesticides	Area covered (acres)	Total expendi- ture (Rs.)	Per acre expen- diture (Rs.)
<u>Marginal farmers</u>				
Well only	24	41.41	948.00	22.89
Well with pumpset	8	25.30	853.00	33.72
	32	66.71	1801.00	27.00
<u>Small farmers</u>				
Well only	4	7.45	114.50	15.37
Well with pumpset	11	34.22	1053.00	30.77
	15	41.67	1167.50	28.02
Sample beneficiaries	47	108.38	2968.50	27.39
Control sample	4	3.75	69.00	18.40

these beneficiaries averaged Rs. 27.39 per acre. Expenditure incurred by the marginal farmers averaged Rs. 27 per acre and by the small farmers Rs. 28.02 per acre.

4.37 Among the sample non-borrowers only 4 had applied pesticides covering an area of 3.75 acres and involving an average expenditure of Rs. 18.40 per acre in 1982-83.

#### Gross Income

4.38 The gross farm income of the sample beneficiaries has been estimated from four sources: i) value of farm produce; ii) value of by-products; iii) income from sale of water and iv) income from hiring out diesel/electric pumpsets.

4.39 Although some beneficiaries had complained that they could not utilise the well water fully for irrigation in the absence of mechanical device to lift water, only 3 had allowed their neighbours to use surplus water for irrigation without charging. Similarly, only 6 of 23 beneficiaries who had installed pumpsets had rented out their pumpsets for irrigation purposes. Income earned from hiring services has been added to the estimated value of crop produce.

4.40 As shown in Table 4.10, the gross income earned by the

TABLE 4.10

GROSS FARM INCOME OF BENEFICIARY HOUSEHOLDS

(In Rs.)

Categories of beneficiaries	Per acre	Per beneficiary
<u>Marginal farmers</u>		
Well only	1973	5355
Well with pumpset	2348	10312
	2074	6273
<u>Small farmers</u>		
Well only	1716	9907
Well with pumpset	1866	11081
	1792	10494
Sample beneficiaries	1938	7645
Control sample	984	2649

sample beneficiaries in 1982-83 averaged Rs. 1,938 per acre. The gross farm income earned by the sample beneficiaries ranged between Rs. 1,145 and Rs. 3,316 per acre.

4.41 The survey data revealed that the beneficiaries who had installed pumpsets to their wells had earned a higher average gross income than those who did not use mechanical device for lifting water. The average farm income earned by the sample marginal farmers who had installed pumpsets is estimated to be Rs. 2,348 per acre compared with Rs. 1,973 per acre earned by the marginal farmers who had no pumpsets. Similarly, the estimated gross farm income of small farmers with pumpsets turned out to be higher at Rs. 1,866 per acre as against Rs. 1,716 per acre realised by others without pumpsets.

4.42 The farm income of the control sample averaged Rs. 984 per acre. Evidently, the provision of irrigation had enabled the beneficiaries to almost double their average farm income.

#### Cost of Production

4.43 The following items were included in the cost of production of crops: i) expenditure incurred by the sample farmers on purchase of seeds, manures, fertilisers and pesticides; ii) wages paid to hired human labour and bullock labour; iii) irrigation charges including cost of diesel/kerosene/electricity charges; iv) repair and maintenance of farm implements including pumpsets; v) land revenue; vi) interest on working capital at the rate of 10.5 per cent per annum; vii) maintenance of draught animals and viii) the cost of household seeds and manures imputed at the going market rates.

4.44 The details of cost of production estimated from the survey data are presented in Table 4.11. The average cost of production incurred by the sample beneficiaries is estimated to

TABLE 4.11

## AVERAGE COST OF PRODUCTION INCURRED BY SAMPLE BENEFICIARIES

(In Rs.)

Categories of beneficiaries	MARGINAL FARMERS						SMALL FARMERS						SAMPLE BENEFICIARIES		CONTROL SAMPLE	
	Well only		Well with pumpset		Total		Well only		Well with pumpset		Total		Per acre	%	Per acre	%
	Per acre	%	Per acre	%	Per acre	%	Per acre	%	Per acre	%	Per acre	%	Per acre	%	Per acre	%
<u>I. Cost of inputs</u>																
Seeds	176.51	15.99	165.47	13.76	173.53	15.35	151.19	17.71	141.20	14.36	146.12	15.89	160.31	15.58	65.69	16.11
Manure	102.99	9.33	91.78	7.63	99.98	8.84	72.09	8.44	99.57	10.12	86.03	9.35	93.25	9.06	70.44	17.27
Fertilisers	167.64	15.19	170.87	14.21	168.52	14.91	51.85	6.07	110.70	11.25	81.69	8.88	126.63	12.31	32.93	8.07
Pesticides	7.94	0.72	20.43	1.70	11.29	1.00	1.53	0.18	13.64	1.39	7.67	0.84	9.55	0.93	1.24	0.31
	455.08	41.23	448.55	37.30	453.32	40.10	276.66	32.40	365.11	37.12	321.51	34.96	389.74	37.88	170.30	41.76
<u>II. Cost of labour</u>																
Hired bullock labour	19.24	1.74	10.11	0.84	16.78	1.48	17.22	2.02	8.68	0.88	12.89	1.40	14.91	1.45	4.24	1.04
Hired wage labour	184.65	16.73	213.30	17.74	192.36	17.02	206.52	24.19	185.73	18.89	195.97	21.31	194.10	18.87	55.59	13.63
Maintenance of draught animals	334.95	30.34	341.61	28.41	336.74	29.79	263.86	30.90	274.58	27.91	269.29	29.28	304.20	29.57	157.79	38.69
	538.84	48.81	565.02	46.99	545.88	48.29	487.60	57.11	468.99	47.68	478.15	51.99	513.21	49.89	217.62	53.36
<u>III. Other expenditure</u>																
Irrigation charges including hiring charges	26.80	2.43	83.12	6.91	41.93	3.71	26.65	3.12	69.94	7.11	48.60	5.28	45.15	4.39	--	--
Land revenue	5.17	0.47	2.85	0.24	4.55	0.41	4.70	0.55	4.24	0.43	4.47	0.49	4.51	0.44	2.54	0.62
Interest on working capital	65.04	5.89	72.83	6.05	67.15	5.94	45.82	5.37	59.01	6.00	52.51	5.71	60.08	5.84	15.61	3.83
Miscellaneous charges	12.88	1.17	30.20	2.51	17.53	1.55	12.41	1.45	16.33	1.66	14.40	1.57	16.02	1.56	1.77	0.43
	109.89	9.96	189.00	15.71	131.16	11.61	89.58	10.49	149.52	15.20	119.98	13.05	125.76	12.23	19.92	4.88
<b>GRAND TOTAL</b>	<b>1103.81</b>	<b>100.00</b>	<b>1202.57</b>	<b>100.00</b>	<b>1130.36</b>	<b>100.00</b>	<b>853.84</b>	<b>100.00</b>	<b>983.62</b>	<b>100.00</b>	<b>919.64</b>	<b>100.00</b>	<b>1028.71</b>	<b>100.00</b>	<b>407.84</b>	<b>100.00</b>



be Rs. 1,029 per acre. The lowest and highest cost of production incurred by the beneficiaries turned out to be Rs. 231 and Rs. 1,858 per acre respectively. The cost incurred by the marginal farmers averaged Rs. 1,130 per acre as against Rs. 920 per acre by the small farmers. In both these groups, the cost incurred by the beneficiaries who had installed pumpsets was higher than those who did not use pumpsets. The non-borrower farmers who raised rainfed crops had incurred a very low average cost of production estimated at Rs. 408 per acre.

4.45 It can be seen from the table that maintenance of draught animals was a major item of expenditure accounting for nearly 30 per cent of the expenditure incurred by both the sample marginal and small farmers. Wages paid to hired human labour accounted for about 17 per cent of the total cost of production in the case of marginal farmers and about 21 per cent in the case of small farmers. Thus, wages paid to labour - human and bullock - and maintenance of draught animals together accounted for about 48 per cent and 52 per cent of the cost of production incurred by the sample marginal and small farmers respectively.

4.46 It is also interesting to observe that the expenditure incurred on fertilisers by the marginal farmers was significantly higher than that incurred by the small farmers. As against Rs. 168.52 per acre incurred on this input by the marginal farmers, the amount incurred by the small farmers was only Rs. 81.69 per acre. The average amount spent by the control sample on fertilisers was even lower, Rs. 32.93 per acre. Similarly, expenditure incurred on seeds, manures and pesticides by the marginal farmers turned out to be Rs. 284.80 per acre compared with Rs. 239.82 per acre incurred by the small farmers. This comparison suggests that the marginal farmers had used farm resources more intensively than the small farmers.

Net Income

4.47 The net income earned by the sample beneficiaries averaged Rs. 909 per acre. As Table 4.12 shows, the marginal farmers had

TABLE 4.12ESTIMATED AVERAGE INCOME EARNED BY SAMPLE BENEFICIARIES

Categories of beneficiaries	(In Rs.)					
	PER - ACRE			PER - BENEFICIARY		
	Gross income	Total cost	Net income	Gross income	Total cost	Net income
<u>Marginal farmers</u>						
Well only	1973	1104	869	5355	2996	2359
Well with pumpset	2348	1203	1145	10312	5280	5032
	2074	1130	944	6273	3419	2854
<u>Small farmers</u>						
Well only	1716	854	862	9907	4929	4978
Well with pumpset	1866	984	882	11081	5842	5239
	1792	920	872	10494	5385	5109
Sample beneficiaries	1938	1029	909	7645	4058	3587
Control sample	984	408	576	2649	1154	1495

earned a higher net income of Rs. 944 per acre compared with Rs. 872 per acre earned by the small farmers. The net income of the control sample engaged in raising rainfed crops is estimated to be lower at Rs. 576 per acre. Evidently, investment in minor irrigation had enabled the sample beneficiaries to realise an incremental income of Rs. 333 per acre in 1982-83.

4.48 The estimated average net income of the sample beneficiaries showed significant variations between Rs. 339 per acre and

Rs. 1,874 per acre. Two beneficiaries had earned less than Rs. 400 per acre, 14 beneficiaries between Rs. 401 and Rs. 600 per acre, 19 beneficiaries between Rs. 601 and Rs. 800 per acre and 9 beneficiaries between Rs. 801 and Rs. 1,000 per acre. Thus, 44 beneficiaries constituting 55 per cent of the sample had earned net income of less than Rs. 1,000 per acre and the remaining had earned net income above Rs. 1,000 per acre.

#### Impact on Labour

4.49 Provision of irrigation leading to more intensive use of land and adoption of modern farming practices is expected to create additional demand for labour. To assess the impact of minor irrigation on employment both of family and hired labour, the relevant data have been collected from the sample farmers during field survey. While the beneficiaries could recall the data regarding the number of persons employed on wages, days of employment and wages paid to hired labour, they were vague about the days of employment engaged in by the family members. As it is, farmers have a tendency to exaggerate the role of family labour in agriculture as most of the adult family members are engaged in one or the other farm operations throughout the year. Hence, the data on man-days of employment engaged in farm operations by family members collected during field visits are not very reliable. All the same, an attempt has been made to assess the impact of the scheme on the family and hired labour.

4.50 During the field survey all beneficiaries had admitted that labour requirement for farm operations had increased in the post-investment period. However, 6 beneficiaries - 4 marginal farmers and 2 small farmers - did not employ hired labour at all as they depended entirely on their family labour in the post-investment period. Two sample beneficiaries had employed permanent labour in the post-borrowing period.

4.51 The relevant data regarding number of days of employment by family and hired labour are presented in Table 4.13. As the

TABLE 4.13

MAN-DAYS OF EMPLOYMENT IN SAMPLE FARMS

	(Days per acre)		
Categories of beneficiaries	Family labour	Hired (wage) labour	Total labour
<hr style="border-top: 1px dashed black;"/>			
<u>Marginal farmers</u>			
Well only	68	23	91
Well with pumpset	63	25	88
	67	23	90
<hr style="border-top: 1px dashed black;"/>			
<u>Small farmers</u>			
Well only	63	26	89
Well with pumpset	72	22	94
	68	24	92
<hr style="border-top: 1px dashed black;"/>			
Sample beneficiaries	67	24	91
<hr style="border-top: 1px solid black;"/>			
Control sample	63	8	71
<hr style="border-top: 1px solid black;"/>			

data revealed the man-days of hired labour employed by the small farmers were marginally higher than those by the marginal farmers. In respect of family labour too, man-days of employment in the small farms was higher estimated at 68 days as against 67 days in the marginal farms.

4.52 A comparison of man-days of employment in the beneficiary farms and the control sample revealed that the per acre employment in the beneficiary farms was higher than in the non-borrower's farms. Man-days of employment in the beneficiary farms averaged 91 days per acre comprising 67 days of family

labour and 24 days of hired labour compared with 71 days including 63 days of family labour and 8 days of hired labour. Thus, on average, the provision of irrigation had created 20 man-days of additional employment per acre.

### Farm Investment

4.53 As the survey data revealed, most of the sample beneficiaries were left with higher farm income in the post-borrowing period. There is no doubt that since a vast majority of them were poor, they must have spent a significant proportion of the additional income on improving their food consumption. However, a few had also utilised a part of their surplus income for re-investment in farms and for purchase of household durables.

4.54 Investment made by the sample beneficiaries in various assets in the post-investment period is shown in Table 4.14.

TABLE 4.14

INVESTMENT IN FARM ASSETS MADE BY  
SAMPLE BENEFICIARIES IN POST-BORROWING PERIOD

Categories of beneficiaries	PURCHASE OF LAND			FARM BUILDING		LAND IMPROVEMENT		
	No. of benefi- ciaries	Area (ac- res)	Amount (Rs.)	No. of bene- fici- aries	Amount (Rs.)	No. of bene- fici- aries	Area cov- ered (acres)	Amount (Rs.)
<u>Marginal farmers</u>								
Well only	8	3.20	27000	1	2000	4	7.00	6500
Well with pumpset	4	1.30	12500	3	10700	3	3.50	4000
	<u>12</u>	<u>4.50</u>	<u>39500</u>	<u>4</u>	<u>12700</u>	<u>7</u>	<u>10.50</u>	<u>10500</u>
<u>Small farmers</u>								
Well only	2	0.45	4000	--	--	2	3.00	1200
Well with pumpset	4	1.75	12000	3	5900	5	7.45	10700
	<u>6</u>	<u>2.20</u>	<u>16000</u>	<u>3</u>	<u>5900</u>	<u>7</u>	<u>10.45</u>	<u>11900</u>
Sample beneficiaries	18	6.70	55500	7	18600	14	20.95	22400

The data showed that 18 beneficiaries - 12 marginal farmers and 6 small farmers - had invested altogether Rs. 55,500 in purchase

of 6.70 acres of land. Seven beneficiaries - 4 marginal farmers and 3 small farmers - had invested Rs. 18,600 in construction of sheds, pump house, water tank etc. Fourteen beneficiaries had spent Rs. 22,400 on improvement of land, including levelling, bunding etc. covering an area of 20.95 acres.

4.55 Further, as can be seen from Table 4.15 as many as 43

TABLE 4.15

INVESTMENT MADE BY SAMPLE BENEFICIARIES IN  
MILCH AND DRAUGHT ANIMALS IN POST-BORROWING PERIOD

Categories of beneficiaries	MILCH ANIMAL			DRAUGHT ANIMAL			PURCHASE OF FARM IMPLE- MENTS	
	No. of bene- fici- aries	No. of ani- mals	Amount (Rs.)	No. of bene- fici- aries	No. of ani- mals	Amount (Rs.)	No. of bene- fici- aries	Amount (Rs.)
<u>Marginal farmers</u>								
Well only	4	8	5300	22	25	35970	8	5179
Well with pumpset	3	3	2590	3	3	3600	1	6000
	7	11	7890	25	28	39570	9	11179
<u>Small farmers</u>								
Well only	2	2	2800	10	10	13100	4	8300
Well with pumpset	-	-	--	8	11	12600	5	8480
	2	2	2800	18	21	25700	9	16780
Sample beneficiaries	9	13	10690	43	49	65270	18	27959

sample beneficiaries - 25 marginal farmers and 18 small farmers - had purchased 49 bullocks worth Rs. 65,270. Nine beneficiaries had spent a part of their income on purchase of milch animals such as cows, buffaloes and goats in the post-investment period. Besides, 18 beneficiaries had invested a sum of Rs. 27,959 on

farm implements such as drillers, sprayers etc. Thus, a part of the earnings that could have been set aside for repayment of loans had been diverted for purchase of household durables and investment in farm assets.

#### Impact on Poverty Alleviation

4.56 As mentioned earlier, one of the objectives of this scheme, being part of IRD Programme, was to augment the income of the beneficiary households so as to enable them to cross the poverty line. One way of assessing the success of the scheme therefore is to ascertain the extent to which this objective has been achieved. According to the Union ministry of rural development, a rural household with a family income of less than Rs. 3,500 per annum (at 1979-80 price level) is considered to be living below the poverty line. By this definition, the sample beneficiary households should be left with a net income of Rs. 3,500 and above including income from all sources, after allowing for repayment of loan instalment, if they were to live above the poverty line.

4.57 It was observed from the survey data that 14 beneficiary households comprising 5 marginal farmers and 9 small farmers had family income including earnings of all adult members from different occupations above Rs. 3,500 per annum in the pre-borrowing period. However, in terms of per capita income of Rs. 700 per annum, only 9 beneficiary households - 4 marginal farmers and 5 small farmers - were living above the poverty line in the pre-borrowing period. These households thus continued to live above the official poverty line even in the post-borrowing period.

4.58 Excluding these 14 households and without adjusting for repayment of loan instalments, it was found that of the 66 sample beneficiary households, 26 households (39 per cent) had

earned an average net farm income higher than Rs. 3,500 in 1982-83. As shown in Table 4.16, including income earned by the family members from all occupations, the number of families with income above this level rises to 35 (53 per cent).

TABLE 4.16

IMPACT OF MINOR IRRIGATION ON POVERTY ALLEVIATION

Categories of beneficiaries	Family which lived above poverty line in pre-bo- rrowing period including non-farm income	POST-BORROWING PERIOD							
		Family income at Rs. 3,500/-				Family income at Rs. 4,500/-			
		Without adjusting for repayment		After adjusting for repayment		Without adjusting for repayment		After adjusting for repayment	
		Farm inc- lud- inc- lud- ome only	Farm inc- lud- inc- lud- ome only	Farm inc- lud- inc- lud- ome only	Farm inc- lud- inc- lud- ome only	Farm inc- lud- inc- lud- ome only	Farm inc- lud- inc- lud- ome only	Farm inc- lud- inc- lud- ome only	Farm inc- lud- inc- lud- ome only
<u>Marginal farmers</u>									
Well only	3	5	12	1	10	1	8	--	2
Well with pumpset	2	6	7	4	5	4	5	2	3
	5	11	19	5	15	5	13	2	5
<u>Small farmers</u>									
Well only	4	7	8	3	6	4	8	1	3
Well with pumpset	5	8	8	6	7	6	7	2	6
	9	15	16	9	13	10	15	3	9
Sample beneficiaries	14	26	35	14	28	15	28	5	14

4.59 However, it must be admitted that the entire net farm income earned by the beneficiaries will not be available for family consumption. They have to set aside a part of the income



for repayment of instalment until the entire loan is fully repaid. The annual repayment of Bank loan after adjusting for subsidy received from the government was worked out in respect of each sample beneficiary household. After adjusting for repayment of loan instalment, the survey data revealed that 14 beneficiaries (21 per cent) had earned an average net farm income above Rs. 3,500 in 1982-83. Including income from all sources, the number of households earning more than Rs. 3,500 per annum turned out to be 28. Thus, the investment in minor irrigation enabled 28 beneficiary households (42 per cent) to cross the poverty line.

4.60 So far, the impact of the scheme on poverty alleviation has been assessed in monetary terms without adjusting for changes in price level. As indicated earlier, the poverty level of rural households was defined at 1979-80 price level which year broadly corresponds to the pre-borrowing period in this study. It is common knowledge that the general price level has steadily increased since 1979-80, justifying revision in the income level for identifying the households living above the poverty line. To adjust for the changes in the price level between 1979-80 and 1982-83, we have used the consumer price index for agriculture labour in Bihar. The exercise revealed that a household with Rs. 3,500 income in 1979-80 would require Rs. 4,494 or approximately Rs. 4,500 in 1982-83 to compensate for the rise in prices.

4.61 Applying the revised income ceiling, it can be seen that only 15 beneficiary households had earned an average net farm income above Rs. 4,500 in 1982-83. In terms of total family income from all occupations, the number of such families turned out to be 28. After adjusting for repayment of loan instalments, only 14 beneficiary households (21 per cent) were left with income adequate to live above the poverty line in real terms. Evidently, the impact of the scheme in terms of poverty alleviation has been only modest.

Recovery Performance

4.62 Data regarding demand, repayment and outstanding amount in respect of each sample beneficiary have been obtained from the implementing branches through a separate proforma designed for the purpose. Certain qualitative information pertaining to repayment behaviour of the sample beneficiary has been collected during the field survey. The repayment performance of the sample beneficiaries could be assessed from the data presented in Table 4.17.

TABLE 4.17RECOVERY OF BANK LOAN

Categories of beneficiaries	(In Rs.)							
	1	9	8	1	1	9	8	2
	Demand	Payment	% of recovery	Demand	Payment	% of recovery		
<u>Marginal farmers</u>								
Well only	30800.00	9709.44	31.52	44774.95	9533.40	21.29		
Well with pumpset	8037.14	10673.84	132.81	9772.00	8000.00	81.87		
	38837.14	20383.28	52.48	54546.95	17533.40	32.14		
<u>Small farmers</u>								
Well only	22000.00	23144.14	105.20	35000.00	5329.00	15.22		
Well with pumpset	8098.00	1550.00	19.14	10098.00	5232.80	51.82		
	30098.00	24694.14	82.04	45098.00	10561.80	23.42		
Sample beneficiaries	68935.14	45077.42	65.39	99644.95	28095.20	28.20		

4.63 As can be observed from the table, the recovery rate had declined sharply from 65.39 per cent in 1981 to 28.20 per cent in 1982. However, it must be mentioned that satisfactory rate

of recovery of loans in 1981 was partly the result of adjustment of subsidy received by the beneficiaries against their loan repayment.

4.64 It is also instructive to note that the repayment performance of the marginal farmers in 1982 was better than that of the small farmers. The repayment as a percentage of demand in respect of marginal farmers is estimated to be 32.14 as against 23.42 in the case of small farmers. Moreover, within each category, the repayment performance in respect of beneficiaries who had installed pumpsets was better than that of those who had not installed pumpsets.

4.65 These average recovery rates concealed wide variations in repayment behaviour of individual sample beneficiaries. For instance, 18 beneficiaries - 14 marginal farmers and 4 small farmers - had fully repaid the loans by December 1982, much before the expiry of the repayment period.

4.66 The survey data further revealed that excluding the above 18 cases, only 3 beneficiaries were regular in repaying the instalments. Twenty-four beneficiaries comprising 13 marginal farmers and 11 small farmers had paid only a part of the instalments. The remaining 35 beneficiaries - 24 marginal farmers and 11 small farmers - had not paid a single instalment in two years.

4.67 Thus, the repayment performance of 59 sample beneficiaries (74 per cent) was unsatisfactory till the end of 1982. In this context, it is necessary to distinguish between wilful defaulters and non-wilful defaulters. A wilful defaulter can be defined as one who has the ability to repay but is unwilling to do so. The repayment capacity of a borrower depends mainly on the net income earned by him from the investment. However, before

repaying the loan instalments from the net income the beneficiary has to provide for family consumption. This would imply that the repayment capacity of the beneficiary is determined by the surplus income left with him after meeting family expenditure. Thus, a household which had earned a net farm income above Rs. 3,500, the minimum amount required to live above the poverty line, but not paid even a part of the loan instalment can be treated as wilful defaulter.

4.68 Of these 59 beneficiaries whose repayment performance was unsatisfactory, 21 had family income below the poverty line. Thus, the repayment capacity of these households was weak as the income earned by them including earnings from non-farm occupations was less than the amount required to live above the poverty line. Clearly, in these cases, low family income was mainly responsible for the poor recovery of loans.

4.69 The remaining 38 beneficiaries had the capacity to repay as their family income from all sources exceeded Rs. 3,500 in 1982-83. Among these, 16 beneficiaries had paid at least a part of the instalments while 22 had not paid any amount towards repayment of loans either in 1981 or in 1982. Evidently, 22 sample beneficiaries (28 per cent) turned out to be wilful defaulters.

4.70 Low income earned from crop production by the sample beneficiaries was one of the major reasons for poor recovery of Bank loans. Another reason could be the high repayment instalment fixed by the branches in their anxiety to recover the loans as early as possible. As against the repayment period of 15 years for well loans recommended by NABARD, the branches had fixed the repayment period at 5 years. This has resulted in repayment instalment being burdensome to many beneficiaries. Thirdly, in some instances, there was diversion of surplus income for investment in farm assets, with the result, recovery of

Bank loan suffered. Moreover, severe drought in some parts of the district in 1981-82 had reduced the farm income of many families, forcing them to borrow from non-institutional sources. This had further undermined their ability to repay the loan instalments in 1982.

#### Financial Viability

4.71 The financial viability of investment in minor irrigation has been assessed by estimating Internal Rate of Return (IRR) based on following assumptions:

- i) the cost and price relationship will remain constant at 1982-83 price level;
- ii) the economic life of a dug-well is assumed to be 20 years;
- iii) it is assumed that the beneficiaries would spend Rs. 3,000 per well on improvement and renovation every five years;
- iv) a pumpset is presumed to have an economic life of seven years;
- v) the scrap value of a pumpset is assumed at Rs. 300.

4.72 The exercise revealed the following estimates of IRR: 36 per cent in the case of marginal farmers who had constructed only wells and 42 per cent in the case of marginal farmers who had constructed wells and installed pumpsets. In the case of small farmers who had installed pumpsets IRR turned out to be 45 per cent as against 40 per cent in the case of well investment. The high values of IRR could be attributed partly to non-inclusion of the cost of family labour in the estimated cost of production.