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**LINING OF COMMON WATER COURSES  
(AN EVALUATION)**



**ECONOMIC ADVISER TO GOVERNMENT, PUNJAB  
CHANDIGARH**



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## PREFACE

The Punjab State Tubewell Corporation (PSTC) was incorporated during 1975 under the Companies Act with the object of exploiting under ground water resources for irrigation purposes and allied works by availing financial assistance from the financial institutions. Lining of vast net work of water courses in Punjab was taken up by the PSTC during 1975-76 and upto March, 1978, it had lined 3134 kms. of water courses. This work gained momentum when the World Bank Assistance was extended to this programme in April, 1979. About 13500 water courses in the State were planned to be lined by the PSTC.

2. It was envisaged to line water courses to the tune of 15200 Kms. in the districts of Sangrur, Faridkot, Bathinda, Firozpur and parts of Amritsar district with an out-lay of Rs. 117.95 crores (revised to Rs. 162.90 crores) in a period of five years beginning from the year 1979-80, but upto March, 1984, the PSTC could line 11810 kms. of length, leaving a shortfall of 3390 kms. due to financial constraints and inadequate supply of cement. With the completion of lining process of water courses measuring 15,200 kms in length, it was anticipated that additional irrigation potential to the tune of 1,21,600 hectares would be created resulting in an increase of 520.00 thousand tonnes in farm output.

3. The present survey was conducted to study the impact of lining of common water courses with special reference to irrigation intensity, change in cropping pattern and generation of additional irrigation potential and implementation of the scheme including financing, recovery and maintenance aspects. In all 144 beneficiaries (shareholders) were selected whose lands were falling in the Culturable Command Areas (CCAs) of 24 selected water courses of 8 selected distributories. Of the 144 selected beneficiaries, 45.14 per cent reported 'increase' in the supply of water after lining, while 29.17 per cent and 25.69 reported 'decrease' and no change, respectively. Increase in the irrigated area of 144 selected beneficiaries after lining was 7.85 per cent over the pre-lining period while it was 7.88 per cent as per records of the PSTC pertaining to 24 selected water courses. During the course of field study, the evaluation team noted with concern that the lined water courses were not functioning efficiently due to frequent breaches caused by Sub-Standard material used in their construction. The PSTC was under obligation to under take repairs and upkeep the lined water courses during the course of loan recovery period, but it failed to comply with the obligation. Recovery of cost of lining prior to 1979-80 was 33.69 per cent. It declined sharply to 11.87 per cent during 1979-80 and 0.05 per cent during 1983-84. The recovery during 1984-85 and 1985-86 was absolutely nil. The State Govt. being guarantor for the repayment of principal and interest, had to pay back the entire loan amount including interest to NABARD. In this way the PSTC goes on raising institutional finance for the guarantor Govt. since 1984-85.

4. The scheme of 'Lining of Common Water Courses' can yield the anticipated results if prescribed proportions of sand and cement

are used at the construction stage and due curing is done. The institutional responsibility for the maintenance and repair of lined water courses must be identified immediately otherwise assets created worth crores of rupees will vanish in much shorter time than the estimated life. The lining divisions should be closed and the remaining work may be entrusted to the Irrigation Department to lessen financial burden on Govt. exchequer due to non-recovery of cost of lining from the beneficiaries since 1984-85.

5. This evaluation report has been prepared by the Evaluation Unit of the Economic and Statistical Organisation, Punjab. Acknowledgement is made of the useful work done in the preparation of this report by Sarvshri Amolak Singh, Deputy Economic and Statistical Adviser (since Retired) Ajit Singh Sandhu, Research Officer (Now Deputy Economic and Statistical Adviser), Bagicha Singh, Sher Singh and Bhupinder Singh Technical Assistants under the guidance of Sh. K. S. Aulakh, Joint Director (Now Director Capital Formation).

Dated: 18-11-1989  
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## SUMMARY OF FINDINGS AND RECOMMENDATIONS

### (A) Summary of Findings

On the suggestion of the State Evaluation Committee, survey on "Lining of Common Water Courses" was undertaken to study the impact of lining on irrigation intensity, change in cropping pattern including financing, recovery and maintenance of these water courses. Of the selected 8 distributories, 24 water courses, serving the selected 144 beneficiaries were taken for sample study.

#### 1. Targets and Achievements

It was envisaged to construct a total length of 15,200 kms. in the districts of Sangrur, Faridkot, Bathinda, Firozpur and parts of Amritsar, under Phase-I of Punjab Composite Irrigation Project (PCIP), while achievement to this effect was 15,192 Kms., with an outlay of Rs. 117.95 crores revised to Rs. 162.90 crores.

#### 2. Financing

It was laid down in the scheme that 20 percent of the total cost of the project would be provided by the State Government and the remaining 80 per cent would be financed by the participating commercial banks. By the end of March, 1986, about 24 per cent of the total funds raised for lining the water courses, was provided by the State Govt. and the remaining 76 per cent by the banks. Proportionate contribution by the State Govt. was more in the beginning (1979-80) and went downwards thereafter.

#### 3. Cost of Lining

Average cost of lining per Kms. in respect of all the water courses lined by the PSTC up to March 1986, was Rs. 89 thousand (Rs. 27.21 per feet) while cost per feet in respect of 24 selected water courses worked out to Rs. 28.88. Cost per feet varied from Rs. 7.64 to Rs. 48.30. The difference in cost has been attributed mainly to the time gap.

#### 4. Recovery of Cost of Lining

The PSTC borrows funds from the financial institutions on behalf of the farmers. The Revenue Department did not pursue the process of recovery vigorously, resulting into steep fall in the process of recovery. The recovery which was 33.69 Per cent before 1979-80 steeply came down to 0.05 percent during 1983-84. The recovery during 1984-85 and 1985-86 was absolutely nil. It seems that sincere efforts were not made either by the PSTC or by the Revenue Department to pursue the process of recovery.

#### 5. Repairs and Maintenance of Lined Water Courses

Before lining, the 'Katcha' water courses were repaired and

maintained by respective shareholders collectively. After lining, the water courses were not being repaired and maintained either by the shareholders or by the PSTC, though, it was laid down that the PSTC would repair and maintain the said courses during the currency of loan period i.e. seven years. Assets worth crores of rupees were created/constructed by the PSTC without caring for their repairs and maintenance. Shareholders were found unable to repair the lined water courses on the plea that the same was a costly affair, which involved skilled labour etc. The PSTC pleaded for not taking into hand the repairs and maintenance of lined water courses because there were no funds for this purpose.

## 6. Extent of Lining

It was laid down that the PSTC would line about 70 per cent of the original length of each water course and leave about 1000 feet unlined at the tail-end. Taking into account the length lined of all the 24 selected water courses, overall average lined length of the original length of the water courses was 82.23 per cent. It was as low as 48.80 per cent in case of a water course in Arakwas distributory, while cent-per-cent in case of one water course in Kotkapura, and two water courses each in case of Muktsar-Rupana and Rupana (U) distributories.

## 7. Area Irrigated Before and After Lining

(i) It was envisaged that lining would generate additional irrigation potential to the tune of 25 to 30 per cent. Taking into account the area irrigated by 24 selected water courses, the overall increase in the irrigated area was about 8 per cent. In some selected water courses of Bhawanigarh, Kotkapura and Muktsar-Rupana distributories, the irrigated area was reduced to the extent of 80.74 per cent 41.83 per cent and 32.89 percent respectively, while potential in case of a water course of Arkwas, Ghuman, Muktsar-Rupana and Sangrur distributories, increased by 56.71 per cent, 52.23 per cent, 74.44 per cent and 37.86 per cent respectively.

(ii) It was reported that after lining, the discharge of some of the water courses, has reduced, as a result of which the shareholders were compelled to instal tubewells in areas where the underground water was suitable for irrigation purposes, to supplement canal irrigation.

## 8. Intensity of Irrigation of Selected Beneficiaries by Location of Their Land in CCA.

Tail-end beneficiaries were benefited to the tune of 15.78 per cent after lining, over the pre-lining period while middle portion beneficiaries were benefited to the extent of 10.61 per cent and that of head portion to 2.99 per cent. Over all increase in irrigated area of all the selected beneficiaries worked out to 7.85 per cent.



## 9. Change in Cropping Pattern

Increase in area under Paddy crop in Kharif season was 126.57 per cent after lining and increase in area under Wheat crop in Rabi season was 15.50 per cent. Area under Maize, Sugarcane, Cotton and other kharif crops in kharif season decreased and area under Gram and Oilseeds etc, also decreased in Rabi season. Area under current fallows in kharif season decreased to the tune of 50.42 per cent and in Rabi season to the extent of 44.47 percent. Area under watery crops like paddy was on the increase, not due to lining alone but there was a trend towards sowing high yielding and cash crops and ensured irrigation was an important factor for this.

## 10. Participation of Cultivators

In accordance with the procedure, the shareholders were served notices by the PSTC. Out of 144 beneficiaries, 82 per cent were taken into confidence before the lining of common water courses was started and out of them, about one half had signed the requisite agreement with the PSTC.

## 11. Quality of Construction Work

It was found that though a Committee of shareholders was formed to supervise the construction work, but proper quality material and its proper proportions were not strictly adhered to, resulting into frequent breaches in the water courses. The percentage of beneficiaries who were satisfied with the masonry work and quality of material used for lining was sixty. The remaining 40 per cent were not satisfied.

## 12. Some Draw-backs in Lining

The shareholders who happened to possess land on both sides of the water courses, faced difficulties in crossing over to the other side after lining for want of permanent crossings over the lined water courses. In the absence of such crossings, the water courses often breached. It was also found that some water courses were over flowing due to defective or faulty levelling. In some cases brick-lining of water courses was resorted to without caring about the water table of the area, condition of the soil, effect of 'seim' etc. The nitrates and other soil salts affect the life of bricks considerably.

## 13. Space Provided for Water Course

At the time of survey, it was observed that about four feet space was available where the water courses were lined, though at the time of consolidation of holdings, 11 feet space was provided for the purpose. With the lesser space available for the water course, frequent breaches occurred due to less earthen support to its walls. Some shareholders were found to have planted trees along the water courses which had made encroachments into the walls and bases of water courses which in turn resulted into frequent breaches and also shortened the life of the water courses.

#### 14. Relationship of Investment in Lining with the increase in Production

The PSTC did not try to relate the investment in lining with the increase in production. It went on making investment in lining without caring for the laid norms i. e. to establish relationship of lining with the increase in production, hence, it was found difficult at the time of survey to relate investment figures supplied by the PSTC for lining on each water course with the increase in production in any of the water courses.

#### 15. Water Logging Vis-a-vis Lining of Water Courses

The PSTC did not undertake any survey before taking the lining work in hand. Although, the CCA of certain water courses were water logged, still the PSTC continued the brick lining, as a result of which 'sem' damaged the walls and beds of the lined water courses in a big way.

#### (B) Summary of Recommendations

##### 1. Access to Each Holding

Permanent crossings were required to be constructed over each and every water course to permit access of bullock-carts and tractor-trolleys to each holding. The PSTC did not observe this norm especially in those cases where the holdings of the cultivators were situated on both sides of the lined water courses. The PSTC should provide permanent crossings to individual holdings, if the land owners agree to bear the cost of pipes which is approximately Rs. 300/- against the total cost of Rs. 2,000/- for the construction of such passage.

##### 2. Space for Water Course

At the time of consolidation of holdings, 11 feet space was provided for each water course, but it was observed that share-holders made encroachments on the land provided for the water course. Hardly 4 feet space was left for the water course. It is suggested that encroachments made on this land on either side of the water course by the shareholders should be got vacated. It is further suggested that growing of plants and trees along the lined water courses should be banned to avoid encroachments in the walls and bases of the water courses by the roots of trees and plants. However, some shrubs can be planted on the embankments of water courses to discourage encroachments.

##### 3. Use of Proper Material

The PSTC official visit the site at the time of construction and certify the quality of material used and ensure the maintenance of requisite proportions of material used for different processes of construction and would do prescribed curing. In actual practice the PSTC officials did not observe the said norm which inturn resulted in frequent breaches in the water courses. It is suggested that testing of material to be used to construct the water course be entrusted to some independent agency and the PSTC should ensure about the proper proportion of material being used and due curing being done.

#### 4. Criteria of Investment in Lining

It was laid down that the PSTC would relate investment in lining to increase in production, but the said norm was not adhered to at any stage. It is suggested that the PSTC should conduct studies after two years of its lining, in order to see the increase in production with the investment in lining.

#### 5. Recovery of Cost of Lining

The recovery of cost of lining was far from satisfactory. The Revenue Department was under obligation to make recoveries from the respective shareholders on the basis of demand lists supplied by the PSTC. The Revenue authorities were expected to recover the cost of lining and the recovered amount was to be passed on to the PSTC for repayment of loan by the later to the banks. There has been no recovery from 1984-85 onward. It is suggested that the aspect of remission of recovery of cost of lining may be examined at the level of Secretary, Irrigation and Power to sort out the repercussions of recovery not being affected and future policy in this regard should also be laid down accordingly.

#### 6. Lining of Water Courses by the PSTC Vis-a-vis Institutional Finance

The PSTC was involved in the water-course lining programme with the main objective to get finance from the institutional agencies on behalf of the farmers. Since this system of financing has got a set-back due to non-recovery of the cost of lining from the cultivators and the entire cost of lining is to be borne by the Govt., it is, therefore, suggested that all the Lining Divisions of the PSTC should be closed forth-with and lining of the remaining water courses should be entrusted to the Irrigation Department. It has already been doing lining job in respect of the distributories and the Irrigation Department has the requisite expertise and experience in the line.

#### 7. Repairs and Maintenance

The water courses lined by the PSTC were not repaired and maintained by any agency, hence the condition of these water courses was pitiable. Once a breach occurred in a water course, none tried to repair the same. With this situation, the lined water courses were worse than the 'Katcha' water courses. Though the PSTC was under obligation to undertake repairs and upkeep the lined water courses during the currency of loan recovery period, but it failed to comply with the laid norms in this regard. It is suggested that no new work pertaining to fresh lining should be undertaken until all the lined water courses are properly repaired and put in working order. This work should be entrusted to the Irrigation Department by making special provisions for the purpose.

#### 8. Water logging Vis-a-vis Lining of Water Courses

For the development of water logged areas and to lower the water table, where lining has been done, it is suggested that the area regarding construction of new flood protection embankments and improvement of drainage system should be taken on priority basis so that damage to crops may be prevented in the future.



## CHAPTER I

### 1.1. Introduction

The canal water is carried through two types of water courses. Firstly, through Government water channels known as distributories and the other through common water-courses to carry water from distributories to cultivators' fields. These common water courses are owned by the shareholder-cultivators. In Punjab there are about 48,000 Kms. length of common water courses through which canal water is delivered to the respective shareholders for irrigation purposes. All these water courses were kacha before lining, having kinks in their alignment. It was estimated that about 30 per cent of the precious canal water was being lost through seepage. In case, these water courses were properly aligned and their sections made pucca, the losses could be reduced and irrigation facilities could be extended to new areas. The problem was acute in Bathinda, Ferozpur, Faridkot and Sangrur districts of the State. To tackle this problem expeditiously, Government of Punjab decided to distribute the work of lining of water courses amongst two agencies, i. e. Conservator of Soils, Punjab and Punjab State Tubewell Corporation (PSTC). The PSTC was to take up the lining of water courses in Ferozpur, Faridkot and Sangrur districts.

The Punjab State Tubewell Corporation was incorporated during 1970, under the companies Act with the object of exploiting underground water resources for irrigation purposes and allied works by availing financial assistance from the financial institutions. During the year 1975-76, the PSTC was entrusted with the programme of lining of water courses throughout the State and upto March, 1978 it lined 3134 Kms. of water courses. This work gained momentum when the World Bank assistance was extended to this programme in April, 1979 about 13,500 water courses in the State were planned to be lined by the PSTC. The project launched in the shape of Punjab Composite Irrigation Project (PCIP), consists of three schemes which are as given below.

- (a) Lining of water channels owned by Government;
- (b) Lining of water courses owned by cultivators; and
- (c) Pilot demonstration schemes and studies.

The works under the scheme mentioned at (b) are solely executed by the PSTC since the launching of PCIP, Phase-I from April, 1979.

### 1.2. Targets and Achievements

It was envisaged to line water courses to the extent of 15,200 Kms. in the districts of Sangrur, Faridkot, Bathinda, Ferozpur and parts of Amritsar district, with an outlay of Rs. 117.95 crores (revised to Rs. 162.90 crores) in a period of five years beginning from the year 1979-80. The total length of water courses lined upto March, 1984 was to the order of 11,810 Kms. leaving a short-fall of 3,390 Kms., which was carried over to the year 1984-85. This happened due to the constraints like in-

adequate supply of cement and paucity of funds. The progress achieved upto the end of November, 1984 was to the tune of 3,382 Kms., making a total length as 15,192 Kms. against 15,200 Kms. as envisaged in the Phase-I Project. This was done under the revised implementation schedule which fixed March, 1985 as the target month for the completion of lining of water courses under PCIP Composite Phase-I.

With the completion of Phase-I programme of lining of water courses, it was envisaged that additional irrigation potential of 1,21,600 hectares would get created, which when added to irrigation potential of 25,072 hectares, created due to the completion of 3,134 Kms. length of lining prior to the World Bank period would account for a total irrigation potential of 1,46,672 hectares. It was expected to bring an increase in the agricultural production to the tune of 520.00 thousand tonnes.

### 1.3. Genesis of the Scheme

#### (i) Execution of lining of water courses

The scheme is being implemented and executed by the PSTC. The supervision, maintenance and operation of water courses under this scheme, is carried-out by the PSTC by employing suitable staff. The execution of the work of lining of water courses is done on contract basis. Tenders are invited from registered contractors and the lowest tenderer is allotted the work for execution. Before the execution of work, the PSTC issues notices to the shareholders for lining the water courses. Divisional Engineer, visits the village and ensures that concerned beneficiaries are heard in person and their objections if any are looked into and removed. Divisional Engineer also takes an undertaking from them in writing that the lining would be done at their expenses. Beneficiaries are explained all other aspects of the scheme.

Apart from the above aspects discussed for the execution of the project of lining of water courses it has been laid-down to observe the following two points :—

Firstly, for each water course, a Committee of beneficiaries (the membership of which is not to be less than five) is constituted. The major task of this Committee is to supervise the construction work of lining of water course and ensure that lining is done according to prescribed plan. Standard and genuine material is being used.

Secondly, the PSTC appoints a Mortar Mate, who is a full-time paid employee of the Corporation. The Mortar Mate is employed with the consent of the supervisory Committee and is from the same village. He looks after the construction work and is incharge of the cement store. He keeps its accounts and ensures that right proportions of the material is used.

The lining of water courses is done with bricks, cement and common sand. All the materials like cement and bricks are arranged by the PSTC. Cement is procured from the Controller of Cement, Govt. of India at the controlled price. Bricks are directly purchased from the local brick-kilns at the rates fixed by the Deputy Commissioner. Carriage of cement from godown of the PSTC to site and carriage of bricks from brick-kiln to site is paid by the contractor. Supply of sand is also arranged by the contractor.

**(ii) Organisation**

Overall responsibility for project implementation would rest with the Secretary for Irrigation and Power, Punjab. Administration and technical staff of the PSTC would be responsible for executing the work of lining of water courses in the State. The Corporation is headed by a Managing Director assisted by two General Managers in the rank of Chief Engineer. One of the General Managers heads the lining of common water courses Section and the other of Deep Tubewell Section.

General Manager (Lining) with head quarters at Chandigarh is assisted by supporting staff both at headquarters and in the field.

**(iii) Financing**

The PSTC borrows funds from the financial institutions on behalf of the farmers. The participating commercial banks would provide about 80 per cent of the project cost with refinance by NABARD. The remaining 20 per cent cost would be borne by the State Govt. as its share of the total cost of the project. The loan to be provided by the bank to the PSTC under the scheme is guaranteed by the State Government fully and unconditionally for repayment of principal and interest thereon.

**(iv) Co-ordination**

For co-ordination purposes, the PSTC has appointed a Project Officer to exercise supervision and to coordinate the work of the various Circles/ Divisions of the PSTC and maintain necessary liaison with the concerned departments/officials of the State Government, financing banks and NABARD to ensure successful implementation of the scheme according to the phasing drawn up.

**(v) Criteria for Lining**

- (a) Incremental production from the water saved by reducing seepage from the channel must justify investment in lining.
- (b) No farmer in a water course command area should have to convey water for a distance in excess of 1000 ft. from the end of lined water course.
- (c) The limit of 1000 ft. could be extended in case physical obstacles such as depressions or sand dunes make maintenance of an unlined water course difficult.
- (d) The cost of lining should always be within the repayment capacity of the farmers.
- (e) After a water course has been lined, "Warabandi" would be revised to compensate for the faster transmission of water in the lined channels.

**(vi) Designs and Material used for Lining**

- (a) The lining is to be done in brick masonry with cement-sand

mortar (1:5) over laid by cement plaster (1:3) cement sand-mortar. The side walls and bed of the sections are to be constructed with 4½" and 3" thick masonry, respectively. Lined sections for different capacities will be as such :—

- (i) Upto 2 cusecs 3"
- (ii) 2-4 cusecs 6"
- (iii) Above 4 cusecs 9"

The cement, bricks and other materials would be arranged by the PSTC and cost of carriage of material and sand is to be borne by the contractor.

(b) Curing of Cement plaster will be done for three weeks after construction with moist bags.

(c) The back-fill behind the lined section would vary from 1" to 9".

#### (vii) *Recovery of Loans*

On completion of each water course, the PSTC sends a demand list to the Revenue Department and the cost of improvement is to be directly recovered from the farmers. The loan along with interest is to be recovered by the Revenue Department of the Punjab Government in 12 half yearly equated instalments related to the marketing seasons of Kharif and Rabi crops from the second year as Arrears of Land Revenue from the cultivators coming under the Culturable Command Area (CCA) of the water course. In the first year, interest alone is to be recovered. The amount collected by the Revenue Department is to be passed on by it to the PSTC for repayment of loans.

#### (viii) *Maintenance of Water Courses*

The PSTC will ensure that lined water courses are maintained satisfactorily after completion of lining work at least till the loan is fully repaid by the beneficiaries and the cost of maintenance is to be recovered from the beneficiaries during the currency of the project loan i. e. 7 years.

### 1.4. **Need for Evaluation Study**

The PSTC is conducting concurrent evaluation studies of the lining of common water courses at its own level. A full-fledged branch headed by a Superintending Engineer (S.E.) (Monitoring, Evaluation and Planning) is doing these studies regularly and apprising the World Bank and the Govt. from time to time. Need for present evaluation study by an independent agency was felt by the State Evaluation Committee. The State Evaluation Committee selected his subject for evaluation in its meeting held on 3rd April, 1986.

### 1.5. **Objectives of Evaluation Study**

The main objectives of the scheme were to study :—

- (i) The impact of lining of common water courses, with special



- reference to irrigation intensity, change in cropping pattern and irrigation potential generated and its utilisation, and
- (ii) implementation of the scheme including the financing, recovery and maintenance aspect.

### 1.6. Sample Design & Coverage

Multi-stage random sampling technique was followed to select the sample. At the first stage, out of 34 distributories (water courses of which were lined upto 30th June, 1984), 8 were selected, taking 2 from each of the lining circles of the PSTC (Ludhiana, Sangrur, Ferozepur and Bathinda). At the second stage, three water courses were selected from each selected distributory one from the start of distributory, second from the middle and the third from the end. The details are given in Annexure 1.1. In this way, 24 common water courses were selected. From each selected water course, six-beneficiaries were selected taking two from the head portion of the selected water course, two from the middle portion, and two from the tail-end portion, thus making a total of 144 beneficiaries (24x6). From the start and middle of each water course, one beneficiary having maximum and other having minimum area in CCA were selected and from the tailend, one was from lined portion and other from unlined portion. The details are given in Annexure 1. 2. The distributory-wise number of selected water courses and villages surveyed are given in Annexure 1. 3.

### 1.7. Reference Period

The survey was carried out in the field during September to November, 1986. The reference period for the purpose of evaluation of this study was 1985-86. To see the impact of lining, data were also collected for the year just before the lining of the selected water courses.

### 1.8. Instruments of Investigation

In all, four schedules were canvassed for the purpose of present study. Schedule-A was filled from the selected beneficiary share-holders having land in the CCA of the selected water courses to study the impact of lining on irrigation intensity, change in cropping pattern, problems of maintenance etc. Schedule-B was canvassed for each selected water course from the Divisional Offices of the PSTC which lined the selected water courses. Schedule-C was canvassed from Sarpanch/Panch/Lambardar of the village served by the selected water course to record their opinion about lining in general and problem of maintenance of water course after lining in particular. Schedule-D was Canvassed from the Divisional Offices of the PSTC which lined the water courses during the last five years.

### 1.9. Plan of the Report

General introduction including genesis of the scheme and other particulars are given in Chapter-I. Chapter-II deals with lining of common water courses in the State. Impact of lining has been given in Chapter-III. In Chapter-IV, opinion of share holder beneficiaries, village knowledgeable persons like sarpanch and implementing agency (PSTC) have been discussed to sort out problems of maintenance, recovery and other related matters. In Chapter-V, case study of a few selected water courses falling in the water-logged areas of Faridkot and Bathinda districts, has been discussed to see the impact of lining of common water courses with water-logging.

## CHAPTER II

### Lining of Common Water Courses in the State

#### 2.1. Progress of Lining Works

Modernisation of common water courses was envisaged during the early seventies but the programme caught tampo with the World Bank participation in April, 1979. At first stage, field channels falling in the districts of Bathinda, Faridkot, Firozpur and Sangrur were required to be lined. Under Phase-I of Punjab Composite Irrigation Project, a length of 15,200 Kms. was targetted to be lined with a total cost of Rs. 117.95 crores (revised to Rs. 162.90 crores) in a period of five years beginning from the year 1979-80. But the target of constructing the required water courses could not be achieved upto March, 1984 due to budgetary constraints and inadequate supply of cement. Hence, the time schedule was extended and revised to March, 1985. The details of physical and financial targets and achievements from 1979-80 to 1985-86 are given in table 2.1.

**Table 2.1.**

**Physical and Financial Targets and Achievements of Lining**

Year	Physical (Kms)			Financial Expenditure (Rs. in lakhs)		
	Target	Actual	Percentage of actual to target	Target	Actual	Percentage of actual to target
1	2	3	4	5	6	7
1979-80	2,480	1,761	71.01	1,625.00	1,227.03	75.51
1980-81	3,180	2,056	64.65	2,290.00	1,495.76	65.32
1981-82	3,180	2,006	63.08	2,450.00	1,581.18	64.54
1982-83	3,180	2,480	77.99	2,625.00	2,223.22	84.69
1983-84	3,180	3,506	110.25	2,805.00	3,494.20	124.57
1984-85	4,667	4,773	102.27	5,395.20	4,888.65	90.61
1985-86	2,800	2,402	85.79	3,165.00	3,214.64	101.57

Source :—Financial Adviser, PSTC.

Taking the physical targets and achievements into consideration, achievements during 1983-84 and 1984-85 were more than the targets. During 1980-81 and 1981-82, the achievements were comparatively much lower and were to the tune of 64.65 per cent and 63.08 per cent respectively of the given targets. The percentage of actual expenditure to target for lining varied from 124.57 per cent in 1983-84 to 64.54 per cent in 1981-82. Financial achievements in 1980-81 and 1981-82 were quite in consonance with physical achievements. But in 1984-85 the financial achievements lagged behind the physical achievements.

## 2.2. Length of Lined Water Courses and Cost of Lining

It has been attempted to collect data in respect of length of lined water courses and expenditure incurred to construct these courses. Information has been collected for the pre-World Bank period in which lining was done upto 1979-80 and year-wise onwards. Year-wise information is given in table 2.2.

**Table 2.2.**

### Length Lined and Expenditure Incurred

Year	Length Lined (in Kms.)	Expenditure incurred (Rs. in lakhs)	Actual Expenditure Per K.M. (Rs. in Lakhs)
1	2	3	4
Pre 1979-80	.. 3,133.96	1,689.38	0.54
1979-80	.. 1,761.17	1,227.03	0.70
1980-81	.. 2,056.39	1,495.76	0.73
1981-82	.. 2,006.37	1,581.18	0.79
1982-83	.. 2,479.94	2,223.22	0.90
1983-84	.. 3,506.44	3,494.20	1.00
1984-85	.. 4,772.52	4,888.65	1.02
1985-86	.. 2,401.51	3,214.64	1.34
<b>Total</b>	.. <b>22,118.30</b>	<b>19,814.06</b>	<b>0.89</b>

Source :—Financial Adviser, PSTC.

Length lined and expenditure incurred in respect of water courses has followed a rising trend from 1979-80 to 1984-85. Average expenditure incurred per Km. upto March, 1986 works out to Rs. 0.89 lakh. Expenditure per Km. followed a rising trend and rose from Rs. 0.54 lakh per Km. to Rs. 1.34 lakh per Km. in 1985-86. It can be explained with the simple reason that cost of material and labour has been continuously rising with the rise in price index.

### 2.3. Financing for Lining of Water Courses

It was laid down in the scheme of lining of water courses that the PSTC would borrow funds from financial institutions on behalf of the farmers. The banks would provide about 80 per cent and the State Government about 20 per cent of the project cost. Total finances raised by the PSTC from banks and seed money provided by the State Govt. is given in table 2.3.

Table 2.3

Seed Money provided by Government and Institutional Finance raised alongwith interest paid.

(Rs. in Lakhs)

Year	Seed Money	Institutional Finance Raised from		Total (2+4)	Interest paid
		ARDC/ NABARD	Other Banks		
1	2	3	4	5	6
Pre 1979-80 ..	473.50 (28.04)	—	1,214.91 (71.96)	1,688.41 (100.00)	94.63
1979-80 ..	577.00 (46.17)	—	672.86 (53.83)	1,249.86 (100.00)	135.25
1980-81 ..	432.00 (27.47)	—	1,272.78 (72.53)	1,754.78 (100.00)	91.75
1981-82 ..	605.00 (36.95)	—	1,032.53 (63.05)	1,637.53 (100.00)	122.42
1982-83 ..	645.00 (26.52)	—	1,786.73 (73.48)	2,431.73 (100.00)	489.81

(contd.)

Table. 23 (concl'd).

Seed Money provided by Government and Institutional Finance raised alongwith interest paid.

(Rs. in Lakhs)

1	2	3	4	5	6
1983-84	580.00 (17.24)	—	2,784.31 (82.76)	3,364.31 (100.00)	743.90
1984-85	900.00 (18.40)	—	3,990.11 (81.60)	4,890.11 (100.00)	748.22
1985-86	600.00 (19.99)	—	2,400.76 (80.01)	3,000.76 (100.00)	939.32
Total	4,862.50 (24.29)	—	15,154.97 (75.71)	20,017.49 (100.00)	3,365.30

Figures in brackets indicate percentages.

Source :—Financial Adviser, PSTC.

Upto March, 1986, out of Rs. 20,017.49 lakhs, 24.29 per cent was provided by the State Govt. and 75.71 per cent by the banks. ARDC/ NABARD did not finance directly but provided refinance facility to the participating commercial banks. Maximum contribution (46.17 per cent) was provided by the State Govt. during 1979-80 when the World Bank participated in the programme and it was minimum (17.24 per cent) during 1983-84. It was observed that no hard and fast rule was observed in maintaining the ratio of 20 per cent to 80 per cent. It can be said that in the beginning when the World Bank started participating in the programme, proportionate contribution by the State Government was more than the stipulated contribution (20 per cent) and afterwards, it went below 20 per cent from 1983-84. It was clarified by the Corporation that the variation in the ratio of seed money to the institutional finance raised was due to the availment of institutional finance from banks. There is over-lapping due to the withdrawal of loans pertaining to previous years during the subsequent years.

#### 2.4. Recovery of Cost of Lining

It was laid down that cost of lining alongwith the interest will be recovered from the farmers by the Revenue Department of the Punjab Govt. in 12 half yearly equated instalments from the second year. The PSTC would prepare a demand list showing cost to be recovered from each beneficiary and send these to the Revenue Department in Kharif and Rabi crop seasons for recovery as Arrears of Land Revenue from the cultivators coming under CCA. The amount due, recovered and out standing from 1979-80 to 1985-86 is given in table 2.4.

TABLE 2.4

Recovery of cost of lining from shareholders (Rs. in Lakhs)

Years ending 31st March	Amount			Percentage of amount recovered to total amount due
	Due	Recovered	Outstanding	
1	2	3	4	5
Pre 1979—80	159.63	53.78	105.85	33.69
1979—80	179.58	21.32	158.26	11.87
1980—81	418.40	9.10	409.30	2.17
1981—82	595.22	1.97	593.25	0.33
1982—83	792.98	0.90	792.08	0.11
1983—84	1,090.66	0.51	1,090.15	0.05
1984—85	1,492.88	—	1,492.88	—
1985—86	2,175.26	—	2,175.26	—
Total	6,904.61	87.58	6,817.03	1.27

Source :—Financial Adviser, PSTO.

Upto March, 1986, only 1.27 per cent of the total outstanding amount of Rs. 6,904.61 lakhs had been recovered. Prior to 1979—80 the recovery was to the extent of 33.69 per cent of the outstanding amount and after 1979—80, the recovery declined sharply from 11.87 per cent in 1979—80 to 0.05 per cent in 1983—84. The recovery during 1984—85 and 1985—86 was absolutely nil. It seems that sincere efforts had not been made in pursuing the recovery of Loans neither by the PSTC nor by the Revenue Department after the participation of World Bank in 1979—80.

### 2.5. Selected Water Courses and Length Lined

From 8 selected distributories, 24 water courses of different discharge-ranges were selected for the purpose of this evaluation survey. According to laid procedure, the PSTC would line upto 70 per cent of the original length of each water course and leave about 1000 ft. unlined at the tailend. But in case where sand dunes

or other obstacles occur in an unlined water course, the said condition would not hold good. In such a case, the entire length of the water course could be lined. Details in respect of selected water courses regarding their original length, length lined and length left unlined are given in table 2.5.

Table 2.5

Distribution of Selected Water Courses by original Length and Length Lined (Feet)

Sr. No.	Distry.	R.D. No.	Original length of W.C.	Length Lined	Remained Unlined	Percentage of lined portion to original length
1	2	3	4	5	6	7
1.	Arakwas ..	17050-TF	26080	12726	13354	48.80
		53688-R	9120	4493	4627	49.27
		10498-TF	42020	38048	3972	90.55
2.	Bhawani-garh ..	19080-TL	8080	5545	2535	68.63
		1872-R	10000	7347	2653	73.47
		93126-R	10020	7973	2047	79.57
3.	Ghuman ..	63500-TR	50470	37550	12920	74.40
		89691-L	64680	41590	23090	64.30
		20545-R	17000	11500	5500	67.65
4.	Kot-Kanara ..	40868-R	18062	10168	7894	56.29
		21167-R	54050	54050	—	100.00
5.	Lal Bai ..	13531-R	14060	9880	4180	70.27
		14828-R (A)	37190	31910	5280	85.80
		9236-R	41585	32345	9240	77.78
		9069-L	29026	24196	4830	83.36



Table 2.5 (concl'd.)

Distribution of Selected Water Courses by original Length and Length Lined (Feet)

Sr. No.	Distry.	R.D. No.	Original length of W.C.	Length lined	Remained Unlined	Percentage of lined portion to original length
1	2	3	4	5	6	7
6.	Muktsar	.. 4559-TL	31400	31100	300	99.04
	Rupana	.. 67836-TL	34210	34210	—	100.00
		21500-L	4700	4700	—	100.00
7.	Rupana (U)	.. 180-R	23330	23330	—	100.00
		19280-R	27390	19410	7980	70.86
		33976-R	7540	7540	—	100.00
		56980-L	67630	67630	—	100.00
8.	Sangrur	.. 91904-L	11575	8900	2675	76.89
		28500-R	10530	8121	2409	77.12
	Total	..	649748	534262	115486	82.23

Source :—Divisional Offices of PSTC.

Lining in case of R. D. No. 17050-TF and 53688-R of Arakwas distry, was done upto 48.80 per cent and 49.27 per cent respectively of the original length which is much less than the fixed norm of 70 per cent. On the other hand, lining in case of R. D. No. 21167-R of Kot Kapura distributory, R. D. No. 67836-TL and R.D. No. 21500-L of Muktsar-Rupana distry, and R.D. No. 180-R, R.D. No. 33976-R and R.D. No. 56980-L of Rupana (U) distributory was 100 per cent in each case. The over-all average of lined length of all the 24 selected water courses was 82.23 per cent which was much higher than the fixed ratio (i.e. 70% of the original length)

## 2.6. Area irrigated before and after lining

Figures relating to irrigated area by each selected water course immediately before lining and after lining in 1985-86 was supplied by the Divisional offices of the PSTC which had constructed the said water courses. It was envisaged that after lining about 25-30 per cent of water would be added to the irrigation potential which was going waste due to seepage in unlined water courses. The details of area irrigated for all (24) the selected water courses before and after lining is given in table 2.6.

Table 2.6

Area Irrigated by Selected Water Courses before and after lining

Sr. No.	Distry.	R.D. No.	Area Irrigated (Acres)		
			Before lining	After lining (1985—86)	Percentage increase (+) or decrease (—)
1	2	3	4	5	6
1.	Arakwas ..	17050-TF	716	697	-2.65
		53688-R	396	433	9.34
		10498-TF	968	1517	56.71
2.	Bhawanigarh ..	19080-TL	135	26	-80.74
		1872-R	450	528	17.33
		93126-R	291	290	-0.34
3.	Ghiman ..	63500-TR	1408	1509	7.17
		89691-L	1787	1907	6.72
		20545-R	404	615	52.23
4.	Kot Kapura	40868-R	949	552	-41.83
		21167-R	1730	1854	7.17
5.	Lal Bai ..	13531-R	546	555	1.65
		14828-R (A)	2134	2224	4.22
		9236-R	1943	1946	0.15
		9069-L	1122	1163	3.65
6.	Muktisar-Ripana ..	4559-TL	1064	1856	74.44
		67836-TL	894	600	-32.89
		21500-L	335	340	1.49
7.	Rupana (U) ..	180-R	803	860	7.10

Table 2.6 (concl'd.)

Area Irrigated by Selected Water Courses before and after lining

Sr. No.	Distry.	R.D. No.	Area Irrigated (Acres)		
			Before lining	After lining (1985-86)	Percentage increase(+) or decrease(-)
1	2	3	4	5	6
		19280-R	1183	1245	5.24
		33976-R	1021	1075	5.29
		56900-L	1607	1766	9.89
S.	Sangrur	91904-L	447	450	0.67
		28500-R	280	386	37.86
<b>Total</b>		..	<b>22613</b>	<b>24394</b>	<b>7.88</b>

Source :—Divisional Offices of PSTC.

Taking all the selected water courses (24) into consideration, average increase in irrigated area over the pre-lining irrigated area worked out to 7.88 per cent as against the anticipated increase of 25 to 30 per cent. In R. D. No. 17050-TF of Arakwas distributory, area irrigated after lining decreased by 2.65 per cent. The decrease was abnormal (80.74 per cent) in case of R. D. No. 19080-TL of Bhawanigarh distributory. In case of R. D. No. 40868-R of Kot Kapura distributory, R. D. No. 67836-TL of Muktsar-Rupana distributory and R. D. No. 93126-R of Bhawanigarh distributory, the reduction in irrigated area was 41.83 per cent, 32.86 per cent and 0.34 per cent respectively. The main reasons for the reduction in irrigated area after lining can be attributed to the defective lining, improper leveling, use of improper material and poor masonry work on one hand and lack of repair and maintenance of the lined water courses on the other.

In all other water courses, area under irrigation increased after lining though insignificantly in some cases. Increase was worth noting in case of R. D. No. 10498-TL of Arakwas distry, (56.71 per cent), R. D. No. 20545-R of Ghuman distry, (52.23 per cent), R. D. No. 4579-TL of Muktsar-Rupana distributory, (74.43 per cent) and R. D. No. 28500-R of Sangrur distry. (37.86 per cent).

### 2.7. Expenditure incurred per feet on Selected Water Courses

Details of selected water courses in respect of year of completion of lining, length lined and expenditure incurred on lining the water courses is given in table 2.7. In order to compare the cost of lining of selected water courses, expenditure per feet has been worked out by dividing total expenditure by length lined of each water course.

Table 2.7.

## Expenditure Per Feet on Different Selected Water Courses

Name of the Distributory	Selected R.D. No.	Year of completion	Length lined (feet)	Expenditure incurred (Rs. in lakhs)	Expenditure per feet (Rs.)
1	2	3	4	5	6
1. Arakwas ..	17050-TF	March, 82	12726	2.35	18.47
	53688-R	July, 81	4493	0.51	11.35
	10498-TF	April, 83	38648	9.08	23.86
2. Bhawanigarh..	19080-TL	May, 82	5545	0.75	13.53
	1872-R	Nov. 78	7347	1.18	16.06
	93126-R	June, 80	7973	0.75	9.41
3. Ghuman ..	63500-TR	June, 82	37550	8.79	23.41
	80601-L	July, 81	41590	9.57	23.01
	20545-R	July, 83	11500	2.41	20.96
4. Kot-Kapura	40868-R	Jan., 84	10168	2.23	21.93
	21167-R	Aug., 83	54050	20.44	37.82
5. Lal-Bai ..	13531-R	Dec. 83	9880	2.00	20.24
	14828-R (A)	June, 84	31910	11.30	35.69
	9236-R	June, 84	32345	9.86	30.48
	9069-L	June, 84	24196	5.58	23.06
6. Muktsar ..	4559-TL	Jan., 84	31100	15.02	48.30
	Rupana	Feb., 84	34210	11.91	34.81
	21500-L	Dec., 83	4700	0.96	20.43
7. Rupana (U)	180-R	March, 84	23330	5.63	24.13
	19280-R	June, 84	19410	6.59	33.95
	33976-R	June, 84	7540	1.71	22.68
	56980-L	Feb., 84	67690	24.08	35.61
8. Singrur ..	91904-L	Feb., 75	8900	0.68	7.64
	28500-R	May, 76	8121	0.82	10.10
Total			534262	154.29	28.88

Source :—Divisional Offices of PSTC.

Taking all the selected water courses into consideration, average expenditure per feet worked out to Rs. 28.88. Expenditure per feet was maximum Rs. (48.30) in case of R. D. No. 4559-TL of Muktsar-Rupana distry. and minimum (Rs. 7.64) in case of R. D. No 91904-L of Sangrur distry. It was observed that though R. D No. 53688-R of Arakwas distry. and R. D. No. 89691-TL of Ghuman distry. were constructed during 1981—82, but cost per feet in case of later was more than double than that of former. On the other hand, though R. D. No. 1872-R of Bhawanigarh distry. was constructed in 1978—79, but the cost per feet worked out to Rs. 16.06.

## CHAPTER III

### Impact of Lining of Common Water Courses

Impact of brick-lining of common water courses on beneficiary share-holders has been discussed in this chapter. Change in cropping pattern, additional irrigation potential generated and its utilisation, problem of maintenance of the lined water courses etc. have been discussed in detail. Conclusions are based on data furnished by 144 sample beneficiary-share-holders selected from 24 selected brick-lined common water courses, in the state.

#### 3.1. Distribution of Shareholder-Beneficiaries by Size of Operational Holding

Six beneficiary shareholders, (two each falling on the head portion, middle portion and tail-end portion) were selected from each selected Water course. All the 144 selected Shareholders have been distributed according to different sizes of their operational holdings in table 3. 1,

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Table

Distribution of shareholders by Size of Operational

Name of the selected Distributory	Size of	
	Upto 5	5—<7.50
1	2	3
Arakwas ..	1 (5.56)	1 (5.56)
Bhawanigarh ..	2 (11.11)	2 (11.11)
Ghuman ..	1 (5.55)	5 (27.78)
Kot-Kapura ..	2 (16.67)	1 (8.33)
Lal-bai ..	8 (33.33)	1 (4.17)
Mukatsar		
Rupana ..	2 (11.11)	1 (5.56)
Rupana (U) ..	4 (16.67)	4 (16.67)
Sangrur ..	6 (30.01)	1 (8.33)
<b>Total</b> ..	<b>26</b> <b>(18.05)</b>	<b>16</b> <b>(11.11)</b>

Figures in brackets indicate



## 3.1

Land Holdings during 1985-86

(Acres)

Land Holding				
7.50- <10	10-<15	15-<25	25 & above	Total
4	5	6	7	8
1 (5.56)	—	7 (38.88)	8 (44.44)	18 (100.00)
6 (33.33)	3 (16.67)	1 (5.56)	4 (22.22)	18 (100.00)
—	5 (27.78)	2 (11.11)	5 (27.78)	18 (100.00)
—	—	—	9 (75.00)	12 (100.00)
—	2 (8.34)	8 (33.33)	5 (20.83)	24 (100.00)
2 (11.11)	—	10 (55.55)	3 (16.67)	18 (100.00)
1 (4.16)	3 (12.50)	4 (16.67)	8 (33.33)	24 (100.00)
3 (25.00)	—	1 (8.33)	1 (8.33)	12 (100.00)
13 (9.03)	13 (9.03)	33 (22.92)	43 (29.86)	144 (100.00)

percentages to total.

Out of 144 Selected shareholders, 29.86 percent were having operational land holdings of 25 acres and above, while 18.05 per cent had operational land upto 5 acres. Taking the distributory-wise number of beneficiaries in different ranges of holding-sizes it was observed that in Kot-Kapura distributory 75 percent beneficiaries had holding-size of 25 acres and above followed by Atakwas, Rupana (U) and Ghuman distributories, while in case of Sangrur and Lal-b distributories, 50 percent and 33 per cent had land holding up to 5 acres.

### **3.2 Distribution of Shareholders by Size of Culturable Command Area (CCA):**

All the selected (144) beneficiaries has been classified by different ranges in table 3.2, according to their land in CCA of the selected water courses.

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## Distribution of Shareholders by Size of Land Area falling in

Name of the selected District	Size of Land area		
	Up to 2.50	2.50—<5	5—<7.50
1	2	3	4
Arakwas ..	1 (5.56)	5 (27.78)	4 (22.22)
Bhawanigarh ..	3 (16.67)	6 (33.33)	2 (11.11)
Ghuman ..	—	3 (16.67)	5 (27.78)
Kot-Kapura ..	2 (16.67)	—	1 (8.33)
Lal-bai ..	5 (20.83)	4 (16.67)	—
Muksar-Rupana ..	2 (11.11)	1 (5.56)	1 (5.56)
Rupana (U) ..	2 (8.33)	3 (12.50)	6 (25.00)
Sangrur ..	6 (30.01)	1 (8.33)	—
<b>Total</b> ..	<b>21</b> (14.58)	<b>23</b> (15.97)	<b>19</b> (13.20)

Figures in brackets indicate

## 3.2

CCA of the Selected Water Courses During 1985-86.

falling in CCA				
7.50- <10	10-<15	15-<25	25 & above	Total
5	6	7	8	9
1 (5.56)	3 (16.66)	3 (16.66)	1 (5.56)	18 (100.00)
3 (16.67)	3 (16.67)	1 (5.55)	—	18 (100.00)
2 (11.11)	1 (5.55)	5 (27.78)	2 (11.11)	18 (100.00)
—	1 (8.33)	1 (8.33)	7 (58.34)	12 (100.00)
3 (12.50)	3 (12.50)	4 (16.67)	5 (20.83)	24 (100.00)
3 (16.67)	1 (5.55)	9 (50.00)	1 (5.55)	18 (100.00)
1 (4.17)	6 (25.00)	4 (16.67)	2 (8.33)	24 (100.00)
3 (25.00)	1 (8.33)	1 (8.33)	—	12 (100.00)
16 (11.11)	19 (13.20)	28 (19.44)	18 (12.50)	144 (100.00)

percentages to total.

Out of 144 beneficiaries, 19.44 per cent were having land in CCA in the range of 15-25 acres and about 15 percent had land up to 2.5 acres, while 12.50 per cent had land in the range of 25 acres and above. Maximum number in Kot-Kapura distributory had land in CCA above 25 acres, followed by Lalbai in the same range, while 50 percent cultivators were having land in the range of 2.5 acres in Sangrur distributory. None of the shareholders of Ghuman distributory had land up to 2.5 acres.

### 3.3 Proportion of CCA to total Operated Area.

Distributory-wise proportion of CCA to total operated land in respect of 144 selected beneficiaries is given in table 3.3.

Table 3.3

Percentage of CCA to Total Operated Area.

Distributory	Total Land operated (Acres)	Land falling in CCA (Acres)	Percentage of Land falling in CCA to total land operated.
1	2	3	4
Arakwas	421.00	180.50	42.87
Bhawanigarh	286.50	124.75	43.54
Ghuman	354.00	224.50	63.42
Kot-Kapura	336.00	325.00	96.73
Lal-bai	348.50	306.00	87.80
Muktsar-Rupana	555.00	272.00	49.01
Rupana (U)	440.65	265.40	60.21
Sangrur	81.00	66.00	81.48
Total	2,822.65	1,764.15	62.50

In all, 2822.65 acres of land was cultivated by all the selected beneficiaries during 1985-86, out of which, 1764.15 acres (62.50%) was in the Culturable Command Area (CCA). The selected beneficiaries of Kot-Kapura distributory had the maximum area (96.73%) in CCA followed by Lal-bai and Sangrur distributories, forming 87.80 per cent 81.48 per cent respectively. In case of Arakwas, Bhawanigarh and Muktsar-Rupana distributories, area in CCA was 42.87 percent, 43.54 percent and 49.01 percent respectively. It can, therefore, be inferred that the selected beneficiaries of Arakwas, Bhawanigarh and Muktsar-Rupana distributories were having less than half of their total operated land in CCA, while in case of the rest, the land held in CCA was more. It means that out of 144 selected beneficiaries, 54 (37.50 per cent) had less than half their holdings in CCA while the rest 90 (62.50 per cent) had more than fifty per cent area in CCA.

### 3.4 Change in Irrigation Facilities after Lining in the Given 'Wara Bandi'

All the 144 selected cultivators were interviewed and relevant information in respect of irrigation facilities before and after lining was collected from them. Distributory-wise analyses of changes in irrigation facilities of all the selected beneficiaries in relation to their allotted 'Wara-bandi' is given in table 3.4

**Table 3.4**

Distribution of Selected Shareholders Reporting Increase, Decrease or No Change in the Supply of Water After Lining in the given Wara-Bandi.

Name of the Selected Distributory	No. of Shareholders Reporting			
	Increase	Decrease	No. Change	Total
1	2	3	4	5
Arakwas	—	17 (94.44)	1 (5.56)	18 (100.00)
Bhawanigarh	—	17 (94.44)	1 (5.56)	18 (100.00)
Ghuman	16 (88.89)	—	2 (11.11)	18 (100.00)
Kot-Kapura	7 (58.33)	1 (8.34)	4 (33.33)	12 (100.00)
Lal-bai	14 (58.33)	3 (12.50)	7 (29.17)	24 (100.00)
Muktsar-Rupana	5 (27.78)	3 (16.67)	10 (55.55)	18 (100.00)
Rupana (U)	20 (83.33)	—	4 (16.67)	24 (100.00)
Sangrur	3 (25.00)	1 (8.33)	8 (66.67)	12 (100.00)
Total	65 (45.14)	42 (29.17)	37 (25.69)	144 (100.00)

Figures in brackets indicate percentages to total.

According to the figures in table 3.4, it is significant to note that of the 144 selected beneficiaries, 65 (45.14%) reported increase in irrigation facility after lining while 42 (29.17%) reported decrease in relation to pre-lining position. It is more important to note that a sizeable chunk, 37 of the selected cultivators experienced no change in

irrigation facility even after lining, which means that brick-lining could not make any impact on about one-fourth of the selected beneficiaries. It is disappointing to note that slightly less than one third of the selected cultivators experienced loss against what they were getting from the unlined water courses. Analysing the distributory-wise position of the selected beneficiaries, 16 (88.89%) out of 18 cultivators of Ghuman distributory reported increase in irrigation potential after lining, followed by 20 (83.33%) of Rupana (U) distributory. In case of Kot-Kapura and Lal-bai distributories, about 58 per cent each also got additional water after lining. Not even a single selected beneficiary of Arakwas and Bhawanigarh distributories reported any increase in the supply of water after lining while none from Ghuman and Rupana (U) distributories reported any decrease in this regard. However, 17 (94.44%) out of 18 selected beneficiaries, each from Arakwas and Bhawanigarh distributories, reported decrease in the supply of water after lining. Out of the selected beneficiaries of Muktsar-Rupana, Lal-bai, Kot-Kapura and Sangrur distributories, 16.67 per cent, 12.50 per cent, 8.34 per cent and 8.33 per cent respectively got reduced supply of water after lining.

### 3.5. Distribution of Shareholders Reporting Increase or Decrease in Irrigation Facility After Lining in Percentage-Ranges,

As discussed in table 3.4, Out of 144 total selected cultivators, 65 reported increase and 42 reported decrease in the supply of canal water, while 37 experienced no change in this regard. Percentage-wise distribution of shareholders by different ranges of increase or decrease after lining is given in table 3.5.

Table 3.5

Distribution of Selected Shareholders Reporting Percent Increase or Decrease in the Supply of Water After Lining.

(Number)

Item	No. of Shareholders Reporting	
	Increase	Decrease
1	2	3
Below 10%	37 (56.92)	1 (2.38)
10% < 25%	20 (30.77)	8 (19.05)
25% < 40%	8 (12.31)	12 (28.57)
Above 40%	—	21 (50.00)
Total	65 (100.00)	42 (100.00)

Figures in brackets indicate percentages to total.



Out of total 65 cultivators reporting increase in the supply of canal-water after lining, 56.92 per cent (37) reported increase upto the extent of 10 per cent, while 30.77 per cent (20) and 12.31 per cent (8) reported increase to the tune of 10<25% and 25<40% respectively. Out of total 42 cultivators reporting decrease in the supply of canal water after lining, 50% (21) experienced decrease upto the extent of 40% and above, followed by 28.57% (12) with 25—<40%, 19.05% (8) with 10%—<25% and 2.38%(1) upto 10% respectively.

### 3.6. Irrigated Area of Selected Beneficiaries Before and After Lining.

Distributory-wise irrigated area of selected beneficiaries falling in CCA of the selected water courses before and after lining during 1985-86, has been depicted in table 3.6. Details of area irrigated during 1985-86, over the pre-lining period, by each of the selected water courses before and after lining has already been given in table 2.6 of Chapter II.

Table 3.6

#### Irrigated Area of Selected Beneficiaries Before and After Lining.

Name of the Selected Distributory	Area Irrigated		
	Before Lining (Acres)	After Lining (Acres)	Percentage Increase (+) or Decrease (—) in 1985-86.
1	2	3	4
Arakwas ..	307.50	319.50	3.90
Bhawanigarh ..	242.50	238.50	(—) 1.65
Ghuman ..	449.00	458.50	2.12
Kot-Kapura ..	650.00	640.00	(—) 1.54
Lal-bai ..	338.00	403.00	19.23
Muktsar-Rupana ..	492.00	531.00	7.93
Rupana (u) ..	425.80	502.80	18.08
Sangrur ..	132.00	182.00	37.88
Total ..	3,036.80	3,275.30	7.85

Taking into consideration the total irrigated area of 144 selected beneficiaries, 3275.30 acres was irrigated during 1985-86 as against the pre-lining irrigated area of 3,036.80 acres. This shows an increase in the irrigated area to the tune of 238.50 acres, i.e. 7.85 per cent over the pre-lining period. The selected beneficiaries of Sangrur distributory were able to get a gain of 37.88 per cent in the irrigation potential created, while those of Bhawanigarh distributory suffered loss in this regard by a decrease in irrigation potential to the tune of 1.65 per cent after lining. The irrigation potential in case of Lal-bai and Rupana (U) distributories, increased by 19.23 per cent and 18.08 per cent respectively after lining, while those of Arakwas, Ghuman and Kot-Kapura distributories increased by 3.90 per cent, 2.12 per cent and 1.54 per cent respectively.

To give due representation to all types of beneficiaries, 2 beneficiaries from each of the head, middle and tail-end portion of the W.C. were selected. Details of area irrigated by the head portion, middle portion and tailend beneficiaries, before and after lining are given in table 3.7.

Table 3.7

Area Irrigated in Respect of Head, Middle and Tail-end Portion of Beneficiaries.

Location of Land	Area Irrigated (Acres)			
	Before Lining	After Lining	Increase in Irrigated area	% Increase in Irrigated Area
1	2	3	4	5
Head Portion ..	1481.00	1,525.30	44.30	2.99
Middle Portion ..	991.80	1,097.00	105.20	10.61
Tail-end Portion ..	564.00	653.00	89.00	15.78
Total ..	3,036.80	3,275.30	238.50	7.85

Keeping in view the location of land on the water course and additional land irrigated by virtue of bricklining of W.C. it was observed that the tailend cultivators were benefited to the tune of 15.78 per cent over the pre-lining period. Middle portion cultivators were also able to receive 10.61 per cent additional water while the head portion cultivators added only 2.99 percent area under irrigation after lining of the water courses.

## 3.7. Distribution of Selected Beneficiaries by Mode of Irrigation :

All the selected beneficiaries have been classified according to the mode of irrigation during 1985-86 to ascertain the number of cultivators who used exclusively canal water and tubewell water and those who used tubewell water alongwith canal water to supplement irrigation. Distributory-wise number of beneficiaries by mode of irrigation during 1985-86 is given in table 3.8.

**Table 3.8**  
Distribution of Selected Beneficiaries by Mode of Irrigation  
during 1985-86.

Name of the Selected Distributory	Mode of Irrigation			(Number)
	Canal	Tubewell	Canal & Tubewell (Combined)	Total
1	2	3	4	5
Arakwas ..	1 (5.55)	5 (27.78)	12 (66.67)	18 (100.00)
Bhawanigarh ..	1 (5.56)	9 (50.00)	8 (44.44)	18 (100.00)
Ghuman ..	12 (66.67)	—	6 (33.33)	18 (100.00)
Kot-Kapura ..	4 (33.33)	—	8 (66.67)	12 (100.00)
Lal-bai ..	24 (100.00)	—	—	24 (100.00)
Muktsar, Rupana ..	17 (94.44)	—	1 (5.56)	18 (100.00)
Rupana (U) ..	14 (58.34)	2 (8.33)	8 (33.33)	24 (100.00)
Sangrur ..	—	6 (50.00)	6 (50.00)	12 (100.00)
<b>Total ..</b>	<b>73</b> (50.69)	<b>22</b> (15.28)	<b>49</b> (34.03)	<b>144</b> (100.00)

Figures in brackets indicate percentages to total.

Of the total 144 beneficiaries, 73 (50.69%) used exclusively canal water for irrigation purposes during 1985-86 while 22 (15.28%) irrigated their crops exclusively with tubewell water, though the area was in CCA of selected water courses. Slightly more than one third i.e. 49 (34.03%) used both canal and tubewell water, keeping in view the exigencies and also to supplement the irrigation done by canal with tubewells. Cent per cent beneficiaries of Lal-bai, 17 (94.44%) of Muktsar-Rupana and 12(66.67%) of Ghuman distributories irrigated their crops exclusively with canal water, while 9 (50%) of Bhawanigarh and 6 (50%) of Sangrur did so with tubewell water alone. None among the selected beneficiaries of Ghuman, Kot-Kapura, Lal-bai and Muktsar-Rupana distributories had to depend exclusively on tubewell water, while none from Sangrur distributory exclusively used canal water during the said period. About two-third (66.67%) beneficiaries of Arakwas and Kot-Kapura and 6 (50%) of Sangrur distributory used tubewell water alongwith the canal water.

### 3.8. Cropping Pattern

It was one of the main objectives to study the impact of lining on the pattern of crops sown during 1985-86 over the pre-lining period. It was envisaged that lining would help in changing the rotation of crops i.e. the crops which could not be sown before lining, due to shortage in the supply of canal water in unlined water courses, would be possible after lining. To study the impact of lining on cropping pattern, information supplied by 144 beneficiaries figures in table 3.9. Details in respect of Kharif and Rabi seasons for each distributory is given in Annexure 3.1. †

Table 3.9

Area Under Different Crops Before and After Lining in 1985-86.

Sr. No.	Name of the Crop	Area in Acres		Percentage increase (+) or decrease (—) in area over the pre-lining area.
		Before lining	After lining in 1985-86	
1	2	3	4	5
<b>Kharif Crops</b>				
1.	Maize	109.00	92.50	(—) 15.14
2.	Paddy	191.00	432.75	126.57
3.	Sugar-cane	32.00	21.00	(—) 34.38
4.	Cotton	824.85	737.63	(—) 10.57

1	2	3	4	5
5.	Fodder	.. 247.05	250.27	1.30
6.	Other Kharif Crops	.. 151.50	126.50	(-) 16.50
7.	Current Fallow	.. 208.75	103.50	(-) 50.42
	<b>Kharif-Crops Sub-Total</b>	.. 1,555.40	1,660.65	6.77
<b>Rabi Crops</b>				
1.	Wheat	.. 1,051.90	1,214.90	15.50
2.	Gram	.. 163.00	84.00	(-) 48.47
3.	Barley	.. 48.50	56.00	15.46
4.	Toria/Taramira/Sorson	.. 89.75	60.00	(-) 33.15
5.	Fodder	.. 208.30	195.05	(-) 6.36
6.	Other Rabi Crops	.. 87.50	87.00	(-) 0.57
7.	Current Fallow	.. 83.20	46.20	(-) 44.47
8.	<b>Rabi Crops Sub-Total</b>	.. 1648.95	1696.95	2.91
9.	<b>Gross Cropped Area</b>	.. 3204.35	3357.60	4.78
10.	<b>Gross Current Fallow</b>	.. 291.95	149.70	(-) 48.72

Percentage increase or decrease in area for each crop after lining over the pre-lining period has been worked out. Overall increase over pre-lining period under different crops worked out to 4.78 per cent, while area under Kharif crops increased to the extent of 6.77 per cent and under Rabi crops to 2.91 per cent. Area under current fallow decreased to about one half (48.72%), while the reduction was 50.42 per cent in Kharif season and 44.47 percent in Rabi season. Area under Paddy crop registered maximum increase (126.57%) in Kharif season followed by wheat crop (15.50%) in Rabi season. Area under maize, sugarcane, cotton and other Kharif crops decreased to the extent of 15.14 per cent, 34.33 per cent, 10.57 per cent and 16.50 per cent respectively and in case of Rabi crops the reduction in area under gram, oilseeds, and fodder was to the tune of 48.47 per cent, 33.15 per cent and 6.36 per cent respectively.

Taking into account change in cropping pattern in the CCA of the selected distributories, the reduction in the area of maize crop was 71.42 percent in case of Arakwas, 100.00 per cent decrease each in case of Bhawanigarh and Rupana (U) distributories, while no change was reported in case of Ghuman and Sangrur distributories. On the other hand, area under maize crop has increased by 108.00 per cent in case of Muktsar-Rupana distributory. Area under paddy crop has registred an increase of 259.26 per cent in Arakwas, 930.00 per cent in Bhawanigarh, 1439.29 per cent in Rupana (U), 10.00 per cent in Ghuman, 7.77 per cent in Kot-Kapura and 12.00 per cent in Muktsar-Rupana distributories. While no change in area under this crop was reported in the case of Sangrur distributory.

Area under wheat crop has increased in case of all the selected distributories. Though it was maximum (32.89%) in case of Bhawanigarh distributory and minimum (3.83%) in case of Kot-Kapura distributory. The area under gram crop has decreased in case of all the selected distributories. The area under current fallow has decreased after lining in case of all the selected distributories. The reduction was above 60 per cent in case of Kot-Kapura, Lal-bai, Muktsar-Rupana and Rupana (U) distributories. The reduction in area under current-fallow was minimum (11.88%) in the case of Ghuman distributory.

## CHAPTER IV

### Opinion about construction of Common Water Courses

Opinion of shareholder-beneficiaries, village functionaries and implementing and executing agency has been incorporated in this chapter. Almost questions of the same nature were put to different persons associated with lining work in one way or the other in order to sort out the problems pertaining to lining. In this regard opinion of beneficiaries, having land served by the selected water courses and village functionaries like Sarpanch/Panch/Lambardar was recorded. Discussions were also held with the PSTC authorities in the field. Some of the important observations about lining are given in the following paragraphs.

#### 4.1. Taking shareholders into confidence before lining

When asked whether the PSTC took the shareholders into confidence before lining, 118 beneficiaries (81.94%) out of 144 replied in affirmative and the remaining said 'no' to the question. The beneficiaries who said 'yes' to the question were further asked if any agreement was signed by them with the PSTC. 76 beneficiarier (52.78%) reported that they had signed the agreement while others were not aware of it. When the same question was put to the village functionaries, 79.17 per cent were aware of taking the shareholders into confidence and the remaining were not aware of the same.

#### 4.2. Awareness about recovery

When questioned about the awareness regarding cost of lining including interest to be recovered from shareholders, 8 per cent of them were aware of it, while the rest 92 per cent were not. So much so that even half of the village functionaries 46 per cent were not aware of the recovery of cost of lining from shareholders. Though the PSTC had signed an agreement with shareholders regarding construction of water courses on behalf of the farmers and the recovery of the cost of lining from them, these were not properly explained to the shareholders and as a result they were ignorant about it.

#### 4.3. Quality of construction work

The shareholders beneficiaries when asked to opine about the masonry work and materials used for lining, 85 (59.83%) were satisfied while others were not. Defects like poor masonry work, inferior quality of bricks, improper proportion of sand and cement, inadequate curing of construction work, defective leveling etc. were reported by the beneficiaries. Proper proportion of cement and sand to be used for brick masonry and plastering was not main-

tained. In addition to this, curing of masonry work was not resorted to as stipulated (i.e. for 3 weeks). By not using the proper material for lining and not curing masonry work as desired, frequent breaches occurred in water courses. Although Committee of shareholders was formed to oversee the construction work in general and use of proper material and its right proportion in particular, but the members did not pay requisite attention towards construction of water courses. The members were busy in their day to day household activities. Hence, contractor and his men were at liberty to use the material which suited them best and curing of brick masonry and plastering of water courses was also not taken care of. In case of a few selected water courses, where the committee members took keen interest in the construction of water courses and at least one member remained present at site, though in rotation, were able to improve upon the quality of masonry work including materials used for lining.

#### 4.4. Repairs and maintenance of Lined Water Courses

Before lining, the respective shareholders used to repair and maintain the water courses collectively, by pooling proportionate manpower required for desilting and plugging the breaches in a Particular season, but after lining, the shareholders became hesitant in maintaining and repairing the lined water courses. When a water course breached or required repair, none did the needfull with the exception that those shareholders who did not have alternate means of irrigation, often used to plug the breaches temporarily by using gunny-bags filled with earth. Hence, repairs and maintenance of water courses was totally a neglected affair after lining. When asked to opine about the maintenance of lined water courses, out of 24 village functionaries, 3(12.50%) viewed that it should be done by shareholders themselves as they used to do so before lining, 15(62.50%) wanted Irrigation Department should do the job, while 6(25.00%) pleaded in favour of the PSTC to do the maintenance work.

The field-authorities of the PSTC could not undertake repair of lined water courses due to non-allocation of funds for this purpose. From the above analysis it was observed that neither the PSTC nor any other agency including shareholders undertook any masonry based repair work. After lining a particular water course, the PSTC officials did not pay any follow-up visit to the said lined water course to check its condition. The shareholders did not care to repair the lined water courses on the plea that since water courses were constructed by the Govt. (PSTC) hence, the responsibility of repairs and maintenance of the said water courses laid with the agency which had constructed these water courses. Before lining, if any breach occurred in a water course, the same was plugged by earth work. In case a lined water course, required, repairs, costly material like cement, bricks etc. are required and that too with the help of skilled labour which was beyond the reach of an individual shareholder. Without organising the shareholders, the maintenance of lined water courses could not be taken, because sufficient funds were required by the shareholders, to do the job. Practically, it was found difficult to organise the shareholder. Hence, when a water course needed any repair, no agency or



body cared to repair the same. As a result of this situation, middle and tail-end beneficiaries felt the same difficulty for not getting proper supply of water which they were getting before lining. Head portion beneficiaries generally took advantage of these breaches while the middle and tail-end beneficiaries suffered accordingly.

It is worth mentioning that there was no use to create assets worth crores of rupees by constructing water courses without making any provision for the repairs and maintenance of the said assets. The PSTC should have taken steps to pursue the matter at least during the currency of the loan period. Some long term measures to deal with this should have been evolved by the PSTC, or any other agency should have been made responsible, to do the needful.

#### 4.5. Recovery of cost of lining

The PSTC borrows funds from the financial institutions on behalf of the farmers. The loan alongwith the interest is recoverable from them in 12 half-yearly equated instalments by the Revenue Department, on the basis of demand lists supplied to the Revenue Department, for affecting recovery on completion of lining of each water course. It was observed that the PSTC officials dealing with the process of recovery of cost of lining never informed the shareholders about amount due to be recovered from them individually. They sent demand lists only to the Revenue Department of the concerned district for recovery. The beneficiaries were unanimous in their opinion that since water courses were constructed by the Govt. or its agency (PSTC), there was no question of recovery from them. They further added, that in case, additional water was provided to them, they were paying additional Abiana to the Government. It was observed that the Revenue Department did not make much efforts to recover the cost of lining from the shareholders. Declaration about remission of cost of lining by the Govt. in recent past has reduced the chances of recovery in future too.

The PSTC was entrusted with the work of lining of water courses on behalf of the farmers on the plea that it would raise institutional finance from banks and Govt. would stand guarantee for the loans raised by it. But since the recovery of cost of lining is almost nil hence, it is not good to continue with the present system. Moreover, the remission of loan recoveries from the shareholders has further complicated the working of the PSTC for all times to come. It is a known proposition that once old loans are remitted, it will be very difficult for the PSTC or the Govt. to recover similar loans raised for the same purpose. Furthermore, it will be discriminatory on the part of the Govt. If the shareholders of future lining programme are made to pay back the cost of lining vis-a-vis the shareholders for whom the lining has been done so far. As under Punjab Composite Irrigation Project (P.C.I.P) distributories are lined by the Irrigation Department, similarly the water courses can be constructed by the same Department. The funds raised for the construction of distributories are repaid by the State Govt. similarly, the case of common water courses can be dealt on the same lines. In both the cases, the Govt. would be responsible to raise funds from different agencies and its repayment.

#### 4.6. Lack of proper planning and defects in lining

Lack of proper co-ordination between Irrigation Department and the P.S.T.C. was observed, as some of the distributories were lined later than their water courses itself. It shows improper leveling and planning.

Improper Planning was observed in case of R.D. No. 1872-R (Bhawani-garh distry.) where construction of said water course started from the tail-end instead of head. Due to improper levelling, shareholders were facing the problems of reduced discharge and hence were not getting the desired quantity of water.

Brick lining of water courses was resorted to without caring for the water table of the area, condition of the soil and effect of 'Semi'. Brick lining in 'Semi' areas weakened the life of water courses. The nitrates affected the life of bricks considerably. It would have been better if concrete lining was resorted to in such areas.

Permanent crossings were not provided on the water courses at the desired points. The shareholders who happen to possess land on both sides of a water course faced difficulty in crossing over to the other side with the bullock-cart, tractor or tractor-trolley. In the absence of permanent crossings over the lined water courses, it was observed that water courses were found often broken at many places.

Some water courses were found overflowing which in turn resulted in the loss of water. The outer walls were either not built up to proper height or the construction of water courses was not properly planned and levelled. Improper levelling was seen in case of some lined water courses just like R.D. No. 40868-R of KotKapura distributory and R.D. No. 130-R of Rupana (U) distributory. It was also observed that some overflows occurred due to silting in the water courses. Neither the P.S.T.C. nor the shareholders removed silt from the bed of the water courses, resulting into overflowing and loss of water.

It was observed that discharge of water instead of increasing has decreased after lining. Because with the given 'Warabandi' the potential of water courses did not increase as stipulated after lining. The reason for the reduced discharge after lining, is best known to the Irrigation Department and the P.S.T.C. In areas, where underground water was suitable for irrigation purposes and easily available, reduced discharge coupled with frequent breaches, compelled the affected shareholders to instal new tubewells in the C.C.As of certain water courses to have alternate means of irrigation at crucial times.

#### 4.7. Space specified for Water Course

According to instructions, 11 feet space was provided for a water course at the time of consolidation in the State. But at present, it was observed that about 4 feet space was left available for the water course, resulting into frequent breaches due to less earthen support to its walls which keep the water course intact. Adding to this, some shareholder-planted trees along the water courses. The roots of trees made encroachments in the water course walls and base. Therefore, the growth of trees along the water courses has not only resulted into frequent breaches but also shortened the life of lining.

#### 4.8 Criterion of investment benefits in lining ignored

It was laid down that the P.S.T.C. would try to relate the investment in lining with the simultaneous increase in production. When the H.Qs of the P.S.T.C. was contacted in this regard to confirm, whether the said proposition was examined at the time of lining or after wards, it was found that the P.S.T.C. did not undertake any study to relate the investment in lining with increase in production.

## CHAPTER V

### Lining of common water courses and water logging a case study

A case study in respect of water logged areas of Faridkot and Bathinda districts was undertaken to see the impact of lining of common water courses on water-logging. For this purpose, 'Sem' affected areas of the said districts were identified with the help of the Revenue Deptt. and concerned Divisional Engineers of the P.S.T.C. who had lined the water courses in the said 'Sem' affected areas. In all, 10 water courses were studied (five each from Faridkot district) (Muktsar area) and Bathinda district (Mansa area). In all, 34 shareholder beneficiaries, (18 from Muktsar area and 16 from Mansa area) were contacted. Information regarding the feeding distributories, water table, villages served by the water courses and area water logged before and after lining is given in table 5.1.

Details of area under water logging before and after lining of-

Sr. No.	Distributory	R.D. No. of Common Water Course	Year of lining	Name of the village surveyed
1	2	3	4	5
<b>Faridkot District (Muktsar Area)</b>				
1.	Mudki ..	7354-L	1980	Jammuana
2.	Faridkot ..	16000-R	1979	Jhabelwali
3.	Kotkapura ..	23456	1984	Sarai Naga
4.	Faridkot ..	115000	1975	Sarai-Naga
5.	Kotkapura ..	23762(R)	1973	Hari-ke-Kalan
<b>Bathinda District (Mansa Area)</b>				
1.	Boha ..	94404-L	1983	Alampur-Mandran
2.	Bhikhi ..	23124-R	1981	Kotra
3.	Bhiki (Atlla minor) ..	40544-L	1982	Atlla Kalan
4.	Kot Duna ..	35500-L	1986	Anoopgarh
5.	Kot Duna ..	35500-R	1986	Joga

## 5.1

## common water courses

Year since water logged (Sem)	Present water table (feet)	No. of contacted cultivators	Water-logged Area of Selected Cultivators (Acres)	
			Before lining	After lining
6	7	8	9	10
1975	2	7	442	442
1979	1	3	—	199
1982	3	2	42	42
1982	3	5	—	40
1982	3	1	—	4
1963	6	5	46	28
1980	4	3	26	26
1980	3	3	29	29
1956	3	3	12	12
1980	3	2	24	24

5.2. It was observed that 'Sem' in Muktsar area was a regular feature which had engulfed large tracts of land, while in Mansa area the 'Sem' had affected some pockets where the land level was quite low and the rain water of the up level surrounding areas continued to be collected there without any further outlet from that place. The table 5.1 reveals that area in respect of R.D. No. 16000-R of Faridkot distributory in Jhabelwali village, R.D. No. 115000 of Faridkot distributory in Sarai-Naga village & R.D. No. 23762-R of Kotkapura distributory in Hari-Ke-Kalan village of Muktsar area were water-logged after lining while there was no change in respect of R.D. No. 7354-L of Mudki distributory in Jammuana village and R.D. No. 23456 of Kot Kapura distributory in Sarai-Naga village before and after lining.

5.3. Three situations emerge with relation to the year of lining with that of year of water-logging i.e. (i) existence of 'Sem' before lining, (ii) existence of 'Sem' after lining and (iii) existence of 'Sem' simultaneously with the lining process. The CCAs of R.D. No. 7354-L of Jammuana village and R.D. No. 23456 of Sarai-Naga village have constantly been under 'Sem' since 1975 and 1982 respectively while these water courses were bricklined during 1980 and 1984. This shows that 'Sem' was prevailing in the area much before the lining process. R.D. No. 115000 and 23762-R serving the villages of Sarai-Naga and Hari-Ke-Kalan were lined during 1975 and 1973 respectively, but 'Sem' appeared in the CCAs of these water courses during 1982, showing thereby that 'Sem' engulfed the area much after the lining process. R.D. No. 16000-R serving Jhabelwali village was lined during 1979, coincidentally water-logging also occurred during the same year i.e. 1979.

In case of Mansa area, water table varied from three feet to six feet in respect of villages served by selected water courses for the purpose of this case study. Area under water-logging has decreased after lining in respect of R.D. No. 94404-L of Boha distributory in village Alampur-Mandran while there was no change in respect of remaining selected water courses. In all the cases of Mansa area, water-logging existed much before the lining process.

From the above analysis, it is concluded that neither the unlined water courses were instruments for the existence of water-logging (Sem), nor the lined water courses helped in reducing 'Sem'. As in case of Muktsar area, the entire 'Sem' affected area has become a barren piece of land over the years. No crop (even paddy though a watery crop) could be cultivated in the sem-prone area. In case of Mansa area, 'Sem' could be avoided by constructing bunds to check the flow of water from the up lying areas.

5.4. It had been better on the part of PSTC, if surveys were conducted to identify 'Sem' affected area before taking up the lining work in hand. In the absence of such surveys and without caring for the presence of 'Sem' in the CCAs of so many water courses where water-logging was in existence the PSTC continued with the job of brick-lining the water courses. As a result of which crores of rupees have gone waste due to 'Sem'. The walls and beds of water courses have been damaged by soil salts. For the development of the water-logged areas and to lower the water table it is suggested that the work regarding construction of new flood protection embankments and improvement of drainage in the affected areas should be taken up on top priority basis so that the damage to crops may be prevented in the future.

ANNEXURE 1.1

Discharge-wise Distribution of Water Courses of Selected Distributories Constructed by P.S.T.C.

Discharge in cusecs.	Sangrur	Lal-Bai	Arakwas	Bhawani-garh.	Ghuman	Rupana	Rupana and Muktsar	Kot-Kapora
1	2	3	4	5	6	7	8	9
0.61-2.00	46 (86.79)	4 (36.36)	18 (78.26)	45 (77.59)	35 (61.41)	5 (33.33)	3 (20.00)	13 (50.00)
2.00-4.00	7 (13.21)	5 (45.46)	4 (17.39)	12 (20.69)	21 (36.84)	8 (53.34)	9 (60.00)	13 (50.00)
Above 4.00	—	2 (18.18)	1 (4.35)	1 (1.72)	1 (1.75)	2 (13.33)	3 (20.00)	—
<b>Total</b>	53 (100.00)	11 (100.00)	23 (100.00)	58 (100.00)	57 (100.00)	15 (100.00)	15 (100.00)	26 (100.00)

Figures in brackets indicate percentages to total.

## ANNEXURE 1.2

Distribution of Selected Water Courses by CCA, and Number of Shareholders.

Sr. No.	Name of the D'stry	R.D. No.	C.C.A. (in Acres)	Shareholders (No.)	Share of land held per beneficiary in C.C.A. (in Acres)
1	2	3	4	5	6
1.	Arakwas ..	17050-TF	547	89	6.15
		53688-R	300	26	11.54
		10498-TF	1240	126	9.84
2.	Bhawanigarh ..	19080-TL	592	42	14.09
		1872-R	1255	84	14.94
		93126-R	488	68	7.18
3.	Ghuman ..	63500-TR	1096	104	10.54
		89691-L	1340	158	8.48
		20545-R	390	62	6.29
4.	Kot-Kapura ..	21167-R	1082	140	7.73
		40868-R	297	32	9.28
5.	Lal-baj ..	13531-R	345	76	4.54
		14828-R(A)	1375	104	13.22
		9236-R	1188	124	9.58
		9069-L	650	220	2.95
6.	Muktsar-Rupana ..	4559-TL	1205	146	8.25
		67836-TL	865	74	11.69
		21500-L	166	39	4.26
7.	Rupana(U) ..	180-R	535	48	11.15
		19200-R	651	67	9.72
		33976-R	608	94	6.47
		56980-L	1135	303	3.75
8.	Sangrur ..	91904-L	814	102	7.98
		28500-R	488	55	8.87
Total ..			18652	2383	7.83

Source :—Divisional Offices of PSTC.



## ANNEXURE—1,3

Distributory wise Number of Selected water Courses and Villages Served.

Distributory	R. D. No.	Village served
1	2	3
1. Sangrur ..	91904—L	Kular Khurd Kheri/Kotha Galib. Bara-Draka, Maur
	28500—R	Saron
2. Kot-Kapura ..	21167—R	Modahar
	20545—R	Burj-Hari
3. Ghuman ..	89691—L	Misar Khana
	63500—TR	Bhai Bakhtaur
	40868—R	Koharwala
4. Rupana (U) ..	180—R	Hari Nau
	33976—R	Hari-ke-Kalan
	19280—R	Samagh
	56980—L	Bhuttiwala
5. Muktsar .. Rupana.	67836—TL	Janisar. Janisar Kalan.
	4559—TL	Vadhain
	21500—L	Muktsar rural, Udekaran
6. Lal-Bai ..	14828—R(a)	Lal-Bai, Thatajwala, Giddarbaha rural.
	9236—R	Rai-Ke-Kalan, Jandian, Loohal Bai
	13531—R	Lal-Bai
	9069—L	Rai-Ke-Kalan
7. Arakwas ..	63688—R	Kotra
	17050—TF	Khokhar
	10498—TF	Gobindgarh
8. Bhiwanigarh ..	19080—TL	Kakra
	1872—R	Baldh Kalan
	93126—R	Sanghren

## Distributory-wise Area Under Different

Sr. No.	Crops	Arakwas		
		Before Lining	After Lining	% Increase/decrease
1	2	3	4	5
<b>Kharif Crops</b>				
1.	Maize	24.50	7.00	(—)71.42
2.	Paddy	13.50	48.50	259.26
3.	Sugarcane	12.00	7.00	(—)41.67
4.	Cotton	61.00	63.25	3.69
5.	Fodder	44.00	40.75	(—)7.39
6.	Other KH crops	1.50	—	—100.00
7.	Current fallow KH crops	24.00	14.00	—41.67
8.	Sub-Total	156.50	166.50	6.39
<b>Rabi Crops</b>				
9.	Wheat	103.00	125.00	21.36
10.	Gram	27.00	12.00	(—)55.56
11.	Barley	9.00	7.00	(—)22.23
12.	Toria/Tara Mira/Serson	3.00	2.00	(—)33.34
13.	Fodder	17.50	17.50	0.00
14.	Other Rabi crops	—	—	—
15.	Current Fallow Rabi crops	9.00	10.00	11.11
16.	Sub Total	159.50	163.50	2.51
17.	Gross cropped Area	316.00	330.00	4.43
18.	Gross current Fallows	33.00	24.00	(—)27.27

## 3.1

## Crops Before and After Lining.

Bhawanigarh		
Before Lining	After Lining	%Increase/ decrease
6	7	8
16.00	—	(—)100.00
10.00	103.00	930.00
13.00	4.00	(—)69.24
45.00	2.50	(—)94.44
18.00	9.25	(—)48.62
10.50	1.00	(—)90.48
12.25	5.00	(—)59.18
112.50	118.75	5.56
74.50	99.00	32.89
17.00	10.50	38.24
8.75	2.00	(—)77.15
—	—	—
11.50	9.25	(—)19.57
—	—	—
—	—	—
111.75	120.75	8.05
224.25	240.50	7.26
12.25	5.00	(—)59.18

## ANNEXURE

## Distributory wise Area Under Different

Sr. No.	Crops	Ghuman		
		Before Lining	After Lining	% Increase/ decrease
1	2	9	10	11
<b>Kharif Crops</b>				
1.	Maize	12.00	12.00	0.00
2.	Paddy	20.00	22.00	10.00
3.	Sugarcane	2.00	2.00	0.00
4.	Cotton	95.00	96.00	1.05
5.	Fodder	18.50	26.00	40.54
6.	Other KH crops	38.00	33.50	(- )11.84
7.	Current fallow KH crops	39.00	33.00	(- )15.38
8.	Sub-Total	185.50	191.50	3.23
<b>Rabi crops</b>				
9.	Wheat	105.00	113.00	7.62
10.	Gram	34.00	30.00	(- )11.76
11.	Barley	24.00	23.00	(- )4.16
12.	Toria/Tara Mira/Sarson	2.00	—	(- )100.00
13.	Fodder	24.00	26.00	8.33
14.	Other rabi crops	22.00	19.00	(- )13.64
15.	Current Fallow Rabi crops	11.50	11.50	0.00
16.	Sub-Total	211.00	211.00	0.00
17.	Gross cropped Area	396.50	402.50	1.51
18.	Gross current Fallows	50.50	44.50	(- )11.88

## Crops Before and After Lining.

## Kot-Kapura

Before Lining	After Lining	% Increase/ decrease
12	13	14
—	—	—
103.00	111.00	7.77
—	—	—
131.00	139.00	6.11
36.00	36.00	0.00
43.00	35.00	(—)18.60
12.00	4.00	(—)66.67
313.00	321.00	2.56
235.00	244.00	3.83
14.00	10.00	(—)28.57
8.00	4.00	(—)50.00
10.00	10.00	0.00
34.00	34.00	0.00
17.00	20.00	17.65
7.00	3.00	(—)57.14
318.00	322.00	1.26
631.00	643.00	1.90
19.00	7.00	(—)63.16

ANNEXURE  
Distributory wise Area Under Different

Sr. No.	Crops	Lal Bai			
		Before Lining	After Lining	% Increase/ decrease	
1	2	15	16	17	
<b>Kharif Crops</b>					
1.	Maize	..	—	—	
2.	Paddy	..	—	—	
3.	Sugarcane	..	—	—	
4.	Cotton	..	195.50	213.50	9.21
5.	Fodder	..	38.50	54.00	40.26
6.	Other KH crops	.	18.00	19.00	5.55
7.	Current fallow KH crops	..	54.00	19.50	(- )63.89
8.	Sub-Total	..	252.00	286.50	13.69
<b>Rabi Crops</b>					
9.	Wheat	..	155.00	193.50	24.84
10.	Gram	..	29.50	17.00	(- )42.37
11.	Barley	..	26.00	19.00	(- )26.92
12.	Toria/Tara Mira/ Serson	..	19.50	21.00	7.69
13.	Fodder	..	38.00	37.00	(- )2.63
14.	Other Rabi crops	..	8.00	8.00	0.00
15.	Current Fallow Rabi crops	..	30.00	10.50	(- )65.00
16.	Sub Total	..	276.00	295.50	7.06
17.	Gross cropped Area	..	528.00	582.00	10.23
	Gross current Fall- ows	..	84.00	30.00	(- )64.29

## 3.1

## Crops Before and After Lining.

Muktsar-Rupana		
Before Lining	After Lining	% Increase/ decrease
18	19	20
25.00	52.00	108.00
25.00	28.00	12.00
4.00	7.00	75.00
118.00	95.00	(-) 19.49
36.00	43.00	19.44
30.00	35.00	16.67
34.00	12.00	(-)64.71
238.00	260.00	9.24
152.00	175.00	15.13
26.00	4.00	(-)84.61
2.00	3.00	50.00
5.00	7.00	40.00
50.00	40.00	(-)20.00
26.00	34.00	30.77
7.00	2.00	(-)71.43
261.00	263.00	0.77
499.00	523.00	4.81
41.00	14.00	(-)65.85

ANNEXURE  
Distributory wise Area Under Different

Sr. No.	Crops	Rupana Upper		
		Before Lining	After Lining	% Increase/ decrease
1	2	21	22	23
<b>Kharif Crops</b>				
1.	Maize ..	10.00	—	(—)100.00
2.	Paddy ..	7.00	107.75	1439.29
3.	Sugarcane ..	—	—	0.00
4.	Cotton ..	168.05	114.08	(—)32.12
5.	Fodder ..	46.35	29.57	(—)36.22
6.	Other KH Crops ..	10.50	3.00	(—)71.43
7.	Current fallow ..	23.50	11.00	(—)53.19
8.	<b>Sub-Total</b> ..	<b>241.90</b>	<b>254.40</b>	<b>5.17</b>
<b>Rabi Crops</b>				
9.	Wheat ..	182.10	216.10	18.67
10.	Gram ..	14.00	—	(—)100.00
11.	Barley ..	12.00	2.00	(—)83.33
12.	Toria/Tara ..	6.00	16.00	166.67
	Mira/Sersen			
13.	Fodder ..	26.30	28.30	7.60
14.	Other Rabi crops ..	13.50	—	(—)100.00
15.	Current Fallow ..	11.50	—	(—)73.41
	Rabi crops			
16.	<b>Sub Total</b> ..	<b>253.90</b>	<b>262.40</b>	<b>3.35</b>
17.	<b>Gross cropped Area</b> ..	<b>495.80</b>	<b>516.80</b>	<b>4.23</b>
18.	<b>Gross current fallows</b> ..	<b>35.00</b>	<b>14.00</b>	<b>(—)60.00</b>



## 3.1

## Crops Before and After Lining

Before Lining	Sangrur	
	After Lining	% Increase/ decrease
24	25	26
21.50	21.50	0.00
12.50	12.50	0.00
1.00	1.00	0.00
11.30	14.30	26.55
9.70	11.70	20.62
—	—	—
10.00	5.00	(- )50.00
56.00	61.00	8.93
45.30	49.30	8.83
1.50	0.50	( - )66.67
—	—	—
3.00	—	(-- )100.00
7.00	3.00	(- )57.14
1.00	6.00	500.00
7.20	6.20	(- )13.89
57.80	58.80	1.73
113.80	119.80	5.27
17.20	12.20	(- )29.07

## ANNEXURE SCHEDULE—A

## Evaluation Study of "Lining of Common Water Courses"

## Schedule—A: Beneficiary

## Block I—Identification

- 1.1. Circle \_\_\_\_\_ 1.2. Division \_\_\_\_\_  
 1.3. R.D. No. \_\_\_\_\_ 1.4. Village \_\_\_\_\_  
 1.5. Tehsil \_\_\_\_\_ 1.6. District \_\_\_\_\_  
 1.7. Name of the cultivator  
       S/o Sh.  
 1.8. Total land operated during 1985-86 (0.00 acres) ;

Land Operated	Irrigated	Un-irrigated	Total
(i) Owned			
(ii) Leased-in			
Total			

- 1.9. Operational/Land falling in CCA of the R.D. under study during 1985-86. (0.00 acres).

Item	Irrigated	Un-irrigated	Total
(i) Owned			
(ii) Leased-in			
Total			

- 1.10. Location of land on the water course under study

Start/Middle/Tail-end

1.11. Distance of land from the distributory (Meters).

**Block II—Cropping and Irrigation Pattern**

(In Respect of Land Served by the Selected RD)

Before Lining		Year _____		
Crops	Sown area (0.00 acres)	If Irrigated		
		Source of irrigation	No. of waterings	Average time taken for each watering per acre
1	2	3	4	5

**CT Both**

**A. Kharif**

1. Maize
2. Paddy
3. Sugercane
4. Cotton  $\left. \begin{array}{l} D \\ A \end{array} \right\}$
5. Fodder
6. Others (Specify)
7. Current fallow

Sub-Total :

**Zaid Kharif**

1.

Sub Total :

**Grand Total :**

1	2	3	4	5
---	---	---	---	---

**B. Rabi**

1. Wheat
2. Gram
3. Sarson/Toria/Taramjra
4. Barley
5. Fodder
6. Others (Specify)
7. Current fallow

Sub-Total

**Zaid Rabi**

- 1.
- 2.

Sub-Total :

Grand Total :

C—Canal, T—Tubewell, D—Desl, A—American.

**Block III****Cropping and Irrigation Pattern**

(In respect of Land Served by the Selected R.D.)

After Lining

Year 1985-86

Crops	Sown area (0.00 acres)	If Irrigated		
		Source of Irrigation	No. of waterings	Average time taken for each watering per acre
1	2	3	4	5

C T Both

**A. Kharif**

1. Maize
2. Paddy

D

1	2	3	4	5
3.	Sugercane			
4.	Cotton } D } A }			
5.	Fodder			
6.	Others (Specify)			
7.	Current fallow			
	Sub-Total ..			
<b>Zaid Kharif</b>				
1.				
2.				
	Sub-Total ..			
	Grand Total ..			
<b>B. Rabi</b>				
1.	Wheat			
2.	Gram			
3.	Sarson/Toria/ Taramira			
4.	Barely			
5.	Fodder			
6.	Others (Specify)			
7.	Current fallow			
	Sub-Total ..			
<b>Zaid Rabi</b>				
1.				
2.				
	Sub-Total			
	Grand Total ..			

**Block IV****Irrigation Potential Generated and Its Utilisation**

4.1. Timings for Watering (Weekly Wara Bandi during 1985-86).

(a) From \_\_\_\_\_ hours to \_\_\_\_\_ Hours

(b) Total time \_\_\_\_\_ (Hours) \_\_\_\_\_ (Minutes)

4.2. Area irrigated and man hours used before and after lining within the given allotted time:

Item	Before lining	After lining	Net gain
1	2	3	4
(i) Area irrigated (0.00 Acres)			
(ii) Man hours used			

4.3. Whether before lining the allotted time was sufficient to irrigate your land on the water course under study? If no, how did you manage to meet the situation?

(i)

(ii)

(iii)

4.4. Whether lining helped in providing additional water than before? Yes/No

If yes, how did you utilise additional water during 1985-86?

(i) Bringing more land under irrigation;

(ii) Providing intensive irrigation to the same piece of land;

(iii) Bringing more land under cultivation;

(iv) Dense Irrigation

(v) Others (Specify)

4.5. If no against 4.4. how did you manage to feed your land during 1985-86? Please elucidate.

## Block IV

## Irrigation Potential Generated and Its Utilisation

4.1 Wara Bandh during 1985-86  
Total time \_\_\_\_\_

4.2. Area irrigated, manhours used and expenditure on tubewell watering before and after lining within the given allotted time:

Item	Before lining	After lining	Net gain
1	2	3	4

(i) Area irrigated  
(0.00 acres)

(ii) Man hours used

(iii) Tubewell expenditure  
(Rs.)

(v) No. of waterings from tubewells.

4.3. Whether before lining the allotted time was sufficient to irrigate your land on the water course under study ?

Yes/No

If no, whether tubewell water was used ?

Yes/No

If yes, give expenditure incurred and number of waterings.

	<u>Kharif</u>	<u>Rabi</u>	<u>Total</u>
(i) Expenditure (Rs.)			
(ii) No. of waterings.			

4.4. Whether lining helped in providing additional water than before ?

Yes/No

If yes, how did you utilise additional water during 1985-86 ?

- (i) Bringing more land under irrigation;
- (ii) Providing intensive irrigation to the same piece of land;
- (iii) Bringing more land under cultivation;
- (iv) Dense irrigation;
- (v) Others (Specify)

4.5. If no against 4.4, how did you manage to feed your land during 1985-86 ?

If from tubewells, give expenditure and

number of waterings

<u>Kharif</u>	<u>Rabi</u>	<u>Total</u>
---------------	-------------	--------------

(i) Expenditure (Rs.)

(ii) No. of waterings.

#### Block V

##### Cost of Lining and Its Recovery

- 5.1. Were you taken into confidence by PSTC before the start of lining work ? Yes/No  
 If yes, did you sign any agreement in this regard ? Yes/No
- 5.2. Are you aware that PSTC has constructed the W.C.s on behalf of the Shareholders ? Yes/No
- 5.3. Are you aware that cost of lining including interest and expenditure incurred on repair/maintenance done by P.S.T.C. is to be repaid by the shareholders in 12 equal half yearly instalments to the Revenue Department ? Yes/No

If yes, give the following information :

- (i) Total recoverable amount Rs. \_\_\_\_\_
- (ii) Amount paid so far  
(Pl. Show receipts) Rs. \_\_\_\_\_
- (iii) Amount of instalment Rs. \_\_\_\_\_
- (iv) Year from which recovery started.



**Block VI****Repair and Maintenance**

- 6.1. Before lining who was maintaining the water course ?

If maintained by shareholders, the number of times, it was repaired in a month/season/year.

Number of persons engaged from your household per repair/maintenance.

- 6.2. Who maintains the lined course at present ?
- 6.3. Whether any Breaches occurred during the last three years ?

Yes/No

If yes, give the following details :—

No. of breaches occurred

Item	1985-86		1984-85		1983-84	
	Kharif	Rabi	Kharif	Rabi	Kharif	Rabi
1	2	3	4	5	6	7

- 6.4. Whether any repairs were done during the last three years Yes/No.

- 6.5. If yes, give the name of the agency and other details.

- 6.6. If voluntarily, give following details

Item	1985-86		1984-85		1983-84	
	Kharif	Rabi	Kharif	Rabi	Kharif	Rabi
1	2	3	4	5	6	7

- Amount spent on repairs (Rs.)
- Mandays spend for repairs

1	2	3	4	5	6	7
---	---	---	---	---	---	---

3. No. of days, the W.C. remained closed.

4. Estimated loss to crops (%)

### Block VII

#### Other Aspects

7.1. Are you satisfied with the work and materials used for brick lining ? Yes/No

If no, what are the short falls ?

(i)

(ii)

(iii)

(iv)

7.2. Whether any committee to supervise the work of lining was formed ? Yes/No

If yes, what were its functions.

(i)

(ii)

(iii)

7.3. Whether any Mortar Mate was appointed by PSTC? Yes/No

7.4. Are you aware that functionaries of PSTC

visited the site occasionally ? Yes/No

If yes, give details

7.5. Difficulties faced after lining and suggestions to improve.

A—Difficulties

B—Suggestions

## ANNEXURE :—SCHEDULE B

## Evaluation Study of 'Lining of Common Water Courses'.

## Schedule-B: Selected Water Courses

1. Circle/Division
2. Name of Distry/Minor of W.C.
3. R.D. No.....
4. Date of Commencement of Lining work
5. Date of Completion of Lining work.
6. Gross Area of Chak (GA)
7. Culturable Command Area (CCA)
8. Discharge
9. Type of outlet (Give detail)
- 9-A. Number of villages served by selected R.D.
10. No. of shareholders
11. Length of original water course
12. Length of water course lined
13. Length of water course left-unlined
14. No. of Jhallars operating in the chak
  - (i) Before lining
  - (ii) After lining
15. Type of lining (Give details)
16. Area irrigated

## A—Before Lining (0.00 acres) (Last three years)

Year	Kharif	Rabi	Total
1	2	3	4
19			
19			
19			

**B—After Lining (0.00 acres) (Last Two years)**

Year	Kharif	Rabi	Total
1	2	3	4
1984-85			
1985-86			

**17. Intensity of cropping and Irrigation. (0.00 acres)**

Item	Net area sown	Cropped Area	Net area Irrigated	Gross Irrigated Area
1	2	3	4	5
1. Before Lining	K:			
	R:			
2. After Lining	K:			
	R:			

**18. Whether PSTC under-took any repairs of the Lined water course under study during the last three years ?**

Yes/No

If yes, give the following details :

Item	1985-86		1984-85		1983-84	
	Kharif	Rabi	Kharif	Rabi	Kharif	Rabi
1	2	3	4	5	6	7
1. No. of times W.C. was repaired						
2. Amount spent on repairs (Rs.)						

**19. If no against item 18, did the W.C. not require maintenance/repair ?**

Yes/No

**20. If yes, against item 19, why PSTC did not undertake the requisite repair.**

## ANNEXURE :—SCHEDULE C

## Evaluation Study of 'Lining of Common Water Courses'

## Schedule-C: Opinion of Sarpanch

1. Name of the Village
2. Name of the Sarpanch/Lambardar/Member
3. Opinion about lining :

(i) Whether the shareholders were taken into confidence before lining ? Yes/No

(ii) Whether any agreement pertaining to recovery of the lined cost was signed with PSTC by the share-holders before lining ? Yes/No

(iii) Which type of lining is most appropriate in your opinion and why ?

(a) type

(b) type

(c) type

(d) Any other type

**Reason to support**

(iv) Are you satisfied with the type of lining undertaken by PSTC ? Yes/No

4. (i) Are you satisfied with the different types of materials used for lining ?

Material	Yes/No	If no, why
(a) Cement	Yes/No	
(b) Bricks	Yes/No	
(c) Bajri or concrete	Yes/No	
(d) Sand	Yes/No	
(e) Any other	Yes/No	

- (ii) Are you satisfied with the quality of Construction Work ? Yes/No  
 If no, give reasons :
- (i) Whether any committee amongst the share-holders, was formed to supervise the construction work of lining ? Yes/No  
 If Yes, what were its functions and whether did it fulfill the assignment.
5. (i) Is it in your knowledge that cost of lining is recoverable from share-holders. Yes/No  
 (ii) If yes, what is the mode of recovery ?  
 (iii) Are you satisfied with :—  
 (i) Amount of instalment of recovery Yes/No  
 (ii) Period of recovery Yes/No
6. (i) In your opinion, who is to maintain the lined water courses ?  
 (ii) Is it in your knowledge that the lined water Courses serving your village was repaired/maintained by any agency ?  
 (iii) Whether the said agency which undertook repairs did so satisfactorily ?
7. Difficulties faced in respect of lining:
8. Suggestions to improve the working of lining:

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ERRATA

<u>Page No.</u>	<u>Para No.</u>	<u>Line No.</u>	<u>Printed</u>	<u>Read as</u>
ii (Contents)	Annexures.	Last line	43-53	43-66
1	3	First	Kins.	Km.
4.	1.4	Seventh	ttate	state
22	1	Seventh	Lal-b	Lal-bai
26	Table 3.3	Second col.	opterated	operated
27.	3.4	First	relevent	relevant
30	1	Forth	ove	over
35	4.1	Fifth	benefici- arier	benefici- aries.
38.	2	Second	warer	water
38	5	Forth	discocharge	discharge.