



EVALUATION STUDY SERIES NO. 27.

---

**MINOR IRRIGATION IN MUZAFFAR NAGAR  
DISTRICT, U. P.**

---

**AN EX-POST  
EVALUATION STUDY**

---



---

**NATIONAL BANK FOR  
AGRICULTURE AND RURAL DEVELOPMENT**

**ECONOMIC ANALYSIS AND PUBLICATIONS DEPARTMENT**

**BOMBAY**

**1987**



The National Bank for Agriculture and Rural Development (NABARD) was established on July 12, 1982. The Agricultural Refinance & Development Corporation (ARDC) ceased to exist from that day and its functions were taken over by the NABARD. The subject-scheme was sanctioned by the erstwhile ARDC. For the sake of convenience, the report refers to ARDC although it does not exist any more.



## FOREWORD

This report presents the results of evaluation of a scheme sanctioned to the Uttar Pradesh State Co-operative Land Development Bank, Ltd., (UPSCCLDB) for financing investments in shallow tubewells.

The financial as well as physical performance under the reference scheme was found to be satisfactory. More than half of the beneficiaries financed under the scheme belonged to the category of small farmers. As the scheme area already had the benefit of canal irrigation, the investments in shallow tubewells financed under the scheme sought to improve the irrigation intensity and timeliness of irrigation.

The sample data showed that 78 per cent of diesel engines and 14 per cent of electric motors purchased by the scheme beneficiaries were oversized (higher hp), resulting in wasteful expenditure. This practice needs to be discouraged by banks and extension agencies.

A positive feature observed under the scheme was that many of the small farmers who were financed, got over the problem of limited viability imposed by small sized holdings by resorting to sale of water to neighbours.

The optimum use of the irrigation potential created, combined with adoption of improved agricultural practices also helped in improving farm incomes and ensuring good repayment performance.

NATIONAL BANK FOR AGRICULTURE  
AND RURAL DEVELOPMENT  
BOMBAY

**G.P. Bhawe**  
Managing Director

3 August, 1987



## **CREDIT LIST**

### **Overall Direction**

Dr. M.V. Gadgil, Chief General Manager

### **General Direction**

Shri C. Ramalingam, General Manager

Shri R.G. Shaligram, Manager

### **Processing, Analysis of Data and Drafting of Report**

Shri N.K. Gupta, Deputy Manager

### **Tabulation of Data**

Shri R.K. Malhotra, Asst. Development Officer

### **Field Investigations**

Shri N.K. Gupta, Deputy Manager





## **ABBREVIATIONS**

<b>ARDC</b>	:	Agricultural Refinance and Development Corporation
<b>DTW</b>	:	Diesel Tubewell
<b>DTW-SF</b>	:	Diesel Tubewell - Small Farmers
<b>DTW-OF</b>	:	Diesel Tubewell - Other Farmers
<b>DTW-All</b>	:	Diesel Tubewell - All (Sample beneficiaries)
<b>ETW</b>	:	Electric Tubewell
<b>ETW-SF</b>	:	Electric Tubewell - Small Farmers
<b>ETW-OF</b>	:	Electric Tubewell - Other Farmers
<b>ETW-All</b>	:	Electric Tubewell - All (Sample beneficiaries)
<b>FRR</b>	:	Financial Rate of Return
<b>hp</b>	:	Horse Power
<b>NABARD</b>	:	National Bank for Agriculture and Rural Development
<b>O&amp;M Cost</b>	:	Operation & Maintenance Cost
<b>PACS</b>	:	Primary Agricultural Credit Society
<b>UPSCCLDB</b>	:	Uttar Pradesh State Co-operative Land Development Bank Ltd.
<b>UPSEB</b>	:	Uttar Pradesh State Electricity Board



## CONTENTS

	Page No.
<b>Foreword</b>	ii
<b>Basic Data Sheet</b>	vi
<b>Summary and Conclusions</b>	1 - 6
<b>The Main Report</b>	
I. Introduction	7
II. The scheme and its implementation	8 - 17
III. Approach to evaluation	18 - 20
IV. Economics of investment	21 - 49
V. Aggregate impact of the scheme	50 - 55
VI. Farm size for investment in tubewells	56 - 58
Annexure I - Annual draft and water application for major crops	59 - 60
Annexure II -Economics of 5 acre holding	61
Annexure III-Economics of jaggery unit and wheat - thresher unit.	62 - 80
Statements 1 - 25	



### BASIC DATA SHEET

1. Scheme	:	Minor Irrigation (STW) in Muzaffar-nagar district, Uttar Pradesh				
2. Month/year of sanction	:	May 1976				
3. Month/year of closure	:	June 1978				
4. Implementation period	:	15 February 1976 - 30 June 1978				
5. Implementing bank	:	UPSCCLDB				
6. Reference year of the study	:	1981-82				
7. Total investment cost (historical)	:	Rs. 272.40 lakh				
8. Financial assistance estimated	:	Rs. 188.25 lakh				
9. Bank loan disbursed	:	Rs. 181.14 lakh				
10. Refinance disbursed	:	Rs. 144.23 lakh				
11. Unit cost of investment (at historical prices)			<b>DTW</b>		<b>ETW</b>	
i) Anticipated	:		Rs. 10,877		Rs. 7,785	
ii) Actual	:		Rs. 7,452		Rs. 11,283	
12. Unit cost of investment at reference year prices	:		Rs. 15,000		Rs. 15,000	
13. Small farmer coverage	:		54 per cent			
			<b>DTW- DTW- DTW- ETW- ETW- ETW-</b>			
			<b>SF OF ALL SF OF ALL</b>			
14. No. of scheme beneficiaries	:	841	672	1,513	572	841 1,413
15. No. of sample beneficiaries	:	25	20	45	17	25 42
16. Average size of holding (acres)	:	5.26	12.55	8.50	5.15	13.44 10.08
17. Average benefiting area (acres)	:	4.96	8.70	6.62	4.62	9.32 7.42
18. Average incremental income (Rs.)						
a) <b>On farm</b>						
i) Without imputation of cost to family labour		2,553	4,901	3,597	3,030	7,729 5,826
ii) With imputation of cost to family labour		1,659	4,302	2,835	1,908	7,055 4,971



	<u>DTW-</u> <u>SF</u>	<u>DTW-</u> <u>OF</u>	<u>DTW-</u> <u>ALL</u>	<u>ETW-</u> <u>SF</u>	<u>ETW-</u> <u>OF</u>	<u>ETW-</u> <u>ALL</u>
<b>b) Total*</b>						
i) Without imputation of cost to family labour	3,272	5,260	4,161	8,335	11,025	9,945
ii) With imputation of cost to family labour	2,378	4,661	3,389	7,213	10,351	9,090
<b>19. Financial Rate of Return(FRR)(%)</b>						
i) Without imputation of cost to family labour	26	49	36	> 50	> 50	> 50
ii) With imputation of cost to family labour	17	42	27	> 50	> 50	> 50
<b>20. Total scheme impact :</b>						
Net addition to						
i) Irrigated area (acres)			:	3,484		
ii) Gross cropped area (acres)			:	8,119		
iii) Crop output (Rs. lakh)			:	1,722.93		
iv) GDP of the scheme area (Rs. lakh)			:	203.25		
v) Employment generation (Man-years)						
(a) On own farm			:	3,230		
(b) Total**			:	4,412		
* Includes net income from sale of water, sale of gur, and thresher (custom hire).						
** Includes employment generation due to manufacture of gur and thresher (custom hire).						





## SUMMARY AND CONCLUSIONS

1. The minor irrigation scheme constituting the subject matter of this evaluation was sanctioned to Uttar Pradesh State Co-operative Land Development Bank, Ltd., (UPSCCLDB) by NABARD in May 1976. It provided for 39 masonry wells, 39 borings in existing wells and persian wheels on the same, 39 new wells with boring and persian wheels, 268 pumpsets on wells, 2,274 tubewells with pumpsets and for construction of 300 km. length of *pucca* field channels in Muzaffarnagar district. The total financial assistance sanctioned was Rs. 188.24 lakh with refinance assistance at Rs. 169.42 lakh. The scheme was implemented with effect from 15 February 1976 and was treated as closed on 30 June 1978.
2. The UPSCCLDB disbursed loans totalling Rs. 181.14 lakh, i.e., 96 per cent of the financial target, and had drawn a refinance of Rs. 144.23 lakh from ARDC. Although the scheme provided for financing various categories of investments like masonry wells, wells with borings and persian wheels, etc., in actuality it provided financial support only for installation of tubewells with pumpsets. In all, the bank financed 1,513 shallow tubewells with diesel engines (DTW) and 1,413 shallow tubewells with electric motors (ETW) under the subject scheme.
3. The utilisation of ground water potential of the scheme area was estimated, as on April 1, 1981, at 46 per cent of the recoverable recharge with a potential for 22,340 additional tubewells in Muzaffarnagar district.
4. The field survey for the assessment of costs and benefits due to the investment units financed under the subject scheme was conducted in May - June 1982 with agricultural year 1981-82 as reference period. The evaluation showed that the implementing bank had not properly understood the various provisions and terms and conditions of the scheme. For instance, the bank had disbursed loans for 'pumpset with boring' but showed this disbursement under the head 'pumpset

on well'. There were also other deviations like making cash payments to the beneficiaries for purchase of electric motor/diesel engine and adjusting the down payment to be made by the borrower against the first instalment of loan amount.

5. The coverage of small farmers under the scheme was 54 per cent in terms of loan amounts advanced and 48 per cent in terms of number of farmers financed.
6. The average unit cost (historical prices) approved in the scheme for both diesel tubewell and electric tubewell was Rs. 11,000. But the average loan amount proposed by the bank was only Rs. 7,000 because of lower loan eligibility of farmers.
7. In case of ETW, the actual investment cost was higher than anticipated cost by 45 per cent, whereas in the case of DTW, it was lower by 31 per cent. Non-construction of the pumphouse by the DTW beneficiaries was the main reason for lower actual cost.
8. Forty eight per cent of the beneficiaries had to contribute more than 25 per cent of the investment cost from their own resources, whereas 33 per cent of the beneficiaries obtained more credit than the average cost of investment.
9. It was found that there was no delay on the part of the bank in sanction and disbursement of loans except in the case of some of the ETW beneficiaries. The latter was mainly due to the time taken by UPSEB in surveying and giving the estimate for electric connections.
10. In about 5 per cent cases, loans were found to be completely misutilised, probably to meet the expenditure connected with social and religious obligations.
11. In all, 87 sample beneficiaries were selected for the study of costs and benefits due to the investment financed under the scheme, of

which 45 were for Diesel Tubewells (DTW) and 42 for Electric Tubewells (ETW).

12. More than 80 per cent of the cultivated holdings in the pre-investment situation were irrigated, the major source of irrigation being canals. Due to untimely and insufficient number of irrigations available from canal, as also high cost of canal water, the farmers had gone in for the tubewell investment.
13. Seventy eight per cent of the diesel engines and 14 per cent of the electric motors purchased by scheme beneficiaries were of higher horse power than recommended under the scheme. It was, however, found that beneficiaries were using these engines/motors not only for lifting water but also for other uses like operation of threshers, cane crushers, etc., which factor was probably responsible for choosing higher horse power motors. The wasteful expenditure on this account incurred by all the scheme beneficiaries was estimated at about Rs. 10 lakh.
14. On an average, use of diesel engine by DTW beneficiaries was 648 hours on own farm, 115 hours for sale of water and 21 hours for other purposes. Likewise, the electric motor was used by ETW beneficiaries for 705 hours on own farm, 142 hours for sale of water and 187 hours for other purposes, including wheat threshing and cane crushing.
15. The average total operation and maintenance (O&M) cost of DTW was found to be higher than that of ETW by nearly 137 per cent. In the case of DTW, the O & M cost per hour worked out to Rs. 4.65, as compared to Rs. 1.49 in the case of ETW.
16. The increase in the cropping intensity from pre-investment to post-investment situation was relatively more in the case of small farmer beneficiaries as compared to others. In case of former, substantial proportion of area under cereals/pulses was brought under sugarcane and other cash crops in the post-investment period.

17. The average yields obtained under tubewell irrigation were higher than those under canal irrigated or rainfed cultivation due mainly to larger application of fertilizers and use of HYV seeds.
18. The value of gross produce (at 1981-82 prices) in the post-investment situation was 70 per cent higher for DTW beneficiaries and 55 per cent higher for ETW beneficiaries when compared with that in the pre-investment situation. Costs of cultivation in the post-investment situation were 78 per cent and 42 per cent higher for DTW/ETW beneficiaries excluding imputed cost of family labour. ETW beneficiaries received 33 per cent more net income, in the post-investment situation, compared to DTW beneficiaries. Net incremental income from own farm at Rs. 5,826 in the case of an ETW beneficiary was 62 per cent more than the net incremental income of a DTW beneficiary at Rs. 3,597. While the per acre incremental income for small farmers was Rs. 335 for DTW beneficiaries and Rs. 413 for ETW beneficiaries, in the case of other farmers, it was Rs. 494 for DTW beneficiaries and Rs. 757 for ETW beneficiaries.
19. Both DTW and ETW beneficiaries sold water to the neighbouring farmers and charged Rs. 8 and Rs. 4 per hour, respectively. On the average, a sample beneficiary earned Rs. 378 by way of income from sale of water. Such income was Rs. 385 per DTW beneficiary and Rs. 356 per ETW beneficiary. The practice of sale of water was more common among small farmers as compared to other farmers. While DTW-SF and ETW-SF earned, on the average, Rs. 526 and Rs. 450, respectively, DTW-OF and ETW-OF earned less at Rs. 220 and Rs. 276, respectively.
20. The flat rate tariff charged by UPSEB for electricity had induced the ETW beneficiaries to make use of their electric motor for threshing and cane crushing also, whereas the DTW beneficiaries were even reluctant to use their diesel engines for other uses like threshing due to higher O&M cost.

21. On an average, the total incremental income per beneficiary including incremental income from farm as also income from sale of water, sale of gur and custom hire of threshers, was Rs. 3,272 for DTW-SF, Rs. 8,335 for ETW-SF, Rs. 5,260 for DTW-OF and Rs. 11,025 for ETW-OF. As a group, such incremental income was Rs. 4,161 per DTW beneficiary and Rs. 9,945 per ETW beneficiary.
22. Financial rates of return on investment under the scheme were estimated at 36 per cent and above 50 per cent respectively, in the case of DTW/ETW beneficiaries with no imputation of cost to family labour. If the imputed cost to family labour was also considered, the FRR would work out to 27 per cent and over 50 per cent, respectively, for DTW and ETW investments. For DTW-SF, FRR was 26 per cent without imputing cost to family labour and 17 per cent with imputed cost to family labour. Such FRRs for DTW-OF were 49 per cent and 42 per cent, respectively. In the case of ETW beneficiaries, all FRRs were above 50 per cent, for small as well as other farmers.
23. The survey data also indicated that, to get a minimum return of 17 per cent on the capital invested (Rs. 15,000 at 1981-82 prices) over a period of 15 years, a minimum annual incremental farm income (without making allowance for family labour cost) of around Rs. 2,820 is necessary. The data indicated further that to get an annual incremental income of Rs. 2,820, a DTW beneficiary was required to have a minimum farm size of 4 to 6 acres, while an ETW beneficiary was required to have a farm size of 2.5 to 4 acres. The estimated minimum farm sizes would stand reduced if ancilliary incomes from sale of water and custom work from thresher and cane crusher are also taken into account.
24. On the basis of discharge of tubewell, depth of irrigation, rotation period and duty hours, it was estimated that a shallow tubewell,

operated either by a diesel engine or an electric motor, can irrigate a maximum area of 8.4 hectares or 20 acres.

25. The repayment performance under the scheme was quite satisfactory which is largely due to high returns from investment in tubewell irrigation. As per bank records only 5 per cent of total instalments due as on 30 June 1982 were in arrears.
26. Installation of tubewells under the scheme is estimated to have generated non-recurring employment of the order of 1,334 man-years. In addition, the scheme investments generated a recurring employment of 4,412 man-years per annum, of which, the share of hired labour was estimated at 2,926 man-years.
27. On the basis of survey data, the implementation of the reference scheme is estimated to have resulted in additional irrigated area of 3,484 acres, additional cropped area of 8,119 acres, incremental crop production valued at Rs. 302 lakh and a net addition to the GDP of the region of around Rs. 203 lakh.

## **INTRODUCTION**





## CHAPTER - I

### INTRODUCTION

- 1.1** Irrigation facilities in India have expanded considerably since independence. In fact, one notices an accelerated expansion in irrigated area with the completion of each five year plan. Realising the importance of development of irrigation as a necessary condition for India's economic development, ARDC/NABARD, since inception, has laid emphasis on the development of minor irrigation in India. Upto 30 June 1982, out of the total amount of Rs. 2,808 crore disbursed by ARDC, the share of minor irrigation was Rs. 1,647 crore. This constitutes 58.7 per cent of the total refinance disbursed.
- 1.2** Uttar Pradesh is the most populated state in India. The state is, however, characterised by low per capita income and high dependence on agriculture. Till end June 1982, ARDC had disbursed refinance in Uttar Pradesh to the tune of Rs. 418 crore, i.e., about 15 per cent of total refinance disbursed by ARDC.
- 1.3** Minor irrigation accounts for 63 per cent of the total refinance disbursed in Uttar Pradesh upto the end of June 1982. Of this, UPSCLDB, which had implemented majority of minor irrigation schemes, had drawn 85 per cent and the share of commercial banks was 15 per cent.
- 1.4** In view of the importance of irrigation in economic development and taking into account the sizeable assistance provided by ARDC for development of minor irrigation in the state of Uttar Pradesh, it was decided to evaluate the benefits flowing from investment in minor irrigation. For this purpose, a minor irrigation scheme, comprising investment in shallow tubewells, implemented by UPSCLDB in Muzaffarnagar district of Uttar Pradesh, was selected. The scheme was considered suitable for ex-post evaluation as nearly four years had elapsed since the completion of the scheme by June 1978. The gap of four years was thought to be sufficient for the stabilisation of the benefits from the investment.



## **THE SCHEME AND ITS IMPLEMENTATION**



## CHAPTER - II

### THE SCHEME AND ITS IMPLEMENTATION

#### The scheme area

- 2.1** Muzaffarnagar district is situated almost in the centre of the sugarcane belt of western Uttar Pradesh. It is bounded by the river Ganges on the east, river Yamuna on the west, district Saharanpur on the north and district Meerut on the south. The district has 4 tehsils, 14 blocks and 1,087 villages.
- 2.2** The major crops grown in the district in 1981-82 were sugarcane, wheat and paddy, accounting for 47.2 per cent, 24.6 per cent and 6.7 per cent of GCA, respectively, or about four-fifth of GCA in the district. The cropping intensity in the district was 203 per cent in 1981-82.
- 2.3** The district is one of the seven districts included in agro-climatic region I of Uttar Pradesh. The soil is characterised by Central Ganga alluvium. The district is one of the best irrigated districts of Uttar Pradesh, where 86 per cent of the cultivated area is irrigated. The major sources of irrigation are canals and tubewells. The district is criss-crossed by a net work of canals, the important canals being East Yamuna Canal and Upper Gangetic Canal. The shares of canal irrigation and tubewell irrigation were 42 per cent and 56 per cent, respectively, of the total irrigated area in 1981-82. There were roughly 45,000 tubewells in the district in 1981-82.
- 2.4** Seventy eight per cent of the total population in the district lives in rural areas. The density of population increased from 425 persons per square kilometre in 1971 to 548 persons per square kilometre in 1981. Of the total work force, 51 per cent were cultivators and 35 per cent landless labourers. The average size of holding was 1.5 hectares. The cultivators were mainly small and marginal farmers.

Fifty seven per cent of the holdings were below one hectare, 19 per cent between 1 and 2 hectares and 15 per cent between 2 and 4 hectares. The district has made a significant progress in rural electrification. Eighty five per cent of the villages have the benefit of electricity. The agricultural development in this district may be seen from the following highlights :

- i) Chemical fertilizer consumption per acre at 103 kgs.
- ii) Per capita foodgrain production at 2.39 quintals.
- iii) Per hectare value of agricultural produce at Rs. 6,650 and
- iv) Per capita value of agricultural produce at Rs. 1,220.

All the above data relate to the year 1981-82.

#### Ground water potential

- 2.5 In Muzaffarnagar district 46 per cent of the recoverable recharge in ground water is exploited. The blockwise position is given in Table 2.1.

Table 2.1

#### Ground water potential (as on 1.4.1981)

Sr. No.	Name of the block	Recoverable recharge (MCM)	Net draft (MCM)	Percentage utilisation
1	2	3	4	5
1.	Baghra	64.44	41.71	65
2.	Budhana	52.90	40.94	77
3.	Charthawal	79.41	43.04	54
4.	Jansath	125.85	46.44	37
5.	Kandhla	82.93	49.51	60
6.	Kairana	54.95	33.21	60
7.	Khatauli	100.97	47.91	47
8.	Morna	119.70	22.71	19
9.	Muzaffarnagar	74.32	33.84	46
10.	Purkaji	148.23	24.05	16
11.	Shamli	66.48	35.43	53
12.	Thana Bhawan	78.69	36.82	47
13.	Un	81.80	56.43	69
14.	Shahpur*	53.95	33.59	62
<b>Total</b>		<b>1184.62</b>	<b>545.63</b>	<b>46</b>

\* For Shahpur block, figures relate to 1.4.1980.

(Source : Technical Feasibility of Ground Water Development on Compact Area Basis - District Muzaffarnagar - Published by Ground Water Directorate - U.P.)

**2.6** It may be seen from the above that ground water utilisation varies from 16 per cent in Purkaji block to 77 per cent in Budhana block. As per the current norms, not more than 80 per cent of the recoverable recharge should be tapped. On this basis, usable surplus of ground water for district as a whole can be placed at 402.07 MCM. At present, there is a demand only for private tubewells. Taking this into consideration and keeping a draft from private tubewell at 0.018 MCM, 22,340 tubewells could be added in this district for optimum utilisation of ground water. The current unit cost of a tubewell is Rs. 15,000. Thus, and investment of Rs. 33.51 crore at current prices, is required to make optimum use of ground water potential.

#### **The scheme and its implementation**

**2.7** In June 1975, Government of Uttar Pradesh had submitted a scheme for financing of minor irrigation works in all the 14 blocks of Muzaffarnagar. On the basis of technical scrutiny by ARDC, four blocks, viz., Kairana, Shamli, Budhana and Khandhla were excluded from the scheme due to non-availability of adequate ground water resources. The scheme was sanctioned by ARDC in May 1976 with financial assistance of Rs. 188.25 lakh and refinance commitment of Rs. 169.42 lakh. The phasing of the scheme was from 1975-76 to 1977-78. On receipt of provisional sanction from ARDC, the UPSCCLDB directed all its four branches in the district (viz., Muzaffarnagar, Jansath, Budhana and Kairana) to implement the scheme with effect from 15 February 1976. The scheme was treated as closed on 30 June 1978. Major terms of sanction and implementation thereof are discussed in the following paragraphs.

**2.8** The physical and financial targets under the scheme and achievements thereof made by the bank (upto 30 June 1978) are given in Table 2.2.

**2.9** The financial progress was satisfactory as 96 per cent of the financial target was achieved by the bank. The bank had drawn a refinance of Rs. 144.23 lakh from ARDC as against ARDC's commitment of



**Table 2.2**  
**Physical and financial progress**

(Amount in Rs. lakh)

Sr. No.	Items of development	Targets		Achievements	
		No. of units	Financial assistance	No. of units	Financial assistance
1	2	3	4	5	6
1.	Masonry well	39	1.37	-	-
2.	Boring & persian wheels on existing wells	39	0.47	-	-
3.	Wells, boring fitted with persian wheel	39	1.83	-	-
4.	Pumpset on wells	268	13.40	-	-
5.	Tubewell with pumpsets	2,274	159.18	1,513 DTW 1,413 ETW }	181.14
6.	Pucca field channels (in Km.)	300	12.00	-	-
<b>Total</b>			<b>188.25</b>		<b>181.14</b>

Rs. 169.43 lakh. However, in the case of physical targets, it was observed that the bank had not clearly understood the items of development approved by ARDC. The bank had disbursed loans for pumpset with boring and showed the disbursement under the head pumpset on well. The techno-economic parameters of pumpset with boring and tubewell with pumpset are same except in financial terms, i.e., cost of a tubewell with pumpset includes cost of a pumphouse, while cost of a pumpset with boring does not include cost of a pumphouse. In fact, all the loans were for tubewell with pumpset and in majority of the cases, the bank had not provided loan for pumphouse and categorised these loans as pumpset loans.

**2.10** Table 2.2 reveals that except tubewells no other item of minor irrigation development was financed. There was virtually no demand for traditional items of irrigation and this clearly highlights the defective scheme

formulation. Besides, on account of lack of monitoring, these aspects were not brought to the notice of the bank and hence no remedial steps could be taken.

- 2.11** The share of small farmers (SF) in the total programme was 67 per cent in respect of financial assistance and 60 per cent in respect of number of units. However, it was observed that SF were not classified properly. This was due to i) taking 'land mortgaged' instead of 'land holding' of the borrower as basis for classification and ii) use of SFDA norms instead of ARDC norms for identifying small farmers, especially by Jansath and Budhana branches, in early stages of scheme implementation. (As per ARDC norms, at 1974 prices, a farmer having unirrigated land holding upto 7 acres was classified as a small farmer).
- 2.12** On the basis of the survey, an estimate of wrong classification was worked out. This revealed that out of 87 sample beneficiaries, 6 SF were classified as other farmers (OF) and 16 OF were classified as SF. Thus, the correct coverage of SF worked out to 54 per cent of financial assistance and 48 per cent of number of units financed.
- 2.13** In majority of the cases, investment was completed within one month for DTW and within 3 months for ETW. Field data revealed that there was not much of time-lag between commencement and completion of investment for both small and other farmers.
- 2.14** In the scheme submitted by the bank, the unit cost was worked out on the basis of cost of different items of investment as was prevailing at the time of submission of the scheme. The average unit cost so worked out for DTW/ETW was Rs. 11,000. The bank, however, had proposed for an average loan amount of Rs. 7,000 on the basis of lower loan eligibility of farmers. This showed that the financing bank's approach was more security oriented than development oriented. ARDC had also approved this lower average loan amount. The stipulation of loan at Rs. 7,000 implied a borrower's contribution at a uniform rate of 36.36 per cent. This lower fixation of average loan amount meant a

heavy financial burden on the scheme beneficiaries. On the basis of information collected during the field survey, a frequency distribution of the sample beneficiaries according to the relationship between actual investment cost and investment credit is prepared as given in Statement 1.

**2.15** It may be observed therefrom that 48 per cent of the beneficiaries had to contribute more than 25 per cent of the cost of investment from their own resources. An interesting feature of this analysis is that in the case of DTW, 33 per cent of beneficiaries obtained more credit than the cost of investment. The reason for this was that, under DTW, 20 beneficiaries were provided with loan for construction of pumphouse, but only one beneficiary had constructed the pumphouse. Thus, 19 beneficiaries had misutilised the amount given for the purpose. Lack of monitoring by financing bank had resulted in wasteful expenditure of scarce capital resources. On the other hand, in the case of ETW, though only 23 beneficiaries were provided with assistance to construct the pumphouse, every ETW beneficiary had to construct the pumphouse as this was a pre-condition by State Electricity Board for providing electric connection. It was gathered during the survey that the beneficiaries having sizeable holding could contribute the higher down payment without much difficulty. But small farmers had to face hardships on this account by way of borrowing from private money-lenders at an exorbitant rate of interest.

**2.16** Instalmentwise, time-lag in the sanction of loan and disbursement of loan amount has been worked out on the basis of information collected from sample beneficiaries and is given in Statement 2. In the case of DTW (SF and OF taken together), loans for 80 per cent of beneficiaries were sanctioned within 15 days of application for loan. The corresponding figure in the case of ETW beneficiaries was 55 per cent. It was observed from the bank records that delay in sanction of loan was on account of incomplete application forms and the time taken in complying with legal formalities like verification of title, etc. Generally, loans were sanctioned in reasonable time.

- ii) The farmer should not be a defaulter in repayment of earlier loans.
- iii) Land offered for mortgage should bear a clear title, and
- iv) Credit worthiness of the farmer.

**2.21** Out of 92 farmers contacted during field study, 5 had completely misutilised the loan amount. The reason for misutilisation of loan, as ascertained from the farmers, was that the farmers who required money to meet social/religious obligations, had sold the engine/motor purchased out of loan amount. This could have been avoided by giving them consumption loans for the purpose.

**2.22** For diesel engines (without accessories), the financing branches of the bank had released loan instalments directly to the dealers. In the case of electric motors and accessories (of DTW and ETW) cash loans were released to the farmers. Of late, the bank has started releasing loans for electric motors directly to the dealers. However, the system of releasing cash loans to the beneficiaries for purchase of accessories continues.

**2.23** To avail of the loan facility, farmers were required to become members of the UPSCLDB by depositing share money. It was observed that the bank branches had recovered share capital money from the first instalment of the loan instead of accepting cash against share capital, prior to release of first instalment of loan. This procedure has now been discontinued.

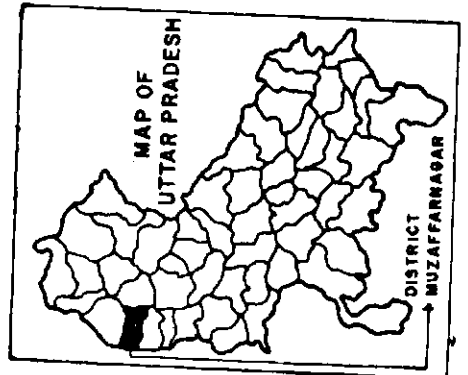
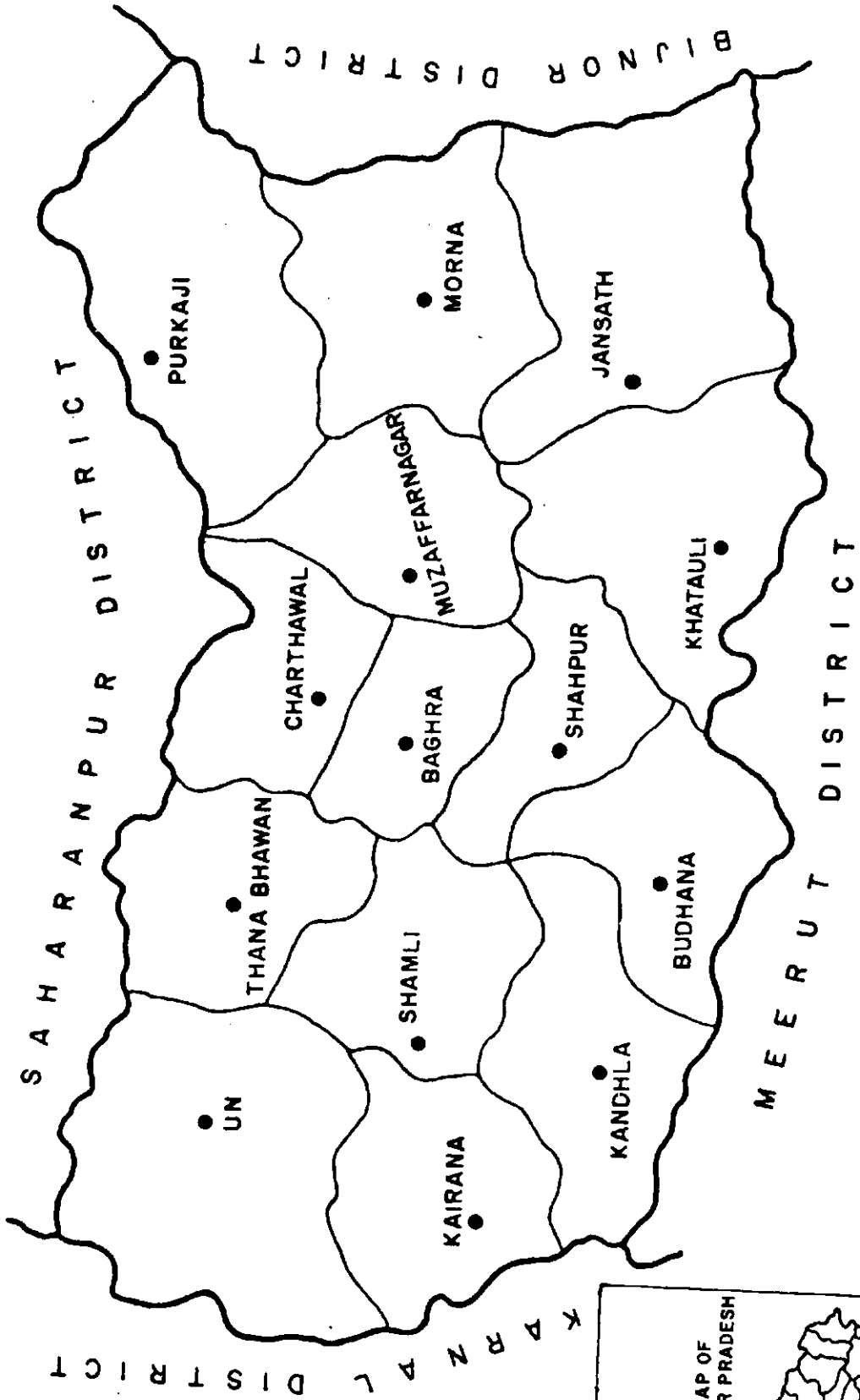
**2.24** The rate of interest charged by the bank branches was as per ARDC guidelines, i.e., @ 10.5 per cent per annum.

**2.25** Each of the financing branch had a staff of one field officer and two or three kisan sewaks. With the active assistance of village level workers and Asst. Development Officer (Minor Irrigation) of Block Development Office, the field staff at branches was considered adequate to handle the work in respect of minor irrigation loans.

- 2.17** Regarding disbursement of loan for DTW, in 80 per cent of the cases, first instalment of loan (for the purpose of boring) was disbursed within one month of sanction. Similarly, in 89 per cent of cases, the second instalment of loan for purchase of engine was released within one month of disbursement of first instalment (after the completion of boring work and getting the certificate from the competent authority).
- 2.18** For ETW, in 67 per cent of the cases, first instalment of loan was released within one month of sanction. However, disbursement of second instalment took one month in 38 per cent of cases, between one to two months in 21 per cent of cases, between two to three months in 24 per cent of the cases and more than three months in 17 per cent of the cases. The delay in disbursement of second loan instalment was on account of time taken by the UPSEB for survey and giving the estimate for electric connection. Only when the borrower had deposited the estimated money with UPSEB and produced the receipt at the bank, second instalment was released. Had the UPSEB fully cooperated with the bank for speedy disposal of cases, this undue time-lag in disbursement of second instalment could have been avoided.
- 2.19** During the field visits, the issue of dissemination of loan information was discussed with branch officials. It was gathered that village level workers of the Block Development Office had actively campaigned for the scheme. Because of their close association with the farmers, they were able to motivate the farmers to go in for tubewell. Also, whenever branch officials visited villages in connection with the recovery of loan, appraisal of loan application, etc., they informed the villages regarding availability of loan facilities for minor irrigation purposes.
- 2.20** The financing branches while selecting the beneficiaries, were following the undernoted criteria :
- i) The farmer should satisfy the loan eligibility conditions, i.e., minimum holding, margin money and security.

**2.26** Inputs like fertilisers, HYV seeds, etc., were easily available from the stores of Agricultural Department, godowns of Primary Agricultural Credit Societies (PACS), cane societies and also from private traders. Short-term credit requirement of farmers was adequately met by PACS, cane societies and commercial bank branches. It was observed that out of 87 sample beneficiaries, 81 had taken short-term loans - 28 from PACS, 52 from cane societies and one from a commercial bank. There were 7 cane societies in the district and the farmers were satisfied with the services provided by those cane societies. The membership of the cane societies had increased from 1,08,373 in 1976-77 to 1,18,194 in 1981-82. The loan disbursed by the societies had increased from Rs. 79 lakh to Rs. 263 lakh during the same period. The farmers' preference for cane society was on account of (i) easy and timely availability of credit, (ii) permission for supply of cane to sugar mills at prices fixed by Government, and (iii) adjustment of loan amount while receiving payment for cane supplied.

MAP OF  
**DISTRICT MUZAFFARNAGAR (U.P.)**  
 SCHEME AREA IS ENTIRE DISTRICT



## **APPROACH TO EVALUATION**





## CHAPTER - III

### APPROACH TO EVALUATION

#### Objectives

- 3.1** In order to estimate the benefits accruing from investment in minor irrigation works under the subject scheme, a field survey was conducted in May-June 1982. The broad objectives of the study were as under :
- i) To study the efficiency in the implementation of the scheme.
  - ii) To compare ex-post realisations with ex-ante assumptions, with particular reference to techno-economic parameters.
  - iii) To measure the impact of the investment on cost of cultivation, production and productivity.
  - iv) To estimate aggregate project benefits in terms of additional output, value added to gross domestic product and increase in recurring and non-recurring labour employment, and
  - v) To provide feedback for future project appraisal and preparation.

#### Methodology

- 3.2** The minor irrigation scheme selected for ex-post evaluation study was for the construction of masonry wells, boring and persian wheel on existing wells, wells and boring fitted with persian wheel, pumpset on wells, tubewell with pumpset and field channels. However, there was no disbursement for any item of development except for tubewells. In the absence of other types of investments, the analysis is confined to benefits from diesel tubewells and electric tubewells.
- 3.3** To select a control sample to represent the 'without project' conditions of sample beneficiaries, it was necessary first to ascertain the pre-investment farming conditions in respect of the area now irrigated by

tubewells, i.e., benefited area. It was observed that the said area consisted of rainfed lands, canal irrigated lands, and diesel tubewell irrigated lands (in case of ETW farmers). Information regarding the farm income under rainfed and canal irrigated conditions was collected from non-benefiting area of the sample beneficiaries. For those beneficiaries having DTW irrigated area under 'without project' situation, information from sample beneficiaries of DTW was utilised. To represent 'without project' situations, the farm data have been analysed under four heads, i.e., rainfed, canal irrigated, DTW irrigated and ETW irrigated.

- 3.4** Economic benefit analysis has been done on the basis of the area benefited by the investments, 'the control' area being the same in the pre-investment situation. As there was no spill-over effect of the investment on the non-benefiting area, the farm income from such area has not been accounted for in both pre and post investment situations.
- 3.5** The analysis of data in respect of use of pumpset, O & M cost, etc., by hp of engine/motor was not attempted as only a few observations were available in certain categories and, apart from hp of pumpset, other aspects like rotation per minute, pump efficiency, etc., are the important factors influencing O & M cost and discharge. It was difficult to classify beneficiaries accordingly. However, data regarding the number of oversized pumpsets and the additional O & M cost which the beneficiaries had to incur because of higher hp of engine/motor, have been worked out.
- 3.6** The financial viability of the investments has been assessed in terms of financial rate of return.
- 3.7** Benefits from the project investments are made up of benefits generated on the area directly benefiting from the investments, and the income received from sale of water, use of engine/motor for wheat thresher and cane crusher.

- 3.8** The cost of cultivation includes expenditure on seeds and seedlings, manure, chemical fertilisers, pesticides, O & M cost of tubewell, land revenue, interest on short-term credit, cost of bullock maintenance, expenditure on hiring of tractor and wages for hired labour (Estimate A). Another estimate of cost of cultivation is worked out on the basis of valuation of family labour at par with the wages paid to hired labour (Estimate B).
- 3.9** The reference period of the study was the agricultural year 1981-82 and the produce and inputs were valued at farm-gate/purchase prices. To compare the cost of investment and to assess the adequacy of loan amount, the cost of investment at historical prices was used and to work out the financial viability, the cost of investment at survey year prices was used.

#### **Sample framework**

- 3.10** The scheme was implemented by four branches of UPSCCLDB. None of the branches had maintained villagewise record of loans sanctioned and disbursed. In view of a very large number of beneficiaries under the scheme, it was not possible to prepare the village-wise list of borrowers. Hence, to economise on time and man-power, one block from each branch was selected on the basis of maximum disbursement of loans and villagewise list of borrowers for the selected block was prepared. The block was selected so as to have adequate number of beneficiaries under both DTW and ETW investments and also to have information on 'without project' situations, i.e., canal irrigated area and rainfed area. Two stage random sampling technique, to select 5 villages from each of the selected blocks at the first stage and 5 borrowers from each of the selected village at the second stage, was used, thus selecting 92 beneficiaries in all.
- 3.11** It was observed that five beneficiaries had misutilised the loan amount, and therefore, they were replaced by other beneficiaries of the same village/nearby village. However, these five beneficiaries were not subjected to close scrutiny for eliciting the information. Thus, the total sample size consisted of 87 beneficiaries only.



# **ECONOMICS OF INVESTMENT**



## CHAPTER - IV

### ECONOMICS OF INVESTMENT

4.1 With a view to measuring the impact of the investment in STWs under the scheme, on the cost of cultivation, production and productivity and to estimate aggregate project benefits, the 87 sample beneficiaries were classified into the following four categories :

- 1) Diesel Tubewell - Small Farmers : DTW-SF(25)
- 2) Diesel Tubewell-Other Farmers : DTW-OF(20)
- 3) Electric Tubewell-Small Farmers : ETW-SF(17)
- 4) Electric Tubewell-Other Farmers : ETW-OF(25)

4.2 The above classification of farmers was done on the basis of ARDC's definition (at 1974 prices) of a small farmer, i.e., a farmer having a holding of upto 7 acres of unirrigated land.

#### Size of holding

4.2 The average size of cultivated holding of the sample beneficiaries was 5.26 acres for DTW-SF, 12.55 acres for DTW-OF, 5.15 acres for ETW-SF, and 13.44 acres for ETW-OF. However, the area actually benefited by DTW/ETW investment was around 94 per cent for DTW-SF, 69 per cent for DTW-OF, 90 per cent for ETW-SF and 69 per cent for ETW-OF. Frequency distribution of sample beneficiaries according to the size of the cultivated holding is given in Statement 3. Modal value of the cultivated holdings occurs in the range of 3 acres to 6 acres for DTW-SF, between 8 acres to 9 acres for DTW-OF, between 4 acres to 5 acres for ETW-SF and between 9 acres to 11 acres for ETW-OF.

4.3 Thus, the average size of benefited area was 4.96 acres for 25 DTW-SF, 8.70 acres for 20 DTW-OF, 4.62 acres for 17 ETW-SF and 9.32 acres for 25 ETW-OF. The same was 6.62 acres for all 45 DTW beneficiaries



together and 7.42 acres for all 42 ETW beneficiaries together. Average benefiting area and its break-up by sources of irrigation in the pre-investment period are presented in Statement 4.

#### Pre-investment irrigation particulars

- 4.4 In the pre-investment situation, cultivated holdings in the case of DTW beneficiaries were partly rainfed and partly canal irrigated, whereas holdings of ETW beneficiaries were partly rainfed, partly canal irrigated and partly DTW irrigated.

Table 4.1

Percentage distribution of cultivated holdings by source of irrigation

Category of beneficiaries	No. of beneficiaries	Cultivated holdings in pre-investment situation				(Per cent)
		Rainfed	Canal irrigated	DTW irrigated	Total	
1	2	3	4	5	6	
DTW-SF	25	19.0	81.0	-	100.0	
DTW-OF	20	14.4	85.6	-	100.0	
ETW-SF	17	28.2	51.5	20.3	100.0	
ETW-OF	25	14.2	82.8	3.0	100.0	
DTW-ALL	45	16.3	83.7	-	100.0	
ETW-ALL	42	17.7	74.9	7.4	100.0	
All sample beneficiaries	87	17.0	79.3	3.7	100.0	

- 4.5 The major source of irrigation in the pre-investment situation was canal. Area irrigated by canal as per cent to net cropped area was about 81 per cent for DTW-SF, 86 per cent for DTW-OF, 52 per cent for ETW-SF and 83 per cent for ETW-OF.

- 4.6 In spite of the fact that majority of the holdings were fairly irrigated, the decision of farmers to go in for the investment in tubewell was

influenced by factors like untimely and lesser number of irrigations available from canal, ready availability of electric connection and low cost of operation and maintenance of ETW. It was observed during the field study that the tubewell was used not to supplement canal irrigation but of substitute it. Farmers had to pay canal charges for kharif as well as rabi season in advance. Beneficiaries had to pay full canal charges whether they utilise canal water or not and in some cases they received very few irrigations from canal. Therefore, once the tubewells were installed beneficiaries discontinued using canal water in order to save canal water charges.

#### Cost of investment

- 4.7 Itemwise and specificationswise anticipated and actual cost of DTW and ETW are presented in Statements 5 and 6, respectively. Summarised table is given below :

Table 4.2

#### Itemwise anticipated and actual cost of investment

(Amount in rupees)

Sr. No.	Item	DTW		ETW	
		Anticipated cost	Actual cost	Anticipated cost	Actual cost
1	2	3	4	5	6
1.	Boring	2,127	1,726	1,685	2,185
2.	Diesel engine/ Electric motor	4,088	3,573	1,471	2,737
3.	Accessories	662	1,070	1,379	1,427
4.	Pumphouse, foundation & other masonry work	4,000	1,083	3,000	4,021
5.	Fitting charges	-	-	250	245
6.	Deposit paid to State Electricity Board.	-	-	-	668
<b>Total</b>		<b>10,877</b>	<b>7,452</b>	<b>7,785</b>	<b>11,283</b>

#### DTW

- 4.8 Actual average cost at Rs. 7,452 was lower by 31 per cent as compared to anticipated cost at Rs. 10,877. This was on account of (i) slight

reduction in the cost of diesel engine as farmers had purchased lower hp diesel engines than the one envisaged in the scheme. However, this was partly offset by an increase in prices of accessories, (ii) the actual depth of the bore was only 68 feet as against anticipated depth of 150 feet, and (iii) some beneficiaries had not constructed the pumphouse reducing the average cost significantly. Cost of DTW in the reference year (1981-82) was Rs. 15,000 per DTW.

## **ETW**

- 4.9** Actual average cost of ETW at Rs. 11,283 was higher by 45 per cent as compared to the anticipated cost at Rs. 7,785. The cost overrun was attributed to (i) price increase during the period of formulation and implementation of the scheme, (ii) purchase of higher hp electric motor by the scheme beneficiaries than the one envisaged under the scheme, and (iii) non-inclusion in the estimate, expenditure on construction of pit and deposit paid to UPSEB. Cost of investment in the reference year (1981-82) prices was Rs. 15,000 per ETW.

## **Horse power of diesel engine/electric motor**

- 4.10** Frequency distribution of sample beneficiaries according to hp of diesel engine/electric motor is presented in Statement 7. It was observed that as against 7 hp to 8 hp diesel engine recommended, 4 per cent of the DTW sample beneficiaries had purchased 5 hp engines, 18 per cent had purchased 6.5 hp engines, 69 per cent had purchased 8 hp engines and 9 per cent had purchased 10 hp engines. Similarly, as against 5 hp electric motor envisaged under the scheme, only 43 per cent of the ETW sample beneficiaries had purchased 5 hp motors, whereas 36 per cent had purchased 7.5 hp motors, 7 per cent had purchased 8 hp motors and 14 per cent had purchased 10 hp motors.
- 4.11** Report on Pilot Project Studies for quality control of Agricultural Pumpsets published by ARDC indicates that the optimum hp requirement

for Muzaffarnagar area is 3 hp to 5 hp for diesel engine and 3 hp to 4 hp for electric motor (the Pilot study was conducted in Bijnore district which is the adjoining district of Muzaffarnagar and has the same agro-climatic conditions). However, the subject report gives estimates of optimum hp on the basis of irrigation requirements alone and utilisation of engine/motor for other purposes is ignored. During the field study it was observed that the beneficiaries were using engine/motor for operating threshers and cane crushers also. These machines require higher hp, i.e., 5 hp to 7.5 hp for thresher and 8 hp to 10 hp for cane crusher. Thus, if we examine the hp requirement only for irrigation purposes, 96 per cent of diesel engines and all electric motors were of higher hp, i.e., oversized. However, keeping in view other uses of engine/motor, the extent of higher hp was 78 per cent in diesel engines and only 14 per cent in electric motors.

**4.12** On an average, a beneficiary having oversized DTW/ETW was incurring an uneconomic expenditure of Rs. 800/Rs. 450 per annum. On the basis of investments completed under the scheme, i.e., 1,513 DTW and 1,413 ETW, the number of oversized DTWs were 1,180 and number of oversized ETWs were 198. Thus, a total wasteful expenditure of Rs. 10.3 lakh per annum was incurred by the tubewell beneficiaries under the scheme due to higher hp of engine/motor.

**4.13** The purchase of oversized engine/motor was because of (i) non-availability of smaller hp engine/motor and (ii) lack of technical advice to beneficiaries for selection of proper hp of engine/motor.

#### **Utilisation of engine/motor**

**4.14** Sample beneficiaries utilised engine/motor for (i) irrigating own farm, (ii) sale of water and (iii) other purposes, viz., threshing, cane crushing, etc. Purposewise utilisation of engine/motor is presented in Statement 8 which is summarised in Table 4.3.

**Table 4.3**

**Average utilisation of diesel engine/electric motor per annum  
(Hours per tubewell)**

Category of beneficiaries	Own farm	Sale of water	Others*	Total
1	2	3	4	5
DTW-SF	535	152	14	701
DTW-OF	789	68	30	887
ETW-SF	462	194	196	852
ETW-OF	870	106	181	1,157
DTW-ALL	648	115	21	784
ETW-ALL	705	142	187	1,034
All sample beneficiaries	675	128	101	904

\* include hours of use of DTW/ETW as a motive power for thresher/ cone crusher, for own use as well as for custom work.

#### **Irrigating own farm**

**4.15** From the Table 4.3, it may be seen that, for irrigating own farms, diesel engine/electric motor was operated, on an average, for 535 hours by DTW-SF and for 789 hours by DTW-OF, for 462 hours by ETW-SF and for 870 hours by ETW-OF. However, number of hours of use per net cultivated acre for the four categories ranged between 90 hours and 108 hours. Variation in the per net cultivated acre use of engine/motor was due mainly to (i) cropping pattern of different categories of beneficiaries and (ii) level of land in the farm. The discharge from different tubewells was more or less the same.

#### **Sale of water**

**4.16** Sale of water to other farmers depends largely on cultivated holding of the beneficiary and demand for water in the neighbouring area. On an average, DTW beneficiaries sold water for 115 hours per annum

and ETW beneficiaries for 142 hours per annum. In particular, DTW-SF sold water for 152 hours, DTW-OF for 68 hours, ETW-SF for 194 hours and ETW-OF for 106 hours. In the case of small farmers, the farms being almost half the size of farms of other farmers, small farmers were able to use their STWs for more time for sale of water. On an average, DTW beneficiaries were charging Rs. 8 per hour for sale of water, while the ETW beneficiaries were charging Rs. 4 per hour.

#### **Other purposes**

- 4.17** The other purposes for which the engine/motor was used were threshing and cane crushing. None of the DTW beneficiaries used engine for cane crushing presumably on account of high cost of operation. Only a few beneficiaries utilised engine for thresher. Large number of ETW beneficiaries were engaged in earning from the activity of threshing and cane crushing for other farmers. This is reflected in the Table 4.3. The number of hours of operation of electric motor for other purposes were more than the number of hours of sale of water.
- 4.18** Thus, the total number of hours of operations of engine/motor were 701 hours for DTW-SF, 887 hours for DTW-OF, 852 hours for ETW-SF and 1,157 hours for ETW-OF, average being 784 hours and 1,034 hours for DTW and ETW beneficiaries, respectively.

#### **Operation & maintenance cost per tubewell**

- 4.19** Details of the operation and maintenance cost per tubewell are given in Statement 9 and Table 4.4. Total O & M cost at Rs. 3,649 for average DTW beneficiary was 137 per cent higher than O&M cost incurred by average ETW beneficiary at Rs. 1,539. Although expenditure on repairs and maintenance of DTW/ETW accounted for 9-13 per cent of total O&M cost, expenditure on diesel and mobil oil for DTW beneficiaries was more than double that of electricity charges paid to UPSEB by ETW beneficiaries. Per hour O&M cost for DTW/ETW beneficiaries averaged Rs. 4.65 and Rs. 1.49, respectively.

Table 4.4

## O &amp; M cost per tubewell

(Amount in rupees)

Category of beneficiaries	Electricity charges	Diesel oil	Mobile oil & other lubricants	Repairs etc.	Total	O & M cost per hour
1	2	3	4	5	6	7
DTW-SF	-	2,546 (80)	347 (11)	287 (9)	3,180 (100)	4.54
DTW-OF	-	3,365 (79)	459 (11)	411 (10)	4,235 (100)	4.77
ETW-SF	1,269 (89)	-	-	159 (11)	1,428 (100)	1.68
ETW-OF	1,413 (87)	-	-	202 (13)	1,615 (100)	1.40
DTW-ALL	-	2,910 (80)	397 (11)	342 (9)	3,649 (100)	4.65
ETW-ALL	1,355 (88)	-	-	184 (12)	1,539 (100)	1.49

Figures in brackets indicate percentages to total O & M cost.

**DTW-O&M cost**

4.20 The O&M costs per DTW for SF and OF at Rs. 3,180 and Rs. 4,235 were 123 per cent and 162 per cent higher than O&M costs per ETW for SF and OF at Rs. 1,428 and Rs. 1,615, respectively. On an average, diesel engine required 1.25 litres of diesel and 0.06 litre of mobil oil per hour. Annual average repairs and maintenance cost was Rs. 287 for DTW-SF and Rs. 411 for DTW-OF. Per hour cost of operation worked out to Rs. 4.54 for SF and Rs. 4.77 for OF. As other farmers had purchased higher hp engine (because of large holding size) their diesel consumption was more, resulting in higher per hour cost of operation. On an average, DTW beneficiaries charged Rs. 8 per hour for sale of water, thus earning a net profit of Rs. 3.35 per hour.

## ETW-O&M cost

4.21 ETW beneficiaries were required to pay a fixed amount of electricity charge per month to the UPSEB, irrespective of the number of hours of use of electric motor. During the survey year, they were paying Rs. 15 per hp per month for electric motor and Rs. 10 per month as electricity charges (for bulbs, etc.). Thus, electricity charges per annum per ETW beneficiary were Rs. 1,020 for 5 hp motor, Rs. 1,470 for 7.5 hp motor, Rs. 1,560 for 8 hp motor and Rs. 1,920 for 10 hp motor. The average annual expenditure on repairs and maintenance of electric motors was Rs. 184 (Rs. 159 for SF and Rs. 202 for OF). Thus, the total O&M cost worked out to Rs. 1,428 for ETW-SF and Rs. 1,615 for ETW-OF, per hour cost of operation being Rs. 1.68 for ETW-SF and Rs. 1.40 for ETW-OF. The economy in per hour cost of operation of ETW was obvious, as the beneficiaries were paying a flat rate tariff for electricity consumption. Thus, higher the number of operational hours, lower was the per hour cost of operation. Probably, this was the reason that the ETW beneficiaries charged only Rs. 4 per hour for sale of water.

## Cropping intensity

4.22 Cropping intensity is expressed in terms of gross cropped area (GCA) as percentage of net cropped area (NCA). GCA was worked out by assigning a weight of 3 for area under sugarcane. Cropping intensity reached by different categories of beneficiaries is given in Table 4.5.

Table 4.5  
Intensity of cropping  
(Per cent)

Category of beneficiaries	Pre-investment				Post-investment	Percentage change
	Rainfed	Canal	DTW	Total	Total	
1	2	3	4	5	6	7
DTW-SF	154	214	-	203	264	+30
DTW-OF	148	248	-	234	263	+12
ETW-SF	154	214	264	207	261	+26
ETW-OF	148	248	263	234	267	+14



4.23 It is observed from Table 4.5 that the change in the cropping intensity from pre-investment to post-investment situation was more in the case of small farmers compared to that in the case of other farmers, for both DTW & ETW beneficiaries. This may be attributed to i) availability of canal/DTW irrigation to more than 85 per cent of the cultivated holdings of other farmers in the pre-investment situation and ii) larger area under sugarcane under canal irrigation resulting in high cropping intensity of canal irrigated lands. Thus, with the availability of assured irrigation facility, small farmer beneficiaries could increase the gross cropped area substantially. GCA increased by 26 to 30 per cent in the case of SF whereas in the case of other farmers, increase was only 12 to 14 per cent.

#### Cropping pattern

4.24 Cropwise break-up of GCA in the pre and post investment situations for SF and OF are presented in Statements 10 and 11, respectively. A summarised version giving percentage distribution of GCA is given in Table 4.6.

Table 4.6  
Cropping pattern - 1981-82

Crop	(Per cent to GCA)							
	DTW				ETW			
	SF		OF		SF		OF	
I	Pre	Post	Pre	Post	Pre	Post	Pre	Post
	2	3	4	5	6	7	8	9
Paddy	9.95	8.87	1.47	8.75	8.78	9.30	1.69	8.91
Maize	11.64	5.20	13.38	6.21	10.14	3.41	13.10	4.36
Jowar/Bajra	3.98	-	1.57	-	4.60	2.99	2.20	0.32
Wheat	32.14	14.45	17.21	13.13	29.57	16.91	17.17	12.10
<b>Sub-total</b>	<b>57.71</b>	<b>28.52</b>	<b>33.63</b>	<b>28.09</b>	<b>53.09</b>	<b>32.31</b>	<b>34.16</b>	<b>25.69</b>
Gram	6.77	-	4.28	-	8.25	-	4.17	-
Potato	-	0.58	-	1.97	-	-	-	1.25
Vegetables	-	2.14	-	1.01	1.04	2.91	-	0.93
Sugarcane	35.52	68.81	61.39	68.93	37.62	64.78	61.67	72.13
<b>Cash crops sub-total</b>	<b>35.52</b>	<b>71.48</b>	<b>61.39</b>	<b>71.91</b>	<b>38.66</b>	<b>67.69</b>	<b>61.67</b>	<b>74.31</b>
GCA (Acres)	10.05	13.08	20.33	22.85	9.57	12.04	21.84	24.79
NCA (Acres)	4.96	4.96	8.70	8.70	4.62	4.62	9.32	9.32
<b>Cropping intensity (%)</b>	<b>203</b>	<b>264</b>	<b>234</b>	<b>263</b>	<b>207</b>	<b>261</b>	<b>234</b>	<b>267</b>

**4.25** It may be observed that there was a shift in cropping pattern from cereals and pulses to cash crops like sugarcane, potato and vegetables. Area under cereals, in percentage terms, reduced considerably after the investment. Area under pulses was totally brought under cash crops. Reduction in the area under cereals and pulses was substantial in the case of small farmers compared to that in the case of other farmers. Area under sugarcane increased from 35.52 per cent to 68.81 per cent in the case of DTW-SF, from 61.39 per cent to 68.93 per cent in the case of DTW-OF, from 37.62 per cent to 64.78 per cent in the case of ETW-SF and from 61.67 per cent to 72.13 per cent in the case of ETW-OF. Thus, area under sugarcane in the case of SF accounted for only 36 to 38 per cent (of GCA) in the pre-investment situation compared to about 61 to 62 per cent in the case of other farmers. In the post-investment situation area under sugarcane increased to 65 to 69 per cent (of GCA) in the case of SF and 69 to 72 per cent (of GCA) in the case of OF. Area under potato and vegetables accounted for about 2 to 3 per cent (of GCA).

#### **Crop yields**

**4.26** The average yield per acre of major crops for different categories of beneficiaries is presented in Statement 12. The tubewell beneficiaries achieved higher yields per acre after the investment compared to the yields obtained by them in the pre-investment situation. In the case of SF, as compared to yields under rainfed conditions, yield per acre of maize was 43 to 44 per cent higher and yield of wheat was 57 to 60 per cent higher. As compared to canal irrigated farms, tubewell owners obtained higher yields to the extent of 36 to 38 per cent in the case of wheat, 21 to 23 per cent in the case of paddy and 28 to 31 per cent in the case of sugarcane. Beneficiaries with assured irrigation (STW) facilities were using better quality seeds, more fertilisers, etc., as compared to quality and quantity of seeds and fertilisers used in canal irrigated farms and rainfed farms. Thus, the higher yield in the post-investment situation was a combined impact of irrigation and other inputs of which more pronounced was fertilisers.

4.27 Amongst the tubewell beneficiaries, it was observed that for major crops like wheat and sugarcane, average yields per acre were higher in case of small farmers compared to yields obtained by other farmers. This was because of the fact that the other farmers, with larger holdings, had to face managerial and labour constraints.

#### Gross value of produce

4.28 Gross value of produce is estimated by using farm gate prices for 1981-82. A single price for each crop was used to avoid variations in gross income on account of price differences for different beneficiaries. Categorywise, gross values of produce in the pre and post investment situations were worked out using area under each crop, corresponding crop yield and price per quintal. These are presented in Statement 13 and 14 and are summarised in Table 4.7.

Table 4.7

#### Gross value of produce per beneficiary (1981-82 prices)

Category of beneficiaries	Pre-investment situation	Post-investment situation	Incremental gross produce (Amount in rupees)	
			per beneficiary	per acre
1	2	3	4	5
DTW-SF	11,855	22,145	10,290	2,075
DTW-OF	24,116	38,459	14,343	1,649
ETW-SF	12,235	19,609	7,374	1,596
ETW-OF	26,232	40,280	14,048	1,507
DTW-ALL	17,304	29,396	12,092	1,827
ETW-ALL	20,567	31,913	11,346	1,529
All sample beneficiaries	18,879	30,611	11,732	1,676

4.29 It may be observed that the cumulative effect of changes in cropping pattern, cropping intensity and average yield reflected in sizeable increase in gross values of farm produce, in the post-investment situation.

4.30 Gross values of output in the post-investment situation increased by 87 per cent for DTW-SF, by about 60 per cent for DTW-OF and ETW-SF

and by 54 per cent for ETW-OF. Overall percentage increase in gross value of output for all DTW/ETW beneficiaries was 70 per cent and 55 per cent, respectively.

### Cost of cultivation

4.31 Changes in cropping pattern and cropping intensity were associated with considerable changes in the composition and increase in level of input use. Itemwise cost of cultivation is given in Statement 15. Table 4.8 gives important items of cost of cultivation. Two estimates of costs of cultivation are presented, viz., A) with valuation of hired labour only and B) with valuation of total (hired and family) labour.

Table 4.8

Important items of cost of cultivation (Per NCA) (1981-82 prices)

(Amount in rupees)

Sr. No.	Major items of expenditure	Small farmers				Other farmers			
		Rainfed	Canal	DTW	ETW	Rainfed	Canal	DTW	ETW
1	2	3	4	5	6	7	8	9	10
1.	Seeds	67 (10)	253 (15)	436 (14)	372 (14)	74 (8)	325 (17)	341 (13)	383 (16)
2.	Fertilisers	78 (10)	313 (19)	575 (19)	605 (22)	120 (13)	361 (19)	545 (19)	543 (22)
3.	Irrigation	- (-)	99 (6)	495 (16)	174 (7)	- (-)	97 (5)	432 (15)	126 (5)
4.	Human labour								
	a) Hired	235 (31)	377 (22)	648 (21)	586 (22)	263 (30)	455 (24)	636 (22)	642 (26)
	b) Family	172	336	485	563	170	372	412	417
5.	Bullock labour	221 (29)	256 (15)	291 (9)	316 (12)	214 (24)	205 (11)	235 (8)	204 (8)
6.	Tractor maintenance/ hire charges	- (-)	152 (9)	294 (10)	255 (10)	12 (1)	198 (10)	338 (12)	247 (10)

Figures in brackets indicate percentages to total cost of cultivation with valuation of hired labour only.

4.32 Cost of cultivation per NCA was higher for OF as compared to SF in the case of rainfed and canal irrigated farms, however, in the case

of DTW and ETW irrigated farms cost of cultivation per NCA was lower for OF as compared to SF, mainly due to economies of scale in respect of irrigation cost and bullock maintenance. Also, on account of resource constraint, DTW-OF/ETW-OF were applying lower dosages of fertilisers, etc., as compared to SF.

- 4.33** Expenditure on seeds averaged higher in the case of irrigated farms due mainly to higher expenditure on sugarcane seeds.
- 4.34** Alongwith irrigation, fertiliser is the main factor which contributes significantly to the increase in the productivity of land. About 20 per cent of the cost of cultivation was on account of fertilisers. Use of fertilisers on rainfed/partially irrigated farms was limited as extensive fertiliser application without the support of proper irrigation has a negative impact on crop yield. Field data indicate that for SF, fertiliser application was four times in canal irrigated farms and 7.5 times in tubewell irrigated farms as compared to rainfed farms. Correspondingly, in the case of OF fertiliser application was 3 times in canal irrigated farms and 4.5 times in tubewell irrigated farms compared to their use on rainfed farms.
- 4.35** Irrigation costs relate to own farm only. It was observed that DTW farms incurred highest irrigation cost per NCA followed by ETW farms and canal farms. In fact, DTW farms spent 2.8 times more than ETW farms in case of SF, whereas, for OF expenditure on DTW irrigation was 3.4 times the ETW irrigation. On account of flat rate tariff for electricity charges ETW farms enjoyed higher economies of scale as compared to DTW farms.
- 4.36** A major part of cost of cultivation was for expenditure on human labour. Two estimates of labour cost, (a) with valuation of hired labour only and (b) with valuation of total (hired as well as family) labour, are presented in the analysis. Tubewell farms incurred high expenditure on labour cost as compared to canal farms and rainfed farms.
- 4.37** Roughly 20 per cent of the cost of cultivation was for expenditure on draught power. Whereas the rainfed farms were depending solely

on bullock power, canal farms and tubewell farms were hiring tractor to supplement the bullock power. The use of tractor for ploughing purposes was mainly to overcome the problem of labour shortage in peak season of land preparation and also to break hard ridges after the harvesting of sugarcane crop. On an average, beneficiaries were paying Rs. 40 per hour for tractor use.

**4.38** Interest on short-term credit was worked out on the assumption that 50 per cent of the cost of cultivation was met by borrowed funds. Thus it was directly proportional to cost of cultivation. This explains categorywise variation in expenditure for the item of interest on short-term credit.

**4.39** The total cost of cultivation for different categories is given in Table 4.9.

**Table 4.9**

**Total cost of cultivation per acre (1981-82 prices)**

Source of irrigation	Cost of cultivation per acre (Amount in rupees)			
	Small farmers		Other farmers	
	A	B	A	B
I	2	3	4	5
Rainfed	760	932	889	1,060
Canal	1,678 (121)	2,014 (116)	1,907 (115)	2,279 (115)
DTW	3,064 (303)	3,549 (281)	2,846 (220)	3,258 (207)
ETW	2,642 (248)	3,205 (244)	2,469 (178)	2,886 (172)

\* Figures in brackets indicate percentage increases over rainfed conditions.

Note : A - With valuation of hired labour only.

B - With valuation of total labour.

**4.40** As compared to rainfed farms, cost of cultivation per acre in respect of SF was higher by 121 per cent for canal irrigated farms, by 303 per cent for DTW irrigated farms and by 248 per cent for ETW irrigated farms. The same trend was observed in case of OF though the magnitude of difference was less presumably due to economies of scale in cost of cultivation.

4.41 The difference in cost A and cost B was more in case of SF than in case of OF. This may be explained by the fact that proportion of hired labour in total labour use was less in case of SF as compared to OF (increase in size of holding necessitated more dependence on hired labour). Thus, with valuation of family labour at par with hired labour, cost of cultivation for SF rose sharply as compared to cost of cultivation for OF.

4.42 Using the cost of cultivation estimates as given in Table 4.9 and area irrigated by different sources of irrigation in the pre and post investment situations, two estimates of costs of cultivation, each for different categories of sample beneficiaries were worked out and are given in Table 4.10.

**Table 4.10**  
**Cost of cultivation (1981-82 prices)**  
 (Amount in rupees)

Category of beneficiaries	Cost of cultivation per beneficiary				Percentage increase over pre-investment cost of cultivation	
	Pre-investment		Post-investment		A	B
	A	B	A	B		
I	2	3	4	5	6	7
DTW-SF	7,460	8,972	15,197	17,603	104	96
DTW-OF	15,318	18,304	24,760	28,345	62	55
ETW-SF	7,862	9,341	12,206	14,806	55	59
ETW-OF	16,692	19,905	23,011	26,898	38	35
DTW-ALL	10,952	13,120	19,447	22,377	78	71
ETW-ALL	13,118	15,629	18,638	22,004	42	41
All sample beneficiaries	11,998	14,331	19,056	22,197	59	55

Note : A - With valuation of hired labour only.  
 B - With valuation of total labour.

4.43 In the case of DTW-SF, the two estimates of cost of cultivation, A and B at Rs. 15,197 and Rs. 17,603 in the post-investment situation registered steep increases of 104 per cent and 96 per cent, respectively,

over the pre-investment situation. This may be attributed to the high cost of cultivation per acre for SF in the post-investment situation. Incremental cost of cultivation was minimum in respect of ETW-OF due mainly to economies of scale in respect of irrigation cost, bullock maintenance and application of lower dosages of fertilisers. In the case of DTW-OF and ETW-SF it varied from 55 per cent to 62 per cent. For, an average DTW/ETW beneficiary cost of cultivation increased by more than 75 per cent/40 per cent.

### Net income

4.44 Two estimates of net farm income emerge from the analysis, i.e., estimate A (with valuation of hired labour only) and estimate B (with valuation of total labour, i.e., including family labour) and are presented in Table 4.11.

**Table 4.11**  
**Net farm income (1981-82 prices)**

Category of beneficiaries	Net farm income per beneficiary				(Amount in rupees)	
	Pre-investment		Post-investment		Percentage increase over pre-investment net farm income	
	A	B	A	B	A	B
1	2	3	4	5	6	7
DTW-SF	4,395	2,883	6,948	4,542	58	58
DTW-OF	8,798	5,812	13,699	10,114	56	74
ETW-SF	4,373	2,894	7,403	4,802	69	66
ETW-OF	9,540	6,327	17,269	13,382	81	112
DTW-ALL	6,352	4,184	9,949	7,019	57	68
ETW-ALL	7,449	4,938	13,275	9,909	78	101
All sample beneficiaries	6,881	4,548	11,555	8,414	68	85

Note : A - With valuation of hired labour only.

B - With valuation of total labour.

4.45 Net farm incomes in the pre and post investment situations were the combined result of cropping pattern adopted by the beneficiaries,



quality and quantity of inputs used, yields obtained and prices prevailing in the reference year. An average DTW/ETW beneficiary realised a net farm income of Rs. 9,949/Rs. 13,275 in the post-investment situation, registering an increase of 57 per cent/78 per cent over the pre-investment situation. Net farm income in the post-investment situation stood at Rs. 6,948 for DTW-SF, Rs. 13,699 for DTW-OF, Rs. 7,403 for ETW-SF and Rs. 17,269 for ETW-OF, recording increases of 58 per cent, 56 per cent, 69 per cent and 81 per cent, respectively.

#### **Incremental income**

- 4.46** Incremental income generated due to installation of tubewells consisted of irrigation benefits and utilisation benefits. Irrigation benefits were defined as excess of net income realised with the introduction of tubewell irrigation over the pre-investment net income on own farm and net income from sale of water. Utilisation benefits comprised of net income accrued from operation of thresher and cane crusher. The method for estimating different components of incremental income and analysis are discussed below .

#### **Net incremental income on own farm**

- 4.47** Estimates of net incremental income as excess of net income accrued in the post-investment situation over the net income accrued in the pre-investment situation for each category of sample beneficiaries are presented in Table 4.12.
- 4.48** Estimates of net incremental income in the post-investment period, for different categories of sample beneficiaries, if studied in the light of growth rates registered by gross farm produce, cost of cultivation and net farm produce over those in the pre-investment period would give more meaningful explanation for magnitude of net incremental income as illustrated in Table 4.13.

Table 4.12

Net incremental income from own farm (1981-82 prices)  
(Amount in rupees)

Category of beneficiaries	Net incremental income from farm produce			
	Per beneficiary		Per acre	
	A	B	A	B
1	2	3	4	5
DTW-SF	2,553	1,659	515	335
DTW-OF	4,901	4,302	563	494
ETW-SF	3,030	1,908	656	413
ETW-OF	7,729	7,055	829	757
DTW-ALL	3,597	2,835	543	428
ETW-ALL	5,826	4,971	785	670
All sample beneficiaries	4,673	3,866	668	552

Note : A - With valuation of hired labour only.  
B - With valuation of total labour.

Table 4.13

Trends in the growth rates

(Per cent)

Category of beneficiaries	Percentage increase in the post-investment situation in				
	Gross income	Cost of cultivation		Net farm income	
		A	B	A	B
1	2	3	4	5	6
DTW-SF	87	104	96	58	58
DTW-OF	60	62	55	56	74
ETW-SF	60	55	59	69	66
ETW-OF	54	38	35	81	112
DTW-ALL	70	78	71	57	68
ETW-ALL	55	42	41	78	101
All sample beneficiaries	62	59	55	68	85

Note : A - With valuation of hired labour only.  
B - With valuation of total labour.

**4.49** It may be concluded from the Table 4.13 that for any category of sample beneficiaries, when gross income increased at a faster pace compared to the growth in the cost of cultivation, then the net income increased by the percentage growth in the gross income plus nearly double the difference between the growth rates in gross income and cost of cultivation, and vice-versa. This holds true mainly because cost of cultivation in each category accounted for the same proportion of gross income. In the case of ETW-OF, however, cost of cultivation formed much less proportion of the gross income, with the result that net income (with valuation of total labour) increased by more than 100 per cent. In absolute terms, ETW-OF realised maximum net incremental income, followed by DTW-OF, ETW-SF and DTW-SF.

**4.50** Whereas, net incremental income per acre (with valuation of hired labour only) (Table 4.12) at Rs. 829 was maximum in the case of ETW-OF, it was Rs. 656 per acre in the case of ETW-SF, Rs. 563 per acre in the case of DTW-OF and Rs. 515 per acre for DTW-SF. If imputed value of family labour is also included, other farmers realised more per acre net incremental income compared to small farmers indicating relatively more use of family labour by SF than OF.

#### **Income accrued from sale of gur:**

**4.51** Although there were arrangements with the sugar factories to lift sugarcane, some of the beneficiaries having large area under sugarcane had gone in for preparation of gur. This was mainly because sugar factories were not able to lift all the sugarcane grown and also gur (jaggery) was one of the main items of local consumption. It was observed that the beneficiaries in general did not purchase jaggery units but had taken such units on hire basis, mainly from 'Nahan' enterprises located at Muzaffarnagar. The range of annual hire charges was from Rs. 2,000 to Rs. 3,500 at historical prices, depending on the quality and capacity of the jaggery unit. At survey year prices annual hire charges were Rs. 4,000.

- 4.52** Farmers having DTW had not gone in for cane crushing presumably because of high O & M cost of diesel engine and as cane crushing involved longer operational hours, net income from sale of gur was not sufficient to induce beneficiaries to take up this activity. On the other hand, farmers having ETW were eager to establish jaggery unit as it involved no additional O & M cost for them because of flat rate tariff for electricity.
- 4.53** During the field survey it was observed that as many as 7 ETW-SF and 6 ETW-OF had established jaggery units. Economics of jaggery unit is presented in Annexure III. Average number of hours of use of motor for cane crushing by the reporting ETW-SF and ETW-OF were about 400 hours and 600 hours and they earned a net income of Rs. 9,500 and Rs. 8,200, respectively, after deducting hire charges for the unit and other inputs like labour, chemicals, fuel, etc. On an average, net income from sale of gur was Rs. 3,913 and Rs. 1,967 per ETW-SF and per ETW-OF, respectively.

#### **Sale of water**

- 4.54** Income from sale of water was possible only because of the tubewell investment and depended on demand for water from neighbouring farmers. Net income accrued from sale of water is presented in Table 4.14. Number of beneficiaries reported sale of water were 19 DTW-SF, 10 DTW-OF, 13 ETW-SF and 10 ETW-OF. It may be observed that practice of sale of water was prevailing more amongst SF compared to OF. Hence, income from sale of water was higher in the case of DTW-SF as well as ETW-SF compared to OF category. Income from sale of water was calculated considering number of hours of sale of water, rate charged per hour by DTW/ETW beneficiary and O & M cost per hour.
- 4.55** Thus, net income from sale of water worked out to Rs. 526 for DTW-SF, Rs. 220 for DTW-OF, Rs. 450 for ETW-SF and Rs. 276 for

Table 4.14

## Net income from sale of water

Category of beneficiaries	No. of beneficiaries reporting sale of water	Rate charged per hour (Rs.)	O&M* cost per hour (Rs.)	Number of hours of sale of water by sample beneficiaries	Net income per hour (Rs.)	Net income from sale of water (Rs.)
1	2	3	4	5	6	7
DTW-SF	19	8.00	4.54	152	3.46	526
DTW-OF	10	8.00	4.77	68	3.23	220
ETW-SF	13	4.00	1.68	194	2.32	450
ETW-OF	10	4.00	1.40	106	2.60	276
DTW-ALL	29	8.00	4.65	115	3.35	385
ETW-ALL	23	4.00	1.49	142	2.51	356
All sample beneficiaries	52	6.07	3.12	128	2.95	378

\* see Table 4.4

ETW-OF, during 1981-82. On an average DTW/ETW beneficiary earned Rs. 385/Rs. 356 as net income from sale of water.

### Thresher

4.56 It was observed that 3 DTW-SF, 2 DTW-OF, 8 ETW-SF and 15 ETW-OF had purchased threshers after installation of tubewell. Beneficiaries were using engine/motor, purchased under the investment, to operate these threshers. As already stated, ETW beneficiaries had not to pay any additional electricity charges for operating the thresher because of flat rate of electricity charged. Hence, many ETW-beneficiaries had gone in for purchase of a thresher. On the other hand, due to high operational cost of diesel engine, DTW beneficiaries were generally reluctant to purchase threshers. Only those DTW beneficiaries with significant area under wheat, purchased threshers. The beneficiaries had used the threshers for their own use and also for custom work. Economics of the wheat thresher unit is given in

Annexure III. Net income from custom hire in the case of DTW beneficiaries worked out to Rs. 16.75 per hour. The same in the case of ETW beneficiaries worked out to Rs. 24.50 per hour. Average number of hours of use of engine/motor for wheat thresher by the reporting beneficiaries were 96 hours in the case of DTW-SF, 83 hours in the case DTW-OF, 82 hours in the case of ETW-SF and 72 hours in the case of ETW-OF. These beneficiaries earned an average income of Rs. 1,608, Rs. 1,390, Rs. 2,000 and Rs. 1,760, respectively. The average for all the sample beneficiaries (net income from custom hire of thresher) worked out to Rs. 193 (DTW-SF), Rs. 139 (DTW-OF) Rs. 942 (ETW-SF) and Rs. 1,053 (ETW-OF) during 1981-82.

4.57 Estimates of net incremental income from farm produce and net incomes from sale of gur, sale of water and custom hire of thresher, are presented in Table 4.15.

**Table 4.15**  
**Net incremental income (1981-82 prices)**  
(Amount in rupees)

Category of beneficiaries	Net incremental income on own farm		Net income from			Total incremental income	
	A	B	Sale of gur	Sale of water	Thresher hire charges	A	B
I	2	3	4	5	6	7	8
DTW-SF	2,553	1,659	-	526	193	3,272 (660)	2,378 (479)
DTW-OF	4,901	4,302	-	220	139	5,260 (605)	4,661 (536)
ETW-SF	3,030	1,908	3,913	450	942	8,335 (1,804)	7,213 (1,561)
ETW-OF	7,729	7,055	1,967	276	1,053	11,025 (1,183)	10,351 (1,111)
DTW-ALL	3,597	2,835	-	385	169	4,161 (627)	3,389 (512)
ETW-ALL	5,826	4,971	2,755	356	1,008	9,945 (1,340)	9,090 (1,255)
All sample beneficiaries	4,674	3,866	1,330	378	574	6,948 (993)	6,148 (877)

Figures in brackets relate to total incremental income per acre.

Note : A - With valuation of hired labour only.

B - With valuation of total labour.

**4.58** Thus, the total incremental income realised by the beneficiaries during 1981-82, worked out to Rs. 3,272 for DTW-SF, Rs. 5,260 for DTW-OF, Rs. 8,335 for ETW-SF and Rs. 11,025 for ETW-OF. Considering valuation of family labour, corresponding estimates of total incremental income were Rs. 2,378, Rs. 4,661, Rs. 7,213 and Rs. 10,351 for the respective categories of the sample beneficiaries. On an average ETW beneficiary realised 140 per cent more incremental income with estimate A compared to the DTW beneficiary, whereas, if imputed value of family labour is also included, ETW beneficiary realised 168 per cent more incremental income compared to DTW beneficiary. If the total incremental income (estimate A) accrued to the beneficiaries is viewed on a per acre basis, it is observed that SF category in both DTW and ETW beneficiaries realised higher incremental income compared to OF. Higher incremental income realised by ETW beneficiaries was due mainly to the income from sale of gur.

#### **Financial viability**

**4.59** The financial viability of the investments under the scheme was assessed on the basis of financial rates of return (FRR). As the final programme under the scheme included investments in DTWs and ETWs and as these investments benefited two classes of farmers, separate FRRs were calculated for DTW-SF, DTW-OF, ETW-SF and ETW-OF as also for DTW-ALL, ETW-ALL and all sample beneficiaries. Separate cash flows/FRRs are presented in Statements 17 to 23. The cash flows have been calculated on the following assumptions :

- a) All valuations are at 1981-82 prices.
- b) Economic life of the pumpset is 15 years.
- c) Economic life of the bore is 15 years.
- d) Economic life of the pit and the pumphouse is 40 years.

- e) Irrigation benefits from the tubewells flow at 80 per cent during the first year of installation and at 100 per cent from the second year onwards.
- f) The salvage value of the pumpset and bore at the end of the 15th year is 10 per cent of the investment cost. The salvage value of the pit and the pumphouse is assumed at 62.5 per cent of the investment cost.
- g) There will be no shrinkage in the command area of STW.
- h) There will be no change in the crop pattern over the years.

4.60 Based on these assumptions, the estimated FRRs are given in Table 4.16.

**Table 4.16**  
**Financial rates of return**

Category of beneficiaries	FRR (%)	
	Estimate A	Estimate B
I	2	3
DTW-SF	26	17
DTW-OF	49	42
DTW-ALL	36	27
ETW-SF	> 50	> 50
ETW-OF	> 50	> 50
ETW-ALL	> 50	> 50
All sample beneficiaries	> 50	> 50

Note : A - With Valuation of hired labour only.  
B - With Valuation of total labour.

It may be observed that the investments under the scheme had proved economically viable for all the categories of beneficiaries. The FRR for DTW-SF was, however, lower than others mainly due to relatively high O & M cost of DTWs.



## Employment generation

4.61 It was gathered during the field study that non-recurring employment of 114 mandays per beneficiary was created in construction and installation of the tubewell. Recurring employment generation in the pre-investment and post-investment situations were reported as under :

Table 4.17

### Recurring employment per acre

Category of beneficiaries	(Mandays)			
	Rainfed	Canal	DTW	ETW
1	2	3	4	5
<b>Small farmers</b>				
i) Hired	25	50	80	72
ii) Total*	51	95	140	140
<b>Other farmers</b>				
i) Hired	28	55	83	72
ii) Total*	54	99	125	128

\* Including family labour

Using the figures for per acre recurring employment generated and the corresponding areas under rainfed farms, canal, DTW and ETW irrigated farms, total labour use in the pre-investment and post-investment situations was worked out and is presented in Statement 24 and is also summarised in Table 4.18.

4.62 On an average, the sample beneficiaries had used 642 mandays of labour in the pre-investment situation. This labour use increased to 918 mandays per year per beneficiary in the post-investment situation, indicating an increase of 43 per cent (276 mandays). Of this increase, hired labour accounted for 29 per cent and family labour accounted for 14 per cent. For OF category, larger holdings necessitated additional hired labour whereas in the case of SF, in addition to hired labour, there was maximum utilisation of family labour in both

Table 4.18

## Additional recurring employment generation

(Mandays)

Category of beneficiaries	Per beneficiary				Additional employment		
	Post-investment		Pre-investment		Hired	Family	Total
	Hired	Family	Hired	Family			
1	2	3	4	5	6	7	8
DTW-SF	397	298	225	205	172	93	265
DTW-OF	722	365	445	360	277	5	282
ETW-SF	333	315	227	197	106	118	224
ETW-OF	671	522	485	386	186	136	322
DTW-ALL	541	327	323	274	218	53	271
ETW-ALL	534	438	381	310	153	128	281
All sample beneficiaries	537	381	351	291	186	90	276

pre and post investment situations. In the case of ETW beneficiaries, the use of family labour was relatively more than DTW beneficiaries, as they were engaged in the gur manufacturing activity also.

**Asset creation**

**4.63** Information on net addition to asset position for different categories of sample beneficiaries was collected during the study. The data are presented in Table 4.19. It is observed that the maximum investment (38 per cent) by the sample beneficiaries, was in pucca houses, followed by investment in milch animals (17 per cent) and land (15 per cent).

**Repayment performance**

**4.64** The repayment performance of the beneficiaries under the scheme was quite satisfactory. This is evident from the fact that, as on 30 June 1982, the percentage of overdues to demand was only 7.1 per cent. Financing bank branchwise, it was only 5 per cent for Muzaffarnagar branch, 4.9 per cent for Budhana branch, 11.9 per cent for Jansath branch and 1.6 per cent for Shamli branch.

**Table 4.19**  
**Net addition to the assets of sample beneficiaries**  
**(all 87 together) after the investment (1981-82 prices)**

Sr. No.	Item	Net additions to		
		Number	Amount (Rs. '000)	Percentage to total
1	2	3	4	5
1.	Land	16.5 (Acres)	216	15
2.	Cows	11	11	1
3.	Buffaloes	86	241	17
4.	He-buffaloes	23	25	2
5.	Bullocks	40	70	5
6.	Diesel engines/ Electric motors	11	78	6
7.	Threshers	28	86	6
8.	Cane crushers	4	34	2
9.	Dunlop carts	21	47	3
10.	Tractors	-	12	1
11.	Houses	-	540	38
12.	Others	-	50	4
	<b>Total</b>		<b>1,410</b>	<b>100</b>

**4.65** Date on repayment performance of the sample beneficiaries (Statement 25) show that for 87 sample beneficiaries, a total of 349 instalments were due as on 30 June 1982. Of these, 331 instalments (95 per cent) were paid and only 18 (5 per cent) remained in default by 13 beneficiaries. Categorywise the default was 8 per cent in the case of DTW-SF, 6 per cent in the case of DTW-OF, 4 per cent in the case of ETW-SF and 3 per cent in the case of ETW-OF. Thus, the recovery performance of ETW beneficiaries was better than the DTW beneficiaries, probably because of the supplementary income from gur manufacturing and selling activity.

**4.66** According to the UPSCLDB procedure, an instalment becomes overdue only when it is not paid by 30 June of the year. Data for the co-operative year 1980-81, on Demand, Recovery and Overdues position was collected in respect of the schemes beneficiaries, categorywise. It was revealed (Statement 16C) that only in the case of DTW-SF category, there was a default to the extent of

Rs. 6,417, and there was no default in the case of other categories, as on 30 June 1981. However, during the following year 1981-82 all the categories of beneficiaries seem to have defaulted in various degrees. Thus, the extent of default was 16 to 17 per cent in the case of DTW beneficiaries, while it was 6 to 8 per cent in the case of ETW beneficiaries. It was gathered that, during 1981-82, the wheat crop was marginally damaged due to untimely rains and hailstorm. The LDB branch officials were, however, hopeful of recovering the overdues at the time of harvesting of 1981-82 cane crop.



## **AGGREGATE IMPACT OF THE SCHEME**



## CHAPTER - V

### AGGREGATE IMPACT OF THE SCHEME

#### Macro estimates

- 5.1** The major benefits accruing from the scheme investments were in the form of increase in cropping intensity, average yield of crops and changes in the cropping pattern, etc., which resulted in increase in the production of crops grown, increase in income from farm produce and in creation of additional on-farm employment. Because of the investment, the scheme beneficiaries were able to enhance their income by way of sale of water, sale of gur (with the help of a jaggery unit) and custom hire of threshers.
- 5.2** The four financing branches of the UPSCLDB had extended assistance to 3,093 farmers under the scheme for installation of tubewells. However, on the basis of field survey results, it was estimated that 5.4 per cent of the total scheme beneficiaries misutilised the loan amount and the remaining 2,926 beneficiaries completed the investment. Of these, 1,513 were DTW beneficiaries and 1,413 were ETW beneficiaries. In particular, there were 841 DTW-SF, 672 DTW-OF, 572 ETW-SF and 841 ETW-OF. Population estimates are worked out by blowing up the sample estimates. The number of scheme beneficiaries under different categories were used as weights to calculate the macro impact of the investment on irrigated area, production, income, labour employment, etc., and are discussed in the following paragraphs.
- 5.3** Total investment cost at historical prices worked out to Rs. 272.2 lakh and that in the reference year's prices to Rs. 438.9 lakh.
- 5.4** Due to the investment in tubewells under the scheme, net irrigated area of the beneficiaries is estimated to have increased by 20.5 per cent from 17,014 acres in the pre-investment situation to 20,498



acres in the post-investment situation, bringing 3,484 acres of additional area under irrigation. Since majority of the cultivated land of the beneficiaries was irrigated in the pre-investment situation, increase in the net irrigated area was not significant. The investment brought about a change in the source of irrigation, i.e., from unreliable source (canal) to assured source (tubewell).

- 5.5** Following the investment, the scheme beneficiaries could increase the gross cropped area by 17.7 per cent, i.e., by 8,119 acres. Increase in the GCA was almost 40 per cent of the NCA indicating that, with the availability of assured irrigation facility, scheme beneficiaries increased the cropping intensity by bringing additional area under sugarcane of the order of 4,309 acres.
- 5.6** The field data revealed that 910 farmers were benefited from the scheme beneficiaries by way of purchase of water for irrigation purpose. An estimated area of 3,605 acres was brought under irrigation by the scheme tubewells by way of sale of water. However, impact of irrigation on yields, cropping pattern, net farm income, etc., in the case of purchasers of water could not be estimated due to paucity of staff and time during field survey.
- 5.7** Impact of the scheme in terms of increased production of agricultural commodities and their gross value of produce are presented in Table 5.1 for the sample beneficiaries. Although yields of all the crops in the post-development situation increased, area under cereals reduced significantly and was brought under cash crops. Area under pulses was totally brought under sugarcane.
- 5.8** Using these production changes in the agricultural commodities by different categories of sample beneficiaries and the corresponding number of scheme beneficiaries, scheme impact in terms of production was worked out and is presented in Table 5.3.

Table 5.1

Variations in the production of different crops (per beneficiary)

Sr. Crop No.		(Quintals)				Price per Qtl. (Rs.)
		DTW-SF	DTW-OF	ETW-SF	ETW-OF	
1	2	3	4	5	6	7
1.	Wheat	-15.33	7.16	-1.46	3.87	142
2.	Paddy	4.28	21.52	4.62	22.81	110
3.	Maize	-3.94	-8.35	-5.09	-14.25	116
4.	Jowar/Bajra	-2.23	-3.49	-0.25	-3.16	116
<b>Sub-total cereals</b>		<b>-17.22</b>	<b>16.84</b>	<b>-2.18</b>	<b>9.27</b>	<b>-</b>
5.	Pulses	-2.65	-2.92	-2.99	-3.05	230
6.	Sugarcane	498.61	496.34	354.90	552.24	21.5
7.	Potato	4.90	32.85	-	22.94	50
8.	Vegetables	8.40	6.90	7.50	6.90	100
<b>Sub-total cash crops</b>		<b>511.91</b>	<b>536.09</b>	<b>362.40</b>	<b>582.08</b>	<b>-</b>
Total No. of scheme beneficiaries		841	672	572	841	-

Table 5.2

Incremental production and gross value of produce

Sr. Crop No.		Incremental	
		Production ('000 Qtls.)	Gross value of produce (Rs. lakh)
1	2	3	4
1.	Wheat	-5.661	-8.04
2.	Paddy	+39.887	+43.88
3.	Maize	-23.820	-27.63
4.	Jowar/Bajra	-7.021	-8.14
<b>Cereals sub-total</b>		<b>+3.385</b>	<b>+0.07</b>
5.	Pulses	-8.466	-19.47
6.	Sugarcane	+1420.308	+305.37
7.	Potato	+37.247	+18.62
8.	Vegetables	+0.03	+0.03
<b>Total</b>			<b>+302.62</b>

59 The above table reveals that the production of paddy increased in the scheme area and that of wheat, maize and jowar/bajra declined.

Decline in wheat production was due mainly to the decline in the area under wheat, especially in the case of SF category. Overall production of cereals increased by only 3.4 thousand Qtls. Area under pulses was totally brought under cash crops and production of pulses reduced by about 8.5 thousand Qtls.

**5.10** Sugarcane was the major cash crop of the area. With the availability of assured supply of irrigation, area and yield of sugarcane increased resulting in additional production of 1,420 thousand Qtls. valued at Rs. 305 lakh. For all the scheme beneficiaries, the production of cash crops increased by 1,458 thousand Qtls. Corresponding gross value of the incremental output of cash crops stood at Rs. 324 lakh.

**5.11** Net addition to the income of the beneficiary family after the investment in tubewell from farm produce, from sale of water and from sale of gur per scheme beneficiary and for the scheme as a whole are presented in Table 5.3.

**Table 5.3**  
**Net addition to the family income per annum**

Category of beneficiaries	Incremental income* per beneficiary (Rs.)		No. of scheme beneficiaries	Scheme impact Incremental income* (Rs. lakh)	
	A	B		A	B
I	2	3	4	5	6
DTW-SF	3,272	2,378	841	27.51	20.00
DTW-OF	5,260	4,661	672	35.34	31.32
ETW-SF	8,335	7,213	572	47.68	41.26
ETW-OF	11,025	10,351	841	92.72	87.06
<b>Total</b>				<b>203.25</b>	<b>179.64</b>

Note : A - With Valuation of hired labour only.

B - With valuation of total labour.

\* Includes net income from i) farm produce, ii) sale of water, iii) sale of gur and iv) hiring of thresher.

**5.12** Thus, the incremental annual income generated by the scheme for all the scheme beneficiaries together worked out to Rs. 203.25 lakh,

if only hired labour is considered. If, however, imputed value of family labour is also taken into account, the incremental annual income works out to Rs. 179.64 lakh.

**5.13** Financial rate of return for the scheme as a whole worked out to more than 50 per cent in both the cases, i.e., with valuation of hired labour only and with valuation of total labour.

**5.14** The investment in tubewells under the scheme also resulted in creation of additional employment opportunities. The non-recurring employment in construction and installation of tubewell was 114 mandays per unit of investment. Thus, for the scheme as a whole, non-recurring employment of around 1,334 manyears (one manyear = 250 mandays) was generated. In addition, recurring additional employment was also generated on the farm as may be seen from Table 5.4.

**Table 5.4**  
**Average annual employment generation**

Sr. No.	Item	Additional annual employment generation per beneficiary (Mandays)			Scheme impact (Manyears)		
		Hired	Family	Total	Hired	Family	Total
1	2	3	4	5	6	7	8
1.	Farm operations	186	90	276	2,177	1,053	3,230
2.	Manufacture of gur	45	30	75	527	351	878
3.	Thresher	19	17	26	222	82	304
	<b>Total</b>	<b>250</b>	<b>127</b>	<b>377</b>	<b>2,926</b>	<b>1,486</b>	<b>4,412</b>

Note : On-farm labour employment in the pre-investment situation was 351 mandays and 642 mandays of hired and total labour, respectively, per beneficiary.

**5.15** It may be seen from Table 5.4 that the total on-farm labour employment increased by 43 per cent (hired employment increased by 53

per cent) for switch over from without project to with project situation. Inclusive of the labour employment provided by manufacture of gur and operation of thresher, the total employment registered an increase of 59 per cent (71 per cent in case of hired labour). Thus, there was an increase of 377 mandays of total labour employment per beneficiary of which 250 mandays were for hired labour. The total recurring annual employment generated for the scheme as a whole worked out to 4,412 manyears, the share of hired labour being 2,926 manyears.

## **FARM SIZE FOR INVESTMENT IN TUBEWELLS**



## CHAPTER - VI

### FARM SIZE FOR INVESTMENT IN TUBEWELLS

#### Minimum size

- 6.1** The minimum size of farm, required for making the investment in shallow tubewells economically viable, can be estimated on the basis of minimum net income required to be generated and then converting the same into acreage, considering the net farm income per net acre obtained under different conditions.
- 6.2** The required minimum net income can be estimated by equating cost of investment with the discounted flow of benefits at a discount rate expected to be the minimum return on the investment. On the assumption that a farmer should get a minimum return of 17 per cent on the capital invested (to take care of the interest on capital at 12.5% and also leave him some benefits), the minimum income can be estimated with the use of the following formula :-

$$C = \sum_{t=1}^n \frac{B_t}{(1+d)^t}$$

Where C is investment cost

B is annual benefit

d is discount rate

n is life of the asset in years.

t is time.

- 6.3** Assuming value of 'C' at Rs. 15,000 and 'd' at 17 per cent and 'n' at 15 years, the minimum income works out to Rs. 2,817.
- 6.4** The estimation of minimum farm size required, depends on the pre-investment conditions, i.e., whether it is a switch-over from rainfed land to irrigated land or whether it is a switch-over from one source of irrigation to another source of irrigation. In the present case, both the pre-investment conditions are applicable. Part of the land of the scheme beneficiaries was rainfed and a part was canal irrigated, prior to the investment. Table 6.1 below shows the per acre net



incremental incomes estimated to have earned by the scheme beneficiaries during the reference year (1981-82) and also the minimum size of farm required to earn an annual net incremental farm income of Rs. 2,817 as estimated in para 6.3.

**Table 6.1**  
**Minimum farm size**

Switch-over		Net incremental income per acre (Rs.)		Minimum size of farm required to earn a minimum net annual incremental income of Rs. 2,817	
From	To	A	B	A	B
1	2	3	4	5	6
Rainfed	DTW	707	627	3.99	4.49
Canal	DTW	472	370	5.97	7.61
Rainfed	ETW	1,188	883	2.37	3.19
Canal	ETW	749	631	3.76	4.46

A - With Valuation of of hired labour only.

B - With Valuation of total labour.

**6.5** The above estimates of minimum farm sizes, under different conditions as obtained in the scheme under reference, are worked out on the basis of net farm incomes only. If the ancilliary incomes from sale of water, custom work from thresher and sale of gur are also taken into account, the minimum farm size will be less. As may be observed from the above table, the minimum farm size requirements are much less in the case of investments in electric tubewells mainly because of much lower operation and maintenance cost, which itself was due mainly to flat rates of electricity charged.

#### **Maximum size**

**6.6** The maximum area that can be irrigated by a tubewell, either diesel or electric, depends mainly on technical specifications of the tubewell as also on the peak water requirements of the crops sown. The peak level demand for irrigation water occurs in the rabi season. The

major crops in the area under the scheme, were sugarcane and wheat. The maximum area that can be irrigated by DTW/ETW is worked out on the basis of the following formula :-

$$Q = 28 \frac{A.I.}{R.T.}$$

Where Q = Discharge of tubewell in litres per second

A = Area in hectares

I = Depth of irrigation in cms.

R = Rotation period in days

T = Duty hours

**6.7** The assumptions for the purpose of the application of the above formula to the scheme under reference are :

- a. The discharge is 12.6 litres per second (10,000 gallons per hour) for DTW/ETW.
- b. The depth of irrigation is 7.5 cms. for sugarcane and 6 cms for wheat.
- c. The rotation period is 18 days for wheat and 24 days for sugarcane.
- d. Duty hours are 6 per day during rabi season (This is based on the data obtained during the present field study).
- e. Sugarcane crop covers 60 per cent of the area during rabi and wheat crop covers 40 per cent of the area.

**6.8** Based on the above assumptions, the maximum area which can be irrigated by DTW/ETW is worked out as follows :

$$Q = 28 \frac{A.I.}{R.T.}$$

$$\text{i.e., } 12.6 = 28 \frac{0.60 A \times 7.5}{24 \times 6} + \frac{0.40 A \times 6.0}{18 \times 6}$$

i.e., A = 8.4 hectares or 20 acres.

Thus, irrigation of 20 acres by DTW/ETW is technically feasible.



## ANNEXURE - I

### Annual draft and water application for major crops

1. The annual draft from tubewells averaged 240 acre inches. The annual draft, according to the category of farmers, is given in Table 1 below :

**Table 1**  
**Annual draft from tubewell**  
**(in acre inches)**

Category of farmer	Diesel tubewell	Electric tubewell	Average
1	2	3	4
Small farmer	190	164	180
Other farmer	280	309	297
Average	230	251	240

2. Variations in the annual draft was due to variations in cropping pattern, benefiting area, etc. On an average, the annual draft was 65 per cent higher in the case of other farmers as compared to small farmers.
3. Average irrigation water given per acre of gross irrigated area was 16 acre inches. Farmer categorywise and even DTW/ETW tubewell-wise there was not much variation as can be seen from Table 2 below :

**Table 2**  
**Utilisation of irrigation water**  
**(per acre of gross irrigated area)**  
**(in acre inches)**

Category of farmer	Diesel tubewell	Electric tubewell	Average
1	2	3	4
Small farmer	16.9	15.8	16.5
Other farmer	15.4	15.8	15.6
Average	16.2	15.8	16.0

4. The survey data revealed that the number of irrigations actually given by the farmers was as per requirements, however, the depth of irrigations was less than what was required, as can be observed from Table 3 below :

**Table 3**  
**Depth and number of irrigations - major crops**

Crop	Requirement		Actual	
	No. of irrigations	Depth (Acre inches)	No. of irrigations	Depth (Acre inches)
	1	2	3	4
Wheat	6	3	6	2.5
Sugarcane	12	3	12	2.5

**ANNEXURE - II**  
**Economics of 5 acre holding**

Before construction of a tubewell									After construction of a tubewell									
Crop	Area (acres)	Yield per acre (Qtls)	Total yield (Qtls)	Sale price per Qtl (Rs.)	Total income (Rs.)	Cultivation expenses per acre (Rs.)	Total Cultivation expenses (Rs.)	Surplus of income	1	2	3	4	5	6	7	8	9	(Investment cost Rs. 11,000/-)
<b>Kharif</b>																		
Paddy (Local)	3	5	15	75	1,125	200	600	525										
Maize	1.5	4	6	80	480	150	225	255										
Fodder	0.5	-	-	-	-	-	-	-										
<b>Rabi</b>																		
Wheat (Local)	4	5	20	105	2,100	200	800	1,300										
Fodder	-	-	-	-	3,705	-	1,625	2,080 A										
<b>Perennial</b>																		
Sugarcane	1.0	200	200	12	2,400	1,000	1,400											
<b>Other expenses</b>																		
1) Land Revenue Rs. -																		
2) Interest on S.T. Loans Rs. 130																		
Rs. 130 B																		
1) Land Revenue Rs.																		
2) Interest on S.T. Loans Rs. 225																		
3) Repairs and Maintenance Rs. 1,000																		
Rs. 1,225 E																		

**Other expenses**

Net income : A - B = Rs. 2,080 - Rs. 130 = Rs. 1,950 C.

Net income : D - E = Rs. 5,480 - Rs. 1,225 = Rs. 4,255 F

Incremental income : F - C = Rs. 4,255 - Rs. 1,950 = Rs. 2,305.



## ANNEXURE - III

### I. Jaggery unit

Economics of a jaggery unit is prepared on the basis of following information :

#### (i) Output

It was observed that the farmers, establishing the unit, purchased cane from neighbouring farmers to produce gur. The daily average production of gur was 4 quintals. Conversion of sugarcane juice into gur varied from 10 per cent in October - November to about 14 per cent in April - May. Thus, the average conversion rate is taken at 12 per cent. The survey year price of gur was Rs. 175 per quintal.

#### (ii) Usage

On the basis of information collected from farmers having jaggery units, it was estimated that unit was functional for about 200 days. The average daily use was 12 hours. Thus, jaggery unit was utilised for about 2,400 hours per season out of which diesel engine and electric motor were used for 1400 hours and 1000 hours, respectively.

#### (iii) Price of inputs

##### (a) Sugarcane

Price of cane varied from Rs. 9 per quintal in October - November to Rs. 15 per quintal in April - May. Thus, the average price of cane was assumed at Rs. 12 per quintal.

##### (b) Labour

The practice in the scheme area was to employ labour on production basis, i.e., Rs. 15 per quintal of gur produced.



(c) **Chemicals**

Rs. 10 per quintal of gur produced.

(d) **Fuel**

Sugarcane waste and dry leaves were used as fuel. On an average, the expenditure on this item was Rs. 10 per day.

(e) **Diesel engine**

Diesel consumption was 2 litres per hour & the price of diesel was Rs. 3.50 per litre. 5 litres of mobil oil @ Rs. 12 per litre was replaced after 80 hours of use. The repair & maintenance cost of diesel engine was Rs. 600.

(f) **Electric motor**

The flat rate tariff charged by the U.P. State Electricity Board was Rs. 15/hp/month. Plus Rs. 10 per month as other charges. Generally the farmers were using 7.5 hp electric motor, the total expenditure for this item worked out to Rs. 1,470. Maintenance cost was Rs. 200.

(g) **Hauli**

Hauli was to be constructed every season and the average expenditure was Rs. 1,500.

(h) **Maintenance cost of unit**

Average maintenance cost was Rs. 400.

**Economics**

(i) Production of gur - 800 quintals

(ii) Value of gur - Rs. 1,40,000

**Cost of operation (Rs.)**

i)	Diesel	9,800
ii)	Mobil oil	1,050
iii)	Sugarcane (6,670 quintals)	80,040
iv)	Labour	12,000
v)	Chemicals	8,000
vi)	Fuel	8,000
vii)	Electricity charges	1,470
viii)	Maintenance	
	a) diesel engine	600
	b) electric motor	200
	c) jaggery unit	400
ix)	Hauli	1,500
x)	Hire charges for jaggery unit	4,000
	<b>Total :</b>	<b>1,27,060</b>

**Net income :** 12,940

On this basis net income from each jaggery unit was estimated taking into account of utilisation of jaggery unit, share of electric motor in total hours of operation, hp of electric motor, etc.

**2 Wheat thresher unit :**

The economics of wheat thresher unit is as follows :

- (i) Threshing charges - Rs. 9 per quintal.
- (ii) Quantity threshed in an hour - 3 quintals.
- (iii) Average utilisation of thresher unit - 160 hours.
- (iv) Average running cost
  - (a) for diesel engine - Rs. 7.75 per hour
  - (b) electric motor - flat rate tariff
- (v) Labour charges - Rs. 2.50 per hour

On this basis net income per hour worked out to Rs. 16.75 in the case of diesel engine and Rs. 24.50 in the case of electric motor. Net income from thresher unit has been estimated in each case depending on the number of hours of use of engine/motor, Proportionate cost of operation for electric motor, hp of diesel engine (affecting operation cost), etc.

**STATEMENT 1**

Frequency distribution of sample beneficiaries according  
to the relationship between actual investment cost and investment credit  
(No. of sample beneficiaries)

Sr. No.	Percentage of investment credit to actual investment cost	Diesel Tubewell			Electric Tubewell			Total
		Small Farmers	Other Farmers	All	Small Farmers	Other Farmers	All	
1	2	3	4	5	6	7	8	9
1.	Under 50	2	1	3	8	6	14	17
2.	50 to under 75	6	3	9	6	10	16	25
3.	75 to under 90	4	8	12	2	6	8	20
	Subtotal - (A)	12	12	24	16	22	38	62
4.	90 to under 100	5	1	6	1	3	4	10
5.	100 to under 125	5	5	10	-	-	-	10
6.	125 to under 150	2	1	3	-	-	-	3
7.	150 to under 175	1	1	2	-	-	-	2
	Subtotal - (B)	13	8	21	1	3	4	25
	<b>Grand total (A+B)</b>	<b>25</b>	<b>20</b>	<b>45</b>	<b>17</b>	<b>25</b>	<b>42</b>	<b>87</b>
A.	Beneficiaries getting loan for pumphouse	10	10	20	8	15	23	43
B.	Beneficiaries constructing pumphouse	1	-	1	17	25	42	43

**STATEMENT 2**

Instalmentwise time-lag in the sanction of  
loan and disbursement of loan amount

Type of investment/ Time-lag	(No. of sample beneficiaries)							
	Between date of application and sanction		Between date of sanction and disbursement of first instalment		Between disbursement of first instalment and second instalment		Between disbursement of second and third instalment	
	SF	OF	SF	OF	SF	OF	SF	OF
1	2	3	4	5	6	7	8	9
<b>A. Diesel Tubewell</b>								
1. Less than 15 days	19	17	16	10	12	16	-	1
2. 15 to 30 days	2	2	6	4	2	2	1	-
3. 30 to 60 days	3	1	1	5	1	-	1	-
4. 60 to 90 days	1	-	1	1	1	1	-	-
5. More than 90 days	-	-	1	-	1	-	-	1
<b>Total</b>	<b>25</b>	<b>20</b>	<b>25</b>	<b>20</b>	<b>17</b>	<b>19</b>	<b>2</b>	<b>2</b>
<b>B. Electric Tubewell</b>								
1. Less than 15 days	10	13	3	8	3	6	-	7
2. 15 to 30 days	5	5	7	10	4	3	3	2
3. 30 to 60 days	1	3	5	4	3	6	2	2
4. 60 to 90 days	1	2	1	1	7	3	-	1
5. More than 90 days	-	2	1	2	-	7	3	3
<b>Total</b>	<b>17</b>	<b>25</b>	<b>17</b>	<b>25</b>	<b>17</b>	<b>25</b>	<b>8</b>	<b>15</b>

### STATEMENT 3

Frequency distribution of sample beneficiaries  
according to the size of cultivated holding

Sr. No.	Size of cultivated holding	(No. of sample beneficiaries)			
		Diesel Tubewell		Electric Tubewell	
		Small Farmers	Other Farmers	Small Farmers	Other Farmers
1	2	3	4	5	6
1.	Below 3 acres	-	-	1	-
2.	3 acres to below 4 acres	8	-	4	-
3.	4 acres to below 5 acres	5	-	6	-
4.	5 acres to below 6 acres	8	-	2	-
5.	6 acres to below 7 acres	4	-	4	-
6.	7 acres to below 8 acres	-	3	-	4
7.	8 acres to below 9 acres	-	10	-	6
8.	9 acres to below 11 acres	-	3	-	9
9.	15 acres to below 20 acres	-	2	-	3
10.	20 acres to below 25 acres	-	2	-	3
	<b>Total</b>	<b>25</b>	<b>20</b>	<b>17</b>	<b>25</b>

### STATEMENT 4

Average size of cultivated holding of sample beneficiaries

Category of beneficiaries	No. of sample beneficiaries	Post-investment benefited area (Acres)	Average size of cultivated holding (Acres)			
			Pre-investment position*			
			Rainfed	Canal irrigated	DTW**	Total
1	2	3	4	5	6	7
<b>Small Farmers</b>						
DTW	25	4.96	0.94	4.02	-	4.96
ETW	17	4.62	1.30	2.38	0.94	4.62
<b>Other Farmers</b>						
DTW	20	8.70	1.25	7.45	-	8.70
ETW	25	9.32	1.32	7.72	0.28	9.32
<b>All Farmers</b>						
DTW	45	6.62	1.08	5.54	-	6.62
ETW	42	7.42	1.31	5.56	0.55	7.42
<b>All sample beneficiaries</b>	<b>87</b>	<b>7.00</b>	<b>1.19</b>	<b>5.55</b>	<b>0.26</b>	<b>7.00</b>

\* Represents pre-investment position of the corresponding benefiting area only and does not include the non-benefiting area.

\*\* Only in case of ETW beneficiaries.

**STATEMENT 5**  
**Itemwise historical cost of investment - Diesel Tubewell**

Sr. Item No.	Anticipated		Actual		
	Specifications	Cost (Rs.)	Specifications	Cost (Rs.)	
1	2	3	4	5	6
1. Boring	150' X 4"	2,127 (19)	68' x 4" (range from 30' to 130')	1,726 (23)	
2. Engine	7.8 hp	4,088 (38)	8 hp (range from 5 to 10 hp)	3,573 (48)	
3. Accessories	-	662 (6)	-	1,070 (14)	
4. Pumphouse, foundation & other masonry work	-	4,000 (37)	-	1,083 (15)	
<b>Total</b>		<b>10,877</b>		<b>7,452</b>	

Note : Figures in brackets indicate percentages to total.

**STATEMENT 6**  
**Itemwise historical cost of investment - Electric Tubewells**

Sr. Item No.	Anticipated		Actual		
	Specifications	Cost (Rs.)	Specifications	Cost (Rs.)	
1	2	3	4	5	6
1. Boring	130' X 4"	1,685 (22)	95' x 4" (range from 40' to 225')	2,185 (19)	
2. Electric motor	5 hp	1,471 (19)	5 hp (range from 5 to 10 hp)	2,737 (24)	
3. Pumphouse, foundation & other machinery	-	3,000 (38)	-	4,021 (36)	
4. Accessories	-	1,379 (18)	-	1,427 (13)	
5. Fitting charges	-	250 (3)	-	245 (2)	
6. Deposit paid to State Electricity Board	-	-	-	668 (6)	
<b>Total</b>		<b>7,785</b>		<b>11,283</b>	

Note : Figures in brackets indicate percentages to total.

### STATEMENT 7

Frequency distribution of sample beneficiaries  
according to hp of diesel engine/electric motor

Sr. No.	hp of engine/ motor	(No. of sample beneficiaries)			
		Diesel Tubewell		Electric Tubewell	
1	2	Small Farmers	Other Farmers	Small Farmers	Other Farmers
		3	4	5	6
1.	3 hp	-	-	-	-
2.	5 hp	-	2	9	9
3.	6.5 hp	6	2	-	-
4.	7.5 hp	-	-	5	10
5.	8 hp	17	14	1	2
6.	10 hp	2	2	2	4
	<b>Total</b>	<b>25</b>	<b>20</b>	<b>17</b>	<b>25</b>

### STATEMENT 8

Utilisation of tubewells

Particulars	(Hours per tubewell)	
	Diesel Tubewell	Electric Tubewell
1	2	3
<b>1. Small Farmers</b>		
i) Own farm	535 (76)	462 (54)
ii) Sale of water	152 (22)	194 (23)
iii) Other work	14 (2)	196 (23)
<b>Total</b>	<b>701 (100)</b>	<b>852 (100)</b>
<b>2. Other Farmers</b>		
i) Own farm	789 (89)	870 (75)
ii) Sale of water	68 (8)	106 (9)
iii) Other work	30 (3)	181 (16)
<b>Total</b>	<b>887 (100)</b>	<b>1,157 (100)</b>
<b>3. All Farmers</b>		
i) Own farm	648 (83)	705 (68)
ii) Sale of water	115 (15)	142 (14)
iii) Other work	21 (2)	187 (18)
<b>Total</b>	<b>784 (100)</b>	<b>1,034 (100)</b>

Note : Figures in brackets relate to percentages to total.

**STATEMENT 9**  
**Operation and maintenance cost (per tubewell)**

		(Amount in rupees)			
Sr. No.	Particulars	Diesel Tubewell		Electric Tubewell	
		Small Farmer	Other Farmer	Small Farmer	Other Farmer
1	2	3	4	5	6
1.	Electricity charges	-	-	1,269 (89)	1,413 (87)
2.	Diesel oil	2,546 (80)	3,365 (79)	-	-
3.	Mobil oil & other lubricants	347 (11)	459 (11)	-	-
4.	Expenses on repairs, etc.	287 (9)	411 (10)	159 (11)	202 (13)
5.	Total operation and maintenance cost	3,180 (100)	4,235 (100)	1,428 (100)	1,615 (100)
6.	No. of hours of operation	701	887	852	1,157
7.	O & M cost per hour	4.54	4.77	1.68	1.40

DTW - O & M cost per hour is higher than ETW - O & M cost by 170% for small farmers and 241% for other farmers.

**Note :** 1. Figures in brackets indicate percentage to total cost.

2. Price of diesel was Rs. 3.20 per litre

3. Expenditure inclusive of cost incurred on sale of water.

**STATEMENT 10**  
**Cropping pattern - Small Farmers (1981-82)**

		(Area in acres)								
Sr. No.	Crop	Diesel Tubewell			Electric Tubewell					
		Post-invest-ment	Pre-invest-ment	Canal	Total	Post-invest-ment	Pre-invest-ment	Canal	DTW	Total
1	2	3	4	5	6	7	8	9	10	11
1.	Paddy	1.16	-	1.00	1.00	1.12	-	0.60	0.24	0.84
2.	Maize	0.68	0.17	1.00	1.17	0.41	0.23	0.54	0.20	0.97
3.	Jowar/Bajra	-	0.20	0.20	0.40	0.36	0.27	0.17	-	0.44
4.	Wheat	1.89	0.59	2.64	3.23	2.00	0.82	1.57	0.44	2.83
5.	Gram	-	0.49	0.19	0.68	-	0.68	0.11	-	0.79
6.	Potato	0.07	-	-	-	-	-	-	-	-
7.	Vegetables	0.28	-	-	-	0.35	-	-	0.10	0.10
8.	Sugarcane	3.00	-	1.19	1.19	2.60	-	0.70	0.50	1.20
	Net cropped area	4.96	0.94	4.02	4.96	4.62	1.30	2.38	0.94	4.62
	Gross cropped area (with weight of 3 for sugarcane)	13.08	1.45	8.60	10.05	12.04	2.00	5.09	2.48	9.57
	Cropping intensity (%)	264	154	214	203	261	154	214	264	207

**STATEMENT 11**  
**Cropping pattern - Other Farmers (1981-82)**

		Diesel Tubewell				Electric Tubewell				
Sr. No.	Crop	Post-investment	Pre-investment		Post-investment	Pre-investment				
			Rainfed	Canal		Total	Rainfed	Canal	DTW	Total
1	2	3	4	5	6	7	8	9	10	11
1.	Paddy	2.00	-	0.30	0.30	2.21	-	0.31	0.06	0.37
2.	Maize	1.42	0.64	2.08	2.72	1.08	0.67	2.15	0.04	2.86
3.	Jowar/Bajra	-	0.08	0.38	0.32	0.08	0.08	0.40	-	0.48
4.	Wheat	3.00	0.75	2.75	3.50	3.00	0.80	2.85	0.10	3.75
5.	Gram	-	0.38	0.49	0.87	-	0.40	0.51	-	0.91
6.	Potato	0.45	-	-	-	0.31	-	-	-	-
7.	Vegetables	0.23	-	-	-	0.23	-	-	-	-
8.	Sugarcane	5.25	-	4.16	4.16	5.96	-	4.31	0.18	4.49
	Net cropped area	8.70	1.25	7.45	8.70	9.32	1.32	7.72	0.28	9.32
	Gross cropped area (with weight of 3 for sugarcane)	22.85	1.85	18.48	20.33	24.79	1.95	19.15	0.74	21.84
	Cropping intensity (%)	263	148	248	234	267	148	248	263	234

**STATEMENT 12**  
**Yield of important crops**

		(Quintals per acre)							
Sr. No.	Crop	Small Farmers				Other Farmers			
		Rainfed	Canal	DTW	ETW	Rainfed	Canal	DTW	ETW
1	2	3	4	5	6	7	8	9	10
1.	Maize	8.00	10.40	11.50	11.40	9.24	9.30	11.90	11.50
2.	Wheat	7.52	8.67	12.00	11.80	7.25	8.40	11.90	11.60
3.	Paddy	-	10.10	12.40	12.20	-	9.60	12.20	12.00
4.	Jowar/Bajra	5.14	6.00	-	6.00	8.00	7.50	-	6.00
5.	Sugarcane	-	181.00	238.00	231.00	-	176.00	234.00	227.00
6.	Gram	3.66	4.50	-	4.00	3.30	3.40	4.50	-
7.	Moong/Urad	-	-	4.00	3.50	-	-	4.00	3.70
8.	Potato	-	-	70.00	-	-	-	73.00	74.00



## STATEMENT 13

## Gross yield and receipts-DTW (1981-82)

Category of beneficiaries/ Crop	Price per quintal (Rs.)	Pre-investment situation							Post-investment situation						
		Yield per acre (quintals)		Area (acres)		Gross yield (quintals)		Gross receipts (Rs.)	Yield per acre (quintals)	Area (acres)	Gross yield (quintals)	Gross receipts (Rs.)			
		Rainfed	Canal	Rainfed	Canal	Rainfed	Canal						Total		
1	2	3	4	5	6	7	8	9	10	11	12	13	14		
<b>DTW-Small Farmers</b>															
Paddy	110.00	-	10.10	-	1.00	-	10.10	10.10	1,111.00	12.40	1.16	14.38	1,581.80		
Maize	116.00	8.00	10.40	0.17	1.00	1.36	10.40	11.76	1,364.16	11.50	0.68	7.82	907.12		
Jowar/Bajra	116.00	5.14	6.00	0.20	0.20	1.03	1.20	2.23	258.68	--	-	-	-		
Wheat	142.00	7.52	8.67	0.59	2.64	4.44	22.89	27.33	3,880.86	12.00	1.89	22.68	3,220.56		
Gram	230.00	3.66	4.50	0.49	0.19	1.79	0.86	2.65	609.50	--	-	-	-		
Potato	50.00	-	-	-	-	-	-	-	-	70.00	0.07	4.90	245.00		
Vegetables	100.00	-	-	-	-	-	-	-	-	-	0.28	8.40	840.00		
Sugarcane	21.50	-	181.00	-	1.19	-	215.39	215.39	4,630.89	238.00	3.00	714.00	15,351.00		
<b>Total</b>									<b>11,855.09</b>				<b>22,145.48</b>		
<b>DTW-Other Farmers</b>															
Paddy	110.00	-	9.60	-	0.30	-	2.88	2.88	316.80	12.20	2.00	24.40	2,684.00		
Maize	116.00	9.24	9.30	0.64	2.08	5.91	19.34	25.25	2,929.00	11.90	1.42	16.90	1,960.40		
Jowar/Bajra	116.00	8.00	7.50	0.08	0.38	0.64	2.85	3.49	404.84	-	-	-	-		
Wheat	142.00	7.25	8.40	0.75	2.75	5.44	23.10	28.54	4,052.68	11.90	3.00	35.70	5,069.40		
Gram	230.00	3.30	3.40	0.38	0.49	1.25	1.67	2.92	-	-	-	-	-		
Potato	50.00	-	-	-	-	-	-	-	-	73.00	0.45	32.85	1,642.50		
Vegetables	100.00	-	-	-	-	-	-	-	-	-	0.23	6.9	690.00		
Sugarcane	21.50	-	176.00	-	4.16	-	732.16	732.16	15,741.44	234.00	5.25	1,228.50	26,412.75		
<b>Total</b>									<b>24,116.36</b>				<b>38,459.05</b>		

**STATEMENT 14**  
**Gross yield and receipts-ETW (1981-82)**

Category of beneficiaries/ Crop	Price Per quintal (Rs.)	Pre-investment situation								Post-investment Situation						
		Yield per acre (quintals)				Area (acres)				Gross yield (quintals)	Gross receipts (Rs.)	Yield per acre (quintals)	Area (acres)	Gross yield (quintals)	Gross Receipts (Rs.)	
		Rainfed	Canal	DTW	Total	Rainfed	Canal	DTW	Total							
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
<b>ETW-Small Farmers</b>																
Paddy	110.00	-	10.10	12.40	-	0.60	0.24	-	6.06	2.98	9.04	994.40	12.20	1.12	13.66	1,502.60
Maize	116.00	8.00	10.40	11.50	0.23	0.54	0.20	1.84	5.62	2.30	9.76	1,132.16	11.40	0.41	4.67	541.72
Jowar/Bajra	116.00	5.14	6.00	-	0.27	0.17	-	1.39	1.02	-	2.41	279.56	6.00	0.36	2.16	250.56
Wheat	142.00	7.52	8.67	12.00	0.82	1.57	0.44	6.17	13.61	5.28	25.06	3,558.52	11.80	2.00	23.60	3,351.20
Gram	230.00	3.66	4.50	-	0.68	0.11	-	2.49	0.50	-	2.99	687.70	4.00	-	-	-
Potato	50.00	-	-	70.00	-	-	-	-	-	-	-	-	-	-	-	-
Vegetables	100.00	-	-	-	-	-	0.10	-	-	-	-	300.00	-	0.35	-	1,050.00
Sugarcane	21.50	-	181.00	238.00	-	0.70	0.50	-	126.70	119.00	245.70	5,282.55	231.00	2.60	600.60	12,912.90
<b>Total</b>												<b>12,234.89</b>				<b>19,608.98</b>
<b>ETW-Other Farmers</b>																
Paddy	110.00	-	9.60	12.20	-	0.31	0.06	-	2.98	0.73	3.71	408.10	12.00	2.21	26.52	2,917.20
Maize	116.00	9.24	9.30	11.90	0.67	2.15	0.04	6.19	20.00	0.48	26.67	3,093.72	11.50	1.08	12.42	1,440.72
Jowar/Bajra	116.00	8.00	7.50	-	0.08	0.40	-	-	0.64	3.00	3.64	422.24	6.00	0.08	0.48	55.68
Wheat	142.00	7.25	8.40	11.90	0.80	2.85	0.10	5.80	23.94	1.19	30.93	4,392.06	11.60	3.00	34.80	4,941.60
Gram	230.00	3.30	3.40	4.50	0.40	0.51	-	1.32	1.73	-	3.05	701.50	-	-	-	-
Potato	50.00	-	-	73.00	-	-	-	-	-	-	-	-	74.00	0.31	22.94	1,147.00
Vegetables	100.00	-	-	-	-	-	-	-	-	-	-	-	-	0.23	6.9	690.00
Sugarcane	21.50	-	176.00	234.00	-	4.31	0.18	-	758.56	42.12	800.68	17,214.62	227.00	5.96	1,352.92	29,087.78
<b>Total</b>												<b>26,232.24</b>				<b>40,279.98</b>

## STATEMENT 15

## Itemwise cost of cultivation - (1981-82) (Per net cropped acre)

(Amount in rupees)

Sr. No.	Item	Small Farmers				Other Farmers			
		Rainfed	Canal	DTW	ETW	Rainfed	Canal	DTW	ETW
1	2	3	4	5	6	7	8	9	10
1.	Seeds	67 (9)	253 (15)	436 (14)	372 (14)	74 (8)	325 (17)	341 (13)	383 (16)
2.	Manure	102 (14)	145 (9)	170 (6)	178 (7)	139 (16)	182 (10)	182 (6)	183 (7)
3.	Fertilizers	78 (10)	313 (19)	575 (19)	605 (22)	120 (13)	361 (19)	545 (19)	543 (22)
4.	Pesticides	2 (-)	9 (0.5)	38 (1)	44 (2)	5 (1)	17 (1)	33 (1)	41 (2)
5.	Irrigation	- (-)	99 (6)	495 (16)	174 (7)	- (-)	97 (5)	432 (15)	126 (5)
6.	Labour cost	235 (31)	377 (22)	648 (21)	586 (22)	263 (30)	455 (24)	636 (22)	642 (26)
	(a) Hired	407	713	1,133	1,149	433	827	1,048	1,059
	(b) Total	221 (29)	256 (15)	291 (9)	316 (12)	214 (24)	205 (11)	235 (8)	204 (8)
7.	Bullock labour	23 (3)	27 (1.5)	24 (1)	26 (1)	26 (3)	25 (1)	25 (1)	25 (1)
8.	Land revenue	32 (4)	47 (3)	93 (3)	86 (3)	37 (4)	42 (2)	79 (3)	75 (3)
9.	Interest on S.T. loan	- (-)	152 (9)	294 (10)	255 (10)	12 (1)	198 (10)	338 (12)	247 (10)
10.	Maintenance of tractor (hired)	760 (100)	1,678 (100)	3,064 (100)	2,642 (100)	889 (100)	1,907 (100)	2,846 (100)	2,469 (100)
11.	Total cost of cultivation	932	2,014	3,549	3,205	1,060	2,279	3,258	2,886
	(a) With hired labour								
	(b) With total labour								

Figures in brackets represent percentages to total cost of cultivation with hired labour only.

STATEMENT 16

Gross farm income, net farm income, incremental income (1981-82)

(Amount in rupees)

Category of beneficiaries	Pre-investment situation				Post-investment situation				Additional gross value of output per beneficiary	Net incremental income							
	Average benefiting area (Acres)	Gross value of farm produce	Cost of cultivation	Net farm income	Gross value of farm produce	Cost of cultivation	Net farm income	Per beneficiary		With hired labour	Including family labour	Per acre					
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
DTW-SF	4.96	11,875	7,460	8,972	4,395	2,883	22,145	15,197	17,603	6,948	4,542	10,290	2,075	2,553	1,659	515	335
DTW-OF	8.70	24,116	15,318	18,304	8,798	5,812	38,459	24,760	28,345	13,699	10,114	14,343	1,649	4,901	4,302	563	494
ETW-SF	4.62	12,235	7,862	9,341	4,373	2,894	19,609	12,206	14,807	7,403	4,802	7,374	1,596	3,030	1,908	656	413
ETW-OF	9.32	26,232	16,692	19,905	9,540	6,327	40,280	23,011	26,898	17,269	13,382	14,048	1,507	7,729	7,055	829	757
DTW-All	6.62	17,304	10,952	13,120	6,352	4,184	29,396	19,447	22,377	9,949	7,019	12,092	1,827	3,597	2,835	543	428
ETW-All	7.42	20,567	13,118	15,629	7,449	4,938	31,913	18,638	22,004	13,275	9,909	11,346	1,529	5,826	4,971	785	670
All sample beneficiaries	7.00	18,879	11,998	14,331	6,881	4,548	30,611	19,056	22,197	11,555	8,414	11,732	1,676	4,673	3,866	668	552

**STATEMENT 17**  
**Cash flows - 1981-82**

(Amount in rupees)

I (a) DTW - SF (with valuation of hired labour)	Years		
	1	2-14	15
Cost of investment	15,000	-	-
Incremental income	2,761	3,272	3,272
Residual value	-	-	4,125
Net cashflow	(12,239)	3,272	7,397

FRR = 26%

I (b) DTW - SF (with valuation of total labour)	Years		
	1	2-14	15
Cost of investment	15,000	-	-
Incremental income	2,046	2,378	2,378
Residual value	-	-	4,125
Net cashflow	(12,954)	2,378	6,503

FRR = 17%

**STATEMENT 18**  
**Cashflows - 1981-82**

(Amount in rupees)

II (a) DTW - OF (with valuation of hired labour)	Years		
	1	2-14	15
Cost of investment	15,000	-	-
Incremental income	4,280	5,260	5,260
Residual value	-	-	4,125
Net cash flow	(10,720)	5,260	9,385

FRR = 49%

II (b) DTW - OF (with valuation of total labour)	Years		
	1	2-14	15
Cost of investment	15,000	-	-
Incremental income	3,800	4,661	4,661
Residual value	-	-	4,125
Net cash flow	(11,200)	4,661	8,786

FRR = 42%

**STATEMENT 19**  
**Cash flows - 1981-82**

(Amount in rupees)

III (a) ETW - SF (with valuation of hired labour)	Years		
	1	2-14	15
Cost of investment	15,000	-	-
Incremental income	6,946	8,335	8,335
Residual value	-	-	4,625
Net cash flow	(8,054)	8,335	12,960
FRR = > 50%			
III (b) ETW - SF (with valuation of total labour)	Years		
	1	2-14	15
Cost of investment	15,000	-	-
Incremental income	6,049	7,213	7,213
Residual value	-	-	4,625
Net cash flow	(8,951)	7,213	11,838
FRR = > 50%			

**STATEMENT 20**  
**Cash flows - 1981-82**

(Amount in rupees)

IV (a) ETW - OF (with valuation of hired labour)	Years		
	1	2-14	15
Cost of investment	15,000	-	-
Incremental income	9,086	11,025	11,025
Residual value	-	-	4,625
Net cash flow	(5,914)	11,025	15,650
FRR = > 50%			
IV (b) ETW - OF (with valuation of total labour)	Years		
	1	2-14	15
Cost of investment	15,000	-	-
Incremental income	8,547	10,351	10,351
Residual value	-	-	4,625
Net cash flow	(6,453)	10,351	14,976
FRR = > 50%			

**STATEMENT 21**  
**Cash flows - 1981-82**

(Amount in rupees)

<b>V (a) DTW - All beneficiaries</b> (with valuation of hired labour)	Years		
	1	2-14	15
Cost of investment	15,000	-	-
Incremental income	3,432	4,154	4,154
Residual value	-	-	4,125
Net cash flow	(11,568)	4,154	8,279
FRR =	50%		

<b>V (b) DTW - All beneficiaries</b> (with valuation of total labour)	Years		
	1	2-14	15
Cost of investment	15,000	-	-
Incremental income	2,822	3,389	3,389
Residual value	-	-	4,125
Net cash flow	(12,178)	3,389	7,514
FRR =	50%		

**STATEMENT 22**  
**Cash flows - 1981-82**

(Amount in rupees)

<b>VII (a) ETW - All beneficiaries</b> (with valuation of hired labour)	Years		
	1	2-14	15
Cost of investment	15,000	-	-
Incremental income	8,229	9,945	9,945
Residual value	-	-	4,625
Net cash flow	(6,771)	9,945	14,570
FRR =	> 50%		

<b>VII (b) ETW - All beneficiaries</b> (with valuation of total labour)	Years		
	1	2-14	15
Cost of investment	15,000	-	-
Incremental income	7,545	9,090	9,090
Residual value	-	-	4,625
Net cash flow	(7,455)	9,090	13,715
FRR =	> 50%		

**STATEMENT 23**  
**Cash flows - 1981-82**

(Amount in rupees)

**VII (a) (DTW + ETW) - All sample beneficiaries**  
**(with valuation of hired labour)**

	Years		
	1	2-14	15
Cost of investment	15,000	-	-
Incremental income	5,755	6,948	6,948
Residual value	-	-	4,366
Net cash flow	(9,245)	6,948	11,314

FRR =  $> 50\%$

**VII (b) (DTW + ETW) - All sample beneficiaries**  
**(with valuation of total labour)**

	Years		
	1	2-14	15
Cost of investment	15,000	-	-
Incremental income	5,109	6,148	6,148
Residual value	-	-	4,366
Net cash flow	(9,891)	6,148	10,514

FRR =  $> 50\%$



## STATEMENT 24

## Average labour use per beneficiary

(Mandays)

Category of beneficiaries	Average benefit- ing area (acres)	No. of benefi- ciaries	Pre-investment situation		Post-investment situation		Additional labour use				
			Hired	Family	Total	Hired	Family	Total			
1	2	3	4	5	6	7	8	9	10	11	12
DTW - SF	4.96	25	225	205	430	397	298	695	172 (34.7)	93 (18.7)	265 (53.4)
DTW - OF	8.70	20	445	360	805	722	365	1087	277 (31.8)	5 (0.6)	282 (32.4)
ETW - SF	4.62	17	227	197	424	333	315	648	106 (23.0)	118 (25.5)	224 (48.5)
ETW - OF	9.32	25	485	386	871	671	522	1193	186 (20.0)	136 (14.6)	322 (34.6)
DTW - All	6.62	45	323	274	597	541	327	868	218 (32.9)	53 (8.0)	271 (40.9)
ETW - All	7.42	42	381	310	691	534	438	972	153 (20.6)	128 (17.3)	281 (37.9)
All sample beneficiaries	7.00	87	351	291	642	537	381	918	186 (26.5)	90 (12.9)	276 (39.4)

Figures in brackets represent incremental labour use per acre.

Note : Labour use in Mandays in case of SF and OF per NCA were :

	SF		OF	
	Hired	Total	Hired	Total
Rainfed	25	51	28	54
Canal	50	95	55	99
DTW	80	140	83	125
ETW	72	140	72	128

**STATEMENT 25**  
**Repayment performance - (As on 30.6.1982)**

Sr. No.	Particulars	DTW		ETW	
		Small Farmers	Other Farmers	Small Farmers	Other Farmers
1	2	3	4	5	6
(A)	1. No. of instalments due	86	82	69	112
	2. No. of instalments paid	79	77	66	109
	3. No. of instalments in default	7	5	3	3
(B)	Number of beneficiaries with				
	1. Account closed	2	1	1	-
	2. Nil overdue	20	14	13	23
	3. Overdue under - Rs. 2000	1	5	3	1
	Rs. 2000 to Rs. 4000	1	-	-	1
	Rs. 4000 to Rs. 6000	1	-	-	-
	<b>Total :</b>	<b>25</b>	<b>20</b>	<b>17</b>	<b>25</b>
(C)	Percentage of overdues to demand as on 30.6.1981				
	1. Demand (Rs.)	56,462	27,000	19,950	34,794
	2. Recovery (Rs.)	50,054	27,000	19,950	34,794
	3. Overdues (Rs.)	6,417	-	-	-
	Percentage of overdues to demand as on 30-6-1981	11%	NIL	NIL	NIL
	Percentage of overdues to demand as on 30-6-1982	17%	16%	8%	6%

STATEMENT 24

Average labour use per beneficiary

(Mandays)

Category of beneficiaries	Average benefit-ing area (acres)	No. of benefi-ciaries	Pre-investment situation		Post-investment situation		Additional labour use				
			Hired	Family	Total	Hired	Family	Total	Hired	Family	Total
I	2	3	4	5	6	7	8	9	10	11	12
NTW - SF	4.96	25	225	205	430	397	298	695	172	93	265

**List of reports published under the Evaluation Study Series  
of the National Bank for Agriculture and Rural Development**

Series No.	Title of Evaluation Report	Year of Publication
1.	Minor Irrigation Scheme—Construction of New Wells and Installation of Pumpsets thereon in Sholapur District [Maharashtra]	1977
2.	Minor Irrigation Scheme - Installation of Shallow Tubewells in Karnal District [Haryana]	1977
3.	Bhadra Land Development Project - Scheme for Reclamation and Development of Land [Karnataka]	1977
4.	Land Development under Nagarjuna Sagar Project, Miryalguda Taluka [Andhra Pradesh]	1977
6*.	Dairy Development Scheme in Jagadhri Block of Ambala District [Haryana]	1978
7.	Dairy Development Scheme in Moga Area of Faridkot District [Punjab]	1978
8.	Poultry Development Scheme in Mulkanoor, Karimnagar District [Andhra Pradesh]	1979
9.	Mechanised Fishing Boats in South Kanara District [Karnataka]	1979
10.	Development of Acid Lime Gardens in Nellore District [Andhra Pradesh]	1981
11.	Groundwater Irrigation in Kota District [Rajasthan]	1982
12.	Minor Irrigation in Bhojpur District [Bihar]	1982
13.	Development of Grape Cultivation in Bijapur District [Karnataka]	1982
14.	River Lift Irrigation Schemes in Pune District [Maharashtra]	1982
15.	Dairy Development Schemes in Western Uttar Pradesh	1982
16.	River Lift Irrigation Scheme in Kolhapur District [Maharashtra]	1982
17.	Sheep Rearing in Nalgonda District of Andhra Pradesh	1982
18.	Development of Coffee Plantations in Lower Palnis Area, Madurai District [Tamil Nadu]	1983

\* One report [Series No. 5] was not published.

**List of reports published under the Evaluation Study Series  
of the National Bank for Agriculture and Rural Development - (contd.)**

<b>Series No.</b>	<b>Title of Evaluation Report</b>	<b>Year of Publication</b>
19.	Public Tubewells and River Lifts in Orissa	1984
20.	Power Tillers in Hooghly District [ West Bengal]	1985
21.	Commercial Poultry in Krishna District [Andhra Pradesh]	1986
22.	Dugwell Irrigation in Palghat District [Kerala]	1986
23.	Tractors in North Bihar	1986
24.	Dairy Development in Darjeeling District [ West Bengal]	1987
25.	Tractor Schemes in Varanasi, Ghazipur, and Jaunpur Districts of Eastern Uttar Pradesh	1987
26.	Tractors and Power Tillers in Tamil Nadu	1987

