

WORKING PAPER 34

Pakistan Country Series No. 10

# Proposed Business Plan for Pilot Farmer Organization

**Saeed Ur Rehman  
Mehmood UI Hassan  
Bakhshal Lashari  
Yameed Memon**



Working Paper 34

# **PROPOSED BUSINESS PLAN FOR PILOT FARMER ORGANIZATIONS**

**EXTENDED PROJECT ON FARMER MANAGED  
IRRIGATED AGRICULTURE IN LBOD PROJECT AREA  
OF SINDH PROVINCE**

*Saeed Ur Rehman*

*Mehmood Ul Hassan*

*Bakhshal Lashari*

*Yameen Memon*

**International Water Management Institute**

IWMI receives its principal funding from 58 governments, private foundations, and international and regional organizations known as the Consultative Group on International Agricultural Research (CGIAR). Support is also given by the Governments of Pakistan, South Africa, and Sri Lanka.

*The authors:* Saeed Ur Rehman, Senior Economist IWMI  
Mehmood Ul Hassan, Water Institutions Specialist  
Bakhshal Lashri, Senior Engineer  
Yameen Memon, Principal Social Scientist

Saeed Ur Rehman; Ul Hassan, M.; Lashari, B.; Memon, Y. 2001. *Proposed business plan for pilot farmer organization: Extended project on Farmer Managed Irrigated Agriculture in LBOD Project Area of Sindh Province*. IWMI working paper 34. Lahore, Pakistan: International Water Management Institute.

ISBN: 92-9090-464-X

Irrigation management / Privatization / Financing / Farmers' associations / Irrigated farming / Drainage / Income generation / Operation / Maintenance / Conflict / Monitoring / Farmer-agency interactions / Pakistan

Copyright © 2001, by IWMI. All rights reserved.

Please direct inquiries and comments to: IWMI 12 Km, Multan Road, Chowk Thokar Niaz Baig, Lahore 53700 Pakistan.

## TABLE OF CONTENTS

<b>ACKNOWLEDGEMENTS</b> .....	<b>IV</b>
<b>SUMMARY</b> .....	<b>V</b>
<b>1. INTRODUCTION</b> .....	<b>1</b>
1.1 Current Irrigation Facilities .....	1
1.2 Drainage Facilities.....	3
1.3 Tasks of Farmer Organizations .....	4
1.3.1 <i>Irrigation Management</i> .....	5
1.4 Need for the Business Plan.....	6
1.5 Objectives of the Business Plan.....	7
1.6 Preliminary Business Plans .....	7
1.7 Issues and Constraints of FOs.....	9
<b>2. FINANCIAL OBLIGATIONS AND SOURCES OF INCOME</b> .....	<b>10</b>
2.1 Financial Obligations .....	10
2.1.1 <i>Payments to Area Water Board (AWB)</i> .....	10
2.1.2 <i>Costs of Operating and Maintaining Irrigation Facilities</i> .....	10
2.1.3 <i>O&amp;M Cost for Drainage Facilities</i> .....	12
2.3 Revenue/Sources of Income .....	12
2.4 Current Revenue Assessment .....	12
2.5 Revenue Assessment and Collection Strategy .....	15
2.5.1 <i>Revenue Assessment</i> .....	15
2.5.2 <i>Revenue Collection</i> .....	15
2.5.3 <i>Surcharge</i> .....	15
2.6 Other Sources of Income.....	16
<b>3. CONFLICT RESOLUTION AND PENALTIES</b> .....	<b>17</b>
<b>4. FINANCIAL RECORD KEEPING</b> .....	<b>18</b>
<b>5. REVISION OF BUSINESS PLANS</b> .....	<b>19</b>
<b>6. SUMMARY AND CONCLUSIONS</b> .....	<b>20</b>
<b>REFERENCES</b> .....	<b>22</b>
<b>ANNEXTURES</b> .....	<b>23</b>

## **ACKNOWLEDGEMENTS**

This paper is based on field studies conducted by IWMI as part of its larger research program, “Extended Project on Farmer Managed Irrigated Agriculture in LBOD Area of Sindh Province,” funded by the Government of Sindh under the National Drainage Program. This donor support is gratefully acknowledged.

The authors owe thanks to the field team members of Mirpurkhas, Sanghar, Nawabshah and Dighri who were involved in the data collection for their contributions in pilot testing Farmer Organizations (FOs), which would have not been possible without their untiring and endless efforts. Their efforts are gratefully appreciated.

IWMI staff has been successful in organizing 13 Farmer Organizations, which are ready to takeover control of irrigated command areas of these channels. This is a beginning of a new era in the history of Sindh Province and these farmers have to go a long way to make this business sustainable and beneficial. We are thankful to all the farmers of these pilot areas for their cooperation.

The authors specially thank to Ms. Shahnaz Akhtar for formatting and Ms. Sofiya Saeed for editing the report.

## SUMMARY

The approaches to irrigation management transfer and its financing needs must be understood in irrigation development program in a certain area. The effects of financing policies depend on the Farmer Organizations who control the resources obtained from the beneficiaries with full or partial financial autonomy. With financial dependence, Farmer organization has no control over any funds collected from the water users, and is dependent on the resources allocated to it through the government procedures.

For the past several years, the top priority of Sindh Irrigation and Drainage Authority (SIDA) has been on how to organize farmers at the secondary canal level. SIDA is working on issues related to irrigation management transfer especially on how to give legal authority in managing parts of the irrigation system and on how to share the irrigated cropland taxes. With these legal authorities, farmers are ready to takeover the irrigation system from the Government.

This document provides guidelines in general to the Farmer Organization (FOs) on how to get economic viability and how to carry out effective monitoring through an accountability mechanism. The proposed business plan is an important document that could be helpful in developing the future action plan after irrigation management transfer takes place. The potential for implementing an effective action plan would depend on an operation plan indeed.

Farmer Organizations have been provided with guiding principles to implement tasks of water supply and distribution, operation and maintenance, assessment and collection of water rates and financial record keeping. The procedure for the revision of the proposal has been laid down for efficient irrigation and drainage management. It has been emphasized that scrutiny of expenditures should be done carefully.

Finally, revision of the proposed business plan has been suggested from time to time depending upon the needs when actual business takes place. For determining O&M expenditures, assessment of “requirements” for operating and maintaining physical structures in the irrigation and drainage facilities would be needed every year after the IMT.

## 1. INTRODUCTION

The Irrigation System of Pakistan is the largest integrated irrigation network in the world. Despite heavy investments in irrigation infrastructure by the government, the annual Operation and Maintenance (O&M) allocations for the Provincial Irrigation Departments (PIDs) gradually became insufficient. The O&M became increasingly ineffective due to insufficient funds and changing socio-economic conditions. Increases in O&M costs, low assessment of water charges and low recovery rates, all combined to form this imbalance in the irrigation sector (**WSIP, 1990**). To overcome the poor performance of the canal irrigation system as compared to its expected return on investment in irrigation, the World Bank proposed a reorganization of the whole irrigation sector in the year 1994 and put forward the ideas of participatory irrigation management and decentralization. These proposed reforms started with the enactment of new laws commonly known as the Provincial Irrigation and Drainage Authority (PIDA) Acts of 1997 (**World Bank, 1994**). Following this proposal, the Government of Sindh decided to initiate pilot projects at distributary level by involving the farmers in managing irrigation and drainage systems. The Department of Agriculture (DoA) Sindh requested International Water Management Institute (IWMI) to assist in the social organization of Farmer Organizations (FOs) at distributary level to implement this pilot project.

Since July 1995, 13 Farmer Organizations have been formed at distributary level. Farmers of all outlets of these distributaries were assisted to organize into Watercourse Associations (WCAs) with the help of experience gained on first three pilot channels namely Dhoro Naro, Heran, and Bareji. The success of these reforms with the help of farmers' organizations to manage parts of the irrigation system is heavily dependent on financial viability. This requires an accurate assessment of crops and collection of appropriate water charges for operation and maintenance (O&M) costs of irrigation and drainage facilities in the distributary command areas. To assist FOs in managing the financial liabilities of the farmers, including O&M costs of the distributary command areas and payments to the Sindh Irrigation and Development Authority (SIDA), this business plan has been drafted to provide the financial guidelines. The proposed business plan could be adopted and later may be modified by any FO, to derive financial and economic motive, by participatory irrigation management from their collective action.

### 1.1 CURRENT IRRIGATION FACILITIES

The waters of the Indus River feed the irrigation system of Sindh. There are three barrages, fourteen main canals, 118 feeders and branches and 1, 163 distributaries and minors. The completion of the Sukkur Barrage in 1932 and construction of the Rohri, Nara and Jamrao Canals allowed River Indus water to be diverted for perennial irrigation of large areas of the province. Later on with the construction of Kotri Barrage in 1955 and Guddu Barrage in 1962, canal irrigation was supplied to remaining areas. It has been assessed that canal network in the Sindh Province supplies water to an area of about 13.615 million acres. The length of the main canals is

about 2, 242 miles, branch canals are about 1, 515 miles and secondary canals (distributaries/minors) are about 8, 049 miles long. The overall length of the conveyance system is about 11, 846 miles.

All of the 13 pilot sites are provided irrigation water from three main canals namely Nara, Jamrao and Rohri, and all of them off take from the left side of the Indus River just upstream from Sukkur Barrage. Nara Canal is an excavated channel from the Indus River to intercept the old Nara River; Jamrao Canal off takes from this river channel at RD 129 (129,000 feet) downstream from the head regulator for Nara Canal. Dhoro Naro irrigation channel receives water from Gajrah Branch of Nusrat Canal, which off takes from Rohri Canal.

The irrigation water is distributed through a number of distributing points. The hierarchy of channels in terms of size in descending order is: main canal, branch canal, distributary, minor and watercourses. In the Sindh Province, the term “minor” is often used to mean a small distributary off taking from a main or branch canal. Actually, any secondary canal off taking from a distributary is referred to as a minor. Since the FOs are being organized on distributary channels, therefore, general characteristics of the pilot distributaries and minors are presented in Table 1.1.

The smallest command area in the pilot sites is of Mohammad Ali Minor with a CCA of 3, 833 acres and having only 10 outlets (minimum), whereas the Dighri Distributary has the largest command area of 31, 627 acres and maximum outlets with a number of 72. Similarly, the discharge ranges between 10.90 to 101.80 cusecs for all the pilot channels.

**Table 1.1. Characteristics of the pilot distributaries/minors.**

<b>Name of the Pilot Distributary/Minor</b>	<b>CCA (acres)</b>	<b>Design Discharge (cusecs)</b>	<b>Design Cropping Intensity (%)</b>	<b>Length of Channel (Km)</b>	<b>No. of Outlets</b>
Bareji	13, 049	41.50	81	12	24
Sanhro	15, 367	53.80	81	10	25
Belharo	17, 077	58.60	81	13.87	32
Mirpur	16, 218	63.80	81	14.80	53
Dighri	31, 627	101.80	81	29.35	72
Potho	8, 063	30.00	81	10.35	19
Baghi	8, 128	28.00	81	7.60	14
Khatian Tando	11, 373	33.00	81	12.80	27
Heran	15, 410	62.50	81	10.60	31
Muhammad Ali	3, 833	10.90	81	4.67	10
Rawtiani	9, 026	29.00	81	8.83	19
Tail	8, 286	27.00	81	5.15	14
Dhoro Naro	13, 382	51.60	81	9.84	25

Source: Sindh Irrigation and Development Authority (SIDA).



## 1.2 DRAINAGE FACILITIES

Due to flat topography of Sindh Province, natural drainage is slow and over the years, traditional flood irrigation practices resulted in a steady rise in water table. Groundwater levels, which were lower than 12 feet in 1930's, had risen to less than 4 feet over large areas by 1980s. The rising watertable resulted in water logging of agricultural lands. High evaporation rates with low annual rainfall flushed the salts from the soil profile, causing widespread salinization. As a result, agricultural production declined in large areas of Sindh and land became abandoned in most of the areas.

Due to Government's efforts, the Left Bank Outfall Drain (LBOD) Project-Stage 1 commenced in 1986 to control water logging and salinity by draining waterlogged soils in the districts of Nawabshah, Sanghar, and Mirpur, on the left bank of the Indus River. LBOD installed 2,000 tube wells to lower the watertable and to discharge the drainage saline effluent to the sea via a network of about 2, 000 kilometers of surface drains. Table 1.2 provides information on various components of the LBOD Project.

**Table 1.2. Components of the LBOD Project.**

Description	Nawabshah	Sanghar	Mirpur	Total
Area Served (CCA) 1.270 M. Acres	0.550	0.362	0.358	1.270
Spinal drain (km) KPOD & DPOD	-	-	-	285
Tidal Link (km)	-	-	-	42
Surface Drains (km)	628	554	441	1623
Tile Drains (km)	-	-	1500	1500
Inceptor Drains	154	141	-	295
Standard Tubewells	275	597	769	1641
Rehabilitation of Tubewells	28	-	-	28
Scavenger Tubewells s	189	175	-	364
Transmission Lines-11kv (km)	1313	1440	1380	4133
Distribution Transformers	680	745	860	2285

Source: WAPDA-Left Bank Outfall Drain (LBOD) Project, Sindh.

Pilot areas where FOs were organized, three types of drainage facilities were found i.e. vertical drainage (saline and scavenger tube wells), subsurface (tile) drainage and surface drains. There are two types of drainage facilities in the Bareji Distributary command area. About 70 percent of

the Bareji command area is underlain by subsurface (tile) drainage. However, the pumps at thirteen sump houses are only partially operated but these facilities have the capacity of providing drainage in the future. The details of the tube wells (saline, scavenger), sump houses (tile) and surface drains for the pilot areas are given in Table 1.3.

**Table 1.3. Drainage facilities in pilot areas of Sindh Province.**

Name of the Pilot Channel (Disty/Minor)	Tubewells		Surface Drains				
	No.	Type	No.	Design discharge (cfs)	Total length (km)	Length within command area (km)	No. of drains <15 cfs
Heran	14	Saline	4	96.6	20.73	9.75	-
	3	Scavenger		17.60	7.10	3.76	
				79.50	23.29	3.66	
				43.90	11.30	11.21	
Rawtiani	15	Saline	1	5.00	3.03	3.03	1
Mohammad Ali	2	Saline	-	-	-	-	-
Tail	2	Saline	-	-	-	-	-
Bareji	13	Sump (Tile)	5	25.6	7.00	4.7	-
				16.5	5.00	1.0	
				NA	30.97	12.98	
				NA	4	4	
				NA	NA	10	
Dhoro Naro	8	Saline	2	7.90	5.70	5.18	1
				132.00	146.6	8.53	

Source: WAPDA, Left Bank Outfall Drain (LBOD) Project, Sindh.  
NA: Not Available.

In the pilot area, vertical drainage systems have been installed in 6 sites to lower groundwater levels. Similarly, scavenger tubewells have been provided which have two separate discharge pipes, one for deeper saline water and other for skimming shallow fresh groundwater.

### 1.3 TASKS OF FARMER ORGANIZATIONS

For managing parts of the irrigation and drainage systems on viable basis, following tasks will play a role in efficient working of the FOs:

### 1.3.1 Irrigation Management

- **Reliable Water Supply:** The most important task of FOs would be to obtain a reliable water supply instead of getting more water. This would require an efficient flow monitoring system throughout agricultural seasons.
- **Equitable Water Distribution:** Once the water enters through the gate into the distributary, the first immediate task would be to maintain high degree of equity in water distribution to the best possible level among the outlets of the respective distributary command area as per distribution criteria. FO is required to keep all hydraulic structures in functional condition, check the discharge rating of each outlet, and if necessary to make structural adjustments like resetting the B-Y dimensions and crest elevation for the affected outlets.
- **Efficient O&M of Distributary/Minor:** For efficient running of the system, FO would be responsible to carry out annual, seasonal and routine maintenance of the channel, which includes regular de-silting, repair of hydraulic and non-hydraulic structures, embankment and weed clearance.
- **Financing Irrigation Services:** Legally, FO has to provide for the O&M of the distributary/minor with the help of the Watercourse Associations (WCAs) at the tertiary level. The assessment of the water charges, dues, fees, surcharge in case of defaulters, levy of charges for additional services, management service cost and collection of revenues is formally a responsibility of the FO.
- **Appropriate Staffing:** SIDA rules and regulations make it legally possible to employ a suitable number of technical and non-technical staff for the operation and maintenance of the system and assessment and collection of water charges. Therefore, FO will have to appoint appropriate staff for operation and maintenance of the channel for assessment and collection of water and other charges.
- **Water related Conflict Resolution:** Disputes relating to water resources such as problem of water stealing, controversy over labour contribution, sharing of water between old and new users, inclusion of unirrigated land, revenue assessment and collection may arise as serious problems within the jurisdiction of an FO. It would be the responsibility of the FO to resolve such conflicts by maintaining harmonious relations between the FO and farmers. The method of settlement of disputes may be adopted with the help of the concerned WUA by involving local influential persons. It should be ensured that chances to file cases in the SIDA or state courts should be minimal.
- **Drainage Tubewells:** To benefit significantly from LBOD drainage facilities, FOs have to take a leading role in operating and maintaining the installed drainage facilities (tubewells). In many locations of the pilot area, the groundwater levels are too high such as in the Heran and Bareji Distributary command areas, to control the depth to water table, tubewell operations would be required. FO will be playing a key role to get the benefits associated with the available LBOD drainage facilities.

- **O&M of Surface Drains (<15 cfs):** The Farmer Organization (FO) for each pilot distributary will be responsible for the operation and maintenance of surface drains which have design discharge less than 15 cubic feet per second (cfs). Each FO has to devise a maintenance program and operational plan with particular emphasis on combined management of the irrigation and drainage facilities.

#### **1.4 NEED FOR THE BUSINESS PLAN**

Fundamentally, every business has an economic purpose and all efforts should be made to bring a business into existence based on careful investigations to determine:

- i) Its viability
- ii) The amount of funds required to start it and continue it on sound basis
- iii) Procurement of properly qualified associates;
- iv) Necessary contracts and procurement of option and charter
- v) The methods through which necessary funds for the business shall be raised
- vi) The actual raising of funds

Thus, main task in business relates to financing and indeed, financing activities would be directed to devise the plan and methods of raising necessary funds for starting and carrying out the business. Financing an organization involves raising funds for three distinct purposes:

- 1) Financing during the organization period which means meeting the cost of all intangible property such as expenses on legal, economic and accounting advice on the project from the very start until the time when the business is ready to begin actual operation
- 2) Financing the actual construction, which means meeting the cost of all tangible property. It covers the cost of real estate, labour, materials, contractor's fee, machinery, furniture, fixture equipment, stationary etc.
- 3) Financing the business itself means providing the funds needed over and above the actual receipts of the business to operate it until such time as the receipts are sufficient to cover all outgoing expenses.

Hence, a comprehensive business plan is an important requirement of any FO for irrigation system management. It would primarily assist in shift in responsibility and authority for O&M, revenue assessment and collection for managing the irrigated agriculture from the government to the farmers.

## **1.5 OBJECTIVES OF THE BUSINESS PLAN**

Assessment of financial obligations is usually based on either cost or benefit standard. Enforcement of the rules for water allocation, O&M, payment of charges and taxes is critical to the long-term sustainability of financing system. But effective use of irrigation water charges to ensure efficient irrigation business is the prime objective of any FO in the pilot areas. Therefore, the main objective of writing this plan is to provide guidelines to FOs in gaining financial viability while they manage parts of the irrigation system.

The specific objectives of this business plan are:

- To assist FOs in identifying the O&M costs of the irrigation and drainage facilities for allocating resources to improve the irrigation service at distributary/minor level;
- To provide guidelines to FOs in the assessment and collection of water charges and expected sources of income for financing irrigation services in the pilot areas;
- To assist in assessing the financial obligations of FOs
- To suggest ways and means for financial autonomy of the FOs remaining within the specified rules and regulations of SIDA.

## **1.6 PRELIMINARY BUSINESS PLANS**

Any method of financing irrigation involves collection of revenue from a large number of farmers and requires enough resources for the assessment and collection of these revenues. In Sindh Province, a special revenue group is assigned to assess water charges. SIDA is fully responsible for this work and yet has minimum interaction with the farmers other than pilot areas.

IWMI and Agriculture Department of the Government of Sindh designed an action research program for three pilot distributaries in Sindh. They organized one-day workshop on 26 November 1995. The three pilot distributaries selected were Bareji in Mirpur Khas, Dhoru Naro in Nawab Shah and Heran in Sanghar districts. During the project period, the irrigation facilities were field evaluated, but not the drainage facilities. An initial farm survey was conducted during the Rabi 1996-97 season by IWMI field staff and was reported by Sohani (1997). This was followed by another farm survey during Kharif 1997 and watercourse command areas were the basis for analysis. In these surveys, farm income and farm revenues analysis was carried out. The analysis was reported in the Preliminary Business Plan for each of the pilot distributary. Table 1.4 provides information about the farm income for the three pilot distributaries. The farmers of Heran Distributary command area have the lowest farm income that is Rupees 6, 705 per cropped acre, whereas farmers of Bareji Distributary have double of this amount, which is Rupees 13, 445 per cropped acre.

**Table 1.4. Net annual farm income analysis of the three pilot areas.**

Pilot Distributary	Dhoro Naro		Heran		Bareji	
	Totals		Totals		Totals	
	Per Cropped CCA	Per CCA Acre	Per Cropped CCA	Per CCA Acre	Per Cropped CCA	Per CCA Acre
Gross Revenue (Rs.)	16, 115	8, 905	17, 202	10, 396	23, 397	10, 805
Gross Input Costs (Rs.)	7, 841	4, 330	9, 964	5, 981	9, 408	4, 291
Total Taxes (Rs.)	552	304	533	320	543	248
Total Expenditure (Rs.)	8, 392	9, 634	10, 497	6, 301	9, 951	4, 539
Farm Income (Rs.)	7, 723	4, 270	6, 705	4, 095	13, 445	6, 266

The farmers of Dhoro Naro Distributary have farm income 15 percent higher that is Rupees 7, 723 per cropped acre. If we make comparison in terms of acres of CCA, Dhoro Naro Distributary is only 4 percent greater than Heran Distributary, whereas Bareji is 50 percent greater.

All of the three Preliminary Business Plans also provide information on the gross revenue for the watercourse command areas in each pilot distributary. For the farm income analysis, data were collected for two watercourses of each distributary which were 6R and 10L of Dhoro Naro, 4R and Khadwari Minor's 2R of Heran Distributary, 5L and 7R of Bareji. The analysis shows that for the Heran and Bareji distributaries, the maximum gross watercourse revenue is more than double the minimum gross watercourse revenue. However, when net farm income per cropped acre was compared, the differences are not so great.

In the Preliminary Business Plans, operation and maintenance (O&M) for a Water Users Federation was estimated including the establishment costs and capital costs. Also, based on the Maintenance Plan for each pilot distributary, an annual maintenance budget was calculated. Table 1.5 shows the establishment and maintenance costs for each pilot distributary which were calculated based on annual costs in rupees per CCA acre.

**Table 1.5. Estimation of O&M costs of WUF for each pilot distributary.**

Description	Annual Costs in Rupees Per CCA acre		
	Dhoro Naro	Heran	Bareji
Establishment Costs	36.8	34.5	40.6
Maintenance Costs	19.9	25.9	19.4
Total O&M Budget	56.7	60.4	60.0

The establishment and maintenance costs for each pilot channel vary only from Rs.56.7 to Rs.60.4 per CCA acre per year. Average O&M costs were Rs.59 per CCA acre per year. When we subtract this amount from the total, irrigation system costs are Rs.108 per CCA per acre per year, which means that Rs.49/CCA acre/year should be paid to the area water board, and each

WUF should retain Rs.59/CCA acre/year. These costs were quite close to what farmers were paying at that time. The analysis showed that combined sum of *abiana* plus the money paid illegally for water varied from Rs.88.11 to 111.89 per CCA acre for the three pilot distributaries, with average being Rs.100 per CCA acre.

## **1.7 ISSUES AND CONSTRAINTS OF FOS**

In this section, it is discussed how Irrigation Management Transfer (IMT) intervention in parts of irrigation systems in Sindh affected the farming community in the pilot sites. The key issue is how to manage water resources in an efficient, productive, sustainable, and equitable way. The common problems and concerns that FO may face during the turn over are described below:

1. The decisions taken jointly by the SIDA and FO may face problems during the implementation period because enforcement of the rules for water allocation, adjustment of outlets etc., is a critical matter and disputes between FO and water users may arise over water distribution.
2. While implementing participatory approach to achieve most of its intended targets, the most important issue would be recovery of water charges because already cases exist where cost recovery is a big problem. Hence, collection of water rates may become a problem in the pilot areas. Therefore laws should empower FOs to impose penalties in such cases because collection is not linked with service delivery.
3. Another constraint FO may face is the timely acquisition of its share, which is 40% of the water charges. According to present rules, all the money will be deposited to SIDA's account and later on FO will get its share. Therefore, timely transfer of money will be a problem.
4. In present circumstances, financial management capacity of FO is limited. Because spending of available monetary funding, and accountability system could be a big constraint for FO. They would require an internal and external monitoring system otherwise there is a danger of weak organization.
5. In the local social system, elected members would be required to execute a voluntary service to a certain FO; there are chances that some of them may loose their interest in the course of time. This can be a problem for FO to keep the long-term interest of WCA elected members for sustainability of the organization. In the local social setup, farming community may divide into groups and often-elected groups depress opponents.

## **2. FINANCIAL OBLIGATIONS AND SOURCES OF INCOME**

To meet its financial obligations, farmer organizations should levy charges for all types of water-related services. The cost of operating irrigation and drainage systems is the basis commonly used for determining service charges in the water sector throughout the world. Therefore, the cost of a service delivery can be determined easily when services are rendered by a single farmer organization. Therefore, a realistic assessment should be made before launching a transfer program.

### **2.1 FINANCIAL OBLIGATIONS**

In accordance with Sindh Irrigation and Drainage Authority Act 1997, farmer organizations are liable to meet some financial obligations while managing parts of irrigation system. They are discussed in detail below:

#### **2.1.1 Payments to Area Water Board (AWB)**

According to the act, FO shall remit to AWB, the amount required to meet the costs for the management and operation of the canal system supplying water to the area under the jurisdiction of FO. The act empowers FO to keep operating and reserve funds under interest bearing fixed deposits in a Bank. FO is bound to spend interest accrued from the fixed deposit amount on operation and maintenance including allied activities of the irrigation system.

After careful evaluation and estimation SIDA and pilot FOs have to reach an agreement according to which all the sums receivable for water charges in lieu of delivery of irrigation and drainage services to agricultural/non-agricultural users will be divided between the SIDA and FO. Whatever income comes from *abiana*, development *cess* or drainage *cess* will be divided with a ratio of 60:40. Which means 60% of the total revenue from the sources will be the share of Area Water Board and 40% share will be retained by a farmer organization.

#### **2.1.2 Costs of Operating and Maintaining Irrigation Facilities**

For the preparation of an annual O&M budget for its irrigation facilities, FOs would need guidance because the size of the O&M budget will thus affect the revenue available to farmer organizations. IWMI Sindh team has prepared recently a detailed document within a clearly defined framework established by the Government of Sindh which is based on actual walk thru surveys in the field, on-site inspections of the hydraulic/non-hydraulic structures and actual staffing needs. In this estimation, on the basis of yardsticks, the total cost has been estimated for O&M expenditure. The main components of O&M estimates are described as below:

##### ***2.1.2.1 Bank work***

In this item inspection/non-inspection costs have been estimated keeping in view the wear and tear of banks, cutting of banks due to flow variations, cattle tress passes, weather action and



breaches. Following the yardstick, the total cost per kilometer has been estimated at Rs. 4,020/-. The details of the estimation work are given in Annex-1.

#### ***2.1.2.2 Silt Clearance***

Continuous irrigation supply and velocity on hard soils and flat gradient of Sindh silt deposit is a problem. Hence, desilting cost was calculated at Rs. 4,102/km. Second costs for the construction of groynes, weed clearance and canal trimming were worked out at Rs.205/km. Therefore, total cost for silt clearance comes to Rs.4, 307/km. All details are available in Annex-2.

#### ***2.1.2.3 Maintenance and Repair (M&R) of Structures***

In this analysis, damage to road culverts, bridge parapets, cross regulators/outlet structures, repair to structure floor and repairs of gate and gearing machinery were estimated at Rs.2, 503/km. Annex-3 provides the detailed analysis of M&R.

#### ***2.1.2.4 Other Operational Cost***

For the operation of pilot distributary/minor, first the staffing requirement for a FO has been estimated keeping in view the staff strength under present conditions and then, for running and maintaining the FO office cost has been worked out which totals to Rs.14,845/km. The details are appended in Annex-4.

#### ***2.1.2.5 Total O&M Cost***

Total cost to operate and maintain the pilot channels have been worked out by adding the costs related to bank work, silt clearance, M&R of structures and other operational costs. The estimated total O&M cost for per kilometer of any distributary or minor comes out as Rs.25, 675/-.

#### ***2.1.2.6 Transaction Cost***

FO members would be closely interacting with the AWB/SIDA staff for smoothly running the pilot distributaries/minors. To meet the traveling costs, photocopying, sketching, drafting of various forms etc. 1% of the total O&M cost is suggested for making provision while preparing annual budget estimates for any distributary and minor.

Considering this principle, the transaction cost can be made available from own resources and by this way FO would be in good shape to meet any business related to respective irrigation channel in pilot areas.

#### ***2.1.2.7 Cost Reduction Measures***

Any FO may adopt various costs cutting measures depending upon the degree of cooperation extended by the water users of any distributary/minor in the pilot areas. This would need resource mobilization. Resource mobilization is the most significant and potential area where farmer's participation could be achieved on voluntary basis. For cost reduction, mobilization of manpower and tools might be available for bank work and silt clearance. There are the two

potential items where a FO will be able to save the money but contributions by farmers would vary from one irrigation channel to other.

### **2.1.3 O&M Cost for Drainage Facilities**

To assess the current needs for drainage facilities in the pilot areas is a hard part because it is not yet clear that who will manage the vertical drainage and scavenger tubewells. Therefore, to assess the mechanical costs for making tubewells operational, working hours, repairs and maintenance costs of machinery and as well as of the allied channels which discharge effluent into the nearby surface drains, a sound working would be required. Thus, it is suggested that these cost estimates should be deferred for the time being due to the unclear situation. Since no drainage cess has been finalized and also drainage O&M is not taking place in the pilot areas, thus, as a notion, calculations have been made but these have not been accounted for analysis purpose.

As it has been already decided that surface drains of capacity less than 15 cubic feet per second discharge will be operated and maintained by the respective FOs. From the currently available data about the drainage facilities, only the FOs of Dhoro Naro Minor and Rawtiani distributary would be required to manage surface drains which are below 15 cfs discharge. It is suggested that all of the bank work, weed cleaning and drain maintenance work should be carried out by the farmers on participatory basis to minimize management costs. And for maintenance and repair (M&R) of the structures, a provision of 25% of the Irrigation facilities M&R cost should be made to meet this cost.

Considering the present M&R cost estimates, this amount would be Rs.949/km of the drain length. For the purpose of analysis this cost has not been used.

## **2.3 REVENUE/SOURCES OF INCOME**

An important principal underlying the financing of irrigation and drainage services is based on the framework of prices which are established by the government policies and rules and secondly water charges should be linked to benefits received and the cost of service delivery. In the Sindh Province, the main mechanism of direct charges for irrigation facilities is on per acre basis for agricultural users. Second source of income is from charging water for nonagricultural purposes and revenue from the interest of deposits in the banks plus the income from the sale of assets within the jurisdiction of irrigation authorities.

## **2.4 CURRENT REVENUE ASSESSMENT**

For the purpose of preparation and execution of the IMT, the possible revenue from water charges has been worked out on the basis of current water rates. For the Rabi 1996-97 and Kharif 1997 seasons, a Primary Business Plan has been prepared for each of the pilot distributary. The data from these three Business Plans of Heran, Dhoro Naro and Bareji distributaries have been used as the basis for assessing the income from water charges. Because gross watercourse revenues were

calculated from the original data collected from the field. The actual cropped area and *Abiana* assessment for the three pilot distributaries is given in Table 2.1. On the basis of these figures per acre *abiana* have been calculated which has been used to estimate the revenue from water charges for the case of all the pilot distributaries (**Government of Sindh, 2001**). Here, the assumption has been made that cropping pattern on other pilot distributaries and minors will be same as prevailed on three pilot distributaries namely Heran, Bareji and Dhoro Naro. It has been reported that Heran Distributary has annual cropping Intensity of 121.32%, Dhoro Naro with 113.63, whereas Bareji has only 90.59 percent (**Pirzada et al, 1997; Khanzada et al, 1997; Sial et al, 1997**). Therefore, on average 109% cropping intensity has been considered for the calculation of *Abiana* for all the pilot distributaries. The cropping intensity has been taken from the referred reports and is based on actual surveys in the field. Since *Abiana* is levied on the actual cropped area basis, therefore, cropping intensity has been taken from the actual reported data. The higher cropping intensities have been due to rise in watertable after operation of canals which has reduced the crop water requirements resulting in more crops from the same available quantity of water.

**Table 2.1. Assessment of abiana on per acre basis pilot from three distributaries.**

Distributary/ Minor	Rabi 1996-97		Kharif 1997		Total	
	Cropped Area (Acre)	Abiana (Rs.)	Cropped Area (Acre)	Abiana (Rs.)	Cropped Area (Acre)	Abiana (Rs.)
Heran	8, 513	429, 314	9, 323	801, 871	17, 836	1,231,185
Bareji	4, 970	205, 590	5, 684	535, 689	10, 654	741, 279
Dhoro Naro	7, 894	413, 181	6, 869	600, 913	14, 763	1, 014, 094
Total	21377	1048085	21876	1938473	43253	2986558
Abiana per Acre (Rs.)	49		89		69	

The above table shows that on average Rupees 49 *abiana* was assessed on per acre basis for the Rabi season, whereas Rupees 89 per acre for Kharif season. On average annual *abiana* rate comes out Rupees 69 per acre for the three pilot distributaries (**Pirzada et al, 1997; Khanzada et al, 1997; Sial et al, 1997**). Thus, *abiana* rate of Rs.69/acre has been used to assess the revenue for the cropped areas in pilot areas. This method has been employed only to make estimates prior to the irrigation management transfer.

The financial analysis for the 13 FOs has been given in Table 2.2, which indicates positive balance for 10 FOs. In this analysis, the assessment of drainage cess and O&M costs for the case of surface drains have been left open due to the non-availability of the actual data pertaining to pilot areas. Thus farmers will have to make careful assessment of operation and maintenance costs and as well as the assessment of the actual benefiting CCA from these surface drains. This is the hard part of the Irrigation and Drainage Transfer and will be the responsibility of the drainage committee(s).

**Table 2.2. Assessing the Viability of FOs in pilot areas of Sindh.**

Distributary/Minor	FO Share in Revenue (Rs.)	Total O&M Cost		Balance
		Irrigation	Drainage	Amount (Rs.)
Heran	504,709	299,371	-	205,338
Bareji	358,722	338,910	-	19,812
Dhoro Naro	412,899	277,906	-	134,993
Sanhro	462,301	282,425	-	179,876
Belharo	513,744	391,723	-	122,021
Mirpur	487,902	417,989	-	69,913
Dighri	951,467	828,917	-	122,549
Potho	242,567	277,236	-	-34,669
Baghi	244,523	214,643	-	29,880
Khatian Tando	342,145	361,504	-	-19,359
Muhammad Ali	115,312	123,702	-	-8,390
Rawtiani	271,538	249,381	-	22,157
Tail	249,276	145,449	-	103,827

On the other hand, three FO have shown a negative balance that ranges between rupees 8,390 and 34,669. The analysis of the discharge and length of the distributary with respect to balance of FOs indicates a clear relationship. The ratio between discharge of the irrigation channel and its length shows that discharge varies with respect to distributary or minor length with a ratio of 2.37 to 5.90. The data presented in Table 2.3 depicts that irrigation channels those have less than 3 cusec discharge per kilometer length shows a negative balance for the respective FOs. Therefore, on the prevailing rate of Abiana, O&M costs cannot be met by these FOs. As the Government is progressively increasing the Abiana on annual basis, therefore, improvement in funds availability will facilitate FOs for being on sound footing in running the irrigation system.

**Table 2.3. Relationship Between Discharge and Length of Irrigation Channels With Respect to Financial Gains of FOs in Pilot Area.**

Distributary / Minor	Discharge in cfs	Length in Kilometers	Ratio of Discharge / Length	Financial Balance in Rs.
Muhammad Ali	10.90	4.67	2.33	-8,390
Khatian Tando	33.00	12.80	2.58	-19,359
Potho	30.00	10.35	2.90	-34,669
Bareji	41.50	12.00	3.46	19,812
Rawtiani	29.00	8.83	3.28	22,157
Baghii	28.00	7.60	3.68	29,880
Mirpur	63.80	14.80	4.31	69,913
Tail	27.00	5.15	5.24	103,827
Belharo	58.60	13.87	4.22	122,021
Dighri	101.80	29.35	3.47	122,549
Dhoro Naro	51.60	9.84	5.24	134,993
Sanhro	53.80	10.00	5.38	179,876
Heran	62.50	10.60	5.90	205,338

## **2.5 REVENUE ASSESSMENT AND COLLECTION STRATEGY**

### **2.5.1 Revenue Assessment**

FO should obtain and maintain the record of land holdings, cultivators and ownership and ownership record should be compiled from the record of Revenue Department. Land record will be helpful in water allocations, water distribution to the new entrants. For the cases where changes occur, new and old record must be maintained.

Once record has been established, a FO member or his nominee shall carry out the crop assessment survey for each season that is kharif and Rabi at appropriate time. Fallow area and area with damaged crop must be noted separately to avoid any disputes on assessment. After the completion of the survey, a summary statement should be prepared and treasurer of the FO must check the assessment lists and its summary sheet. The assessed area should be compared with the total distributary or minor area to avoid and misconceptions.

Currently, the revenue staff of the SIDA assess crops on Deh basis and in several cases these Deh comes under the command area of more than one canal. Since the in pilot areas, irrigation allocations are made on the basis of outlet command area, a immediate shift would be required necessarily for the assessment and collection from Deh level to Watercourse command level in the pilot distributaries.

### **2.5.2 Revenue Collection**

A staff member should prepare a bill on the basis of crop assessment survey by applying the prevalent water rate in the name of each water user. The crop assessment must be completed in accordance with the notified water rates by the SIDA. Any claims for the remission either partial or full on the basis of crop failure must be received by the FO and may be examined by the President to avoid any dispute. On the verification of the President, Committee should grant any concession or remission. In case of any adjustment in the bill, revised bills should be issued.

For depositing the full amount shown in the bill, the committee of farmer organization should open an account in the Bank and FO should keep record of the collections. Assessment, collection and record maintenance is only the responsibility of the FO and they should have control in it.

### **2.5.3 Surcharge**

Whenever an assessed amount is paid after the due date, a surcharge should be levied on the defaulters and like energy/electricity bills, these should be notified on the bills. FO should decide the rate of surcharge to be imposed before the end of the season.

The billing exercise must be completed before the start of harvesting season and there should be deadline for issuing these bills. Rules should be framed to tackle all complaints regarding assessment, payment and proper investigation of such cases.

## **2.6 OTHER SOURCES OF INCOME**

Indirect methods of financing irrigation and drainage service are pretty much needed for supporting the conventional methods. Secondary income to be earned from a variety of resources would be the sale of surplus water for nonagricultural uses, for example allocation for the industrial use, interest on funds, FOs can impose additional charges on the water users which could increase the income of the farmer organizations.

In the long run, farmer organizations can plan tree plantations along the distributary canal banks, FOs can sell water for fish farms. Some income may come from selling few assets available in the canal commands. Some contributions will come from penalties sanctioned on the defaulters.

The immediate income is possible if pilot farmer organizations impose a membership fee on the each water user on per acre basis of CCA. A reasonable rate must be decided before the IMT process starts.

### **3. CONFLICT RESOLUTION AND PENALTIES**

There is a proposition that conflicts can be a means to acquire water rights and often conflicts are used to express dominance. Hence, for participatory irrigation management agreements and negotiations between individual users and collective claims by water users is the fundamental basis to avoid tension and open conflict among the farmers drawing water from the farmer managed irrigation systems.

Conflicts between farmers over water allocation and distribution are common in all over the world. Many conflicts are related with minor disputes on diverting water out of turn or using more excess water as compared to allocated. This kind of disputes can be resolved with the help of WCAs. These are the problems those often arise in the daily irrigation business and are easy to resolve.

Other conflicts arise due to the stealing of water by the farmers on distributary canal and within watercourse commands. Some problems occur at times when changes in water allocation or physical structure are introduced. Hence, farmers use different means to protect their water needs.

The crop assessment and recovery of the water rates is the potential area where dispute and conflicts among the farmers arise. Therefore, it would be nice to formulate a dispute resolution committee by the respective FO to avoid such problems.

#### 4. FINANCIAL RECORD KEEPING

Although the treasurer is considered as the financial in-charge of the Accounts of any organization, but financial record keeping is an independent job and it requires lot of time and input in big organizations. As far as the Former Organizations are concerned, they should keep the maximum record with them and minimum record should be maintained by the Watercourse Associations (WCAs). All the land record pertaining to each watercourse should be the responsibility of the FO. All the documents related to official water allocations and revisions should be kept by the respective FO so that whenever need arises, FO should be able to consult those record with the help of respective WCAs.

It would be wise to advice that a Revenue Assistant should be hired by each FO for keeping the record of the financial functions like abiana assessment/collection. Although the number of employed persons would pretty much depend upon the workload. For the case of smaller FOs, this Assistant may work for several organizations if it is practicable. The following record would be necessary to maintain for each FO:

1. **Book of Assets:** This will have a complete inventory of the assets at the time of irrigation management transfer and subsequently addition or deletion of any items.
2. **Book of Accounts for Revenue:** This book will contain several heads like Resources at the time of transfer, income from water rates on the basis of abiana assessment, income from non-agricultural water allocations, income from additional surcharge and penalties.
3. **Book of O&M Costs:** All the record related to operation and maintenance costs for irrigation and drainage facilities including the transaction costs of the respective FOs should be maintained in a separate register. Because these costs will be a regular feature of each FO, thus, its record must be separate from any other financial activity.
4. **Book of Billing:** A register should be maintained in which all the record related to bills for each WCA should be available. Also relief/remission and complaints related to billing should be recorded together with the particulars against each WCA.
5. **Book of Salaries and Wages:** Each FO should maintain a register bearing all the particulars of salaries and labor with reference to appointment letters and subsequent pay change or if any deductions for loans and taxes.
6. **Book of Reserve Fund:** This record would be a quick check for excess of income over expenditure or vice versa at any particular time. This record should also include particulars about grants from Government, SIDA, Area Water Board or finance from any other source.

Each FO must be careful in chalking out the nature of transactions and financial functions to carry out the proper record keeping and subsequently its audit.



## **5. REVISION OF BUSINESS PLANS**

In the earlier three primary business plans for pilot distributaries, the emphasis was to operate and maintain the irrigation facilities but in this proposed business plan, both irrigation and drainage facilities have been considered to provide guidelines to farmer organizations. The drainage part is still unclear and it would be required to see that what would be managed by the farmers, how much will be the O&M cost. Also the rate of drainage cess has not been yet decided, although National Drainage Consultants (NDC) has worked out that Rupees 84 per acre is the appropriate rate but how much would be imposed. Once the irrigation and drainage management is transferred, certainly, the revision of this proposed business plan would be required as per the actual jurisdiction of each FO.

Once the O&M costs for drainage facilities are known, along with the benefits to the farmers, they can be combined with the irrigation facilities to update this Proposed Business Plan (PBP), which will be different for each pilot distributary. That updated version of this PBP will be presented to appropriate Farmer Organization for debate and agreement among the water users. Once the Farmer Organization members come to an agreement, any necessary changes can be made and then a Final Business Plan would be published.

## **6. SUMMARY AND CONCLUSIONS**

In July 1995, the Department of Agriculture Engineering and Water Management of the Government of Sindh (GoS) requested the International Irrigation Management Institute (IIMI) to undertake an action research program for three pilot distributaries in the LBOD project area. The pilot project was established by organizing three Water Users Federations (WUFs), which were to take the part of the irrigation system for operation and maintenance. In the second phase the three pilot FOs were mobilized and ten additional FOs were formed. These FOs are now ready to takeover various channels as pilot sites to effectively improve the O&M of both the irrigation and drainage facilities on participatory basis.

This pilot project has succeeded through its activities so far to assist in establishing water users organizations in several canal command areas. Currently, the legislative and institutional processes are under way for effectively organizing and strengthening water user organizations on a wider scale. This proposed business plan (PBP) has been drafted to assist the FOs in carrying out the actual business after irrigation management transfer in the pilot areas. This document should be used as guidelines in future in the pilot areas to manage the irrigation system on viable basis.

For managing the irrigation facilities, reliable and equitable water supply, efficient O&M of the irrigation units, proper and timely financing of irrigation service, appointment of appropriate staff, and conflict resolution would be the major tasks of any FO in the pilot areas. While managing the drainage facilities, operation and maintenance of drainage tubewells and O&M of the surface drains below discharge of 15 cfs would require particular attention of the respective FOs.

To meet the costs of operation and maintenance of the irrigation and drainage facilities, FOs would need guidance in assessment and collection of the water rates and drainage cess. For the business of assessment of water rates, FOs, first of all, a shift from Deh to Watercourse command would be needed immediately after the irrigation management transfer (IMT) which will not correspond with the current practice being implemented.

Each FO has been suggested a revenue assessment and collection strategy for financing the irrigation and drainage facilities. The absence of actual data on O&M of drainage facilities and cess collection makes it difficult to assess the actual costs that would require special attention after IMT.

For dealing with conflicts between farmers over water allocation and distribution a Water Committee has been proposed which will help in sorting out various issues related with water.

For financial record keeping, maximum record should be maintained with FOs and minimum record with WCAs to run the business smoothly. Six types of record books have been recommended. Also it has been suggested to hire a FO Assistant for maintaining this record.

Once the O& M costs for irrigation and drainage facilities are known to FOs, they would require a combined effort to revise the proposed business plan which would be finalized after debate and agreement among the water users to convert it to Final Business Plan. Therefore, every FO has been recommended a revision of the currently proposed business plan.

## REFERENCES

- Government of Sindh 2001. Water Rates (ABIANA) 1980-81 To 19980-99. Irrigation and Power Department, Sindh.
- Khazada, M. N. et al. 1997. Preliminary Business Plan for Bareji Distributary. Report No. R-41.2, International Irrigation Management Institute, Lahore, Pakistan.
- Pirzada, A. P. et al. 1997. Preliminary Business Plan for Dhoro Naro Minor. Report No. R-41.1, International Irrigation Management Institute, Lahore, Pakistan.
- Sial, N. H. et al. 1997. Preliminary Business Plan for Heran Distributary. Report No. R-41.3, International Irrigation Management Institute, Lahore, Pakistan.
- SIDA 2000. Irrigation and Drainage Management Transfer (IDMT) Agreement Between SIDA/AWB and Farmer Organizations (FO). Working Paper. Sindh Irrigation & Drainage Authority, National Drainage Program (NDP) Sindh.
- World Bank. 1994. Pakistan Irrigation and Drainage: issues and options. Report No. 11884-Pak, AOD, World Bank, 25 March 1994.
- WSIP. 1990. Water sector investment plan (1990-2000). Lahore: Federal Planning Cell, WAPDA, Pakistan.

## ANNEXTURES

### Annex-1

#### Bank work

Considering 0.5 ft depletion of earth work of in one year, the following cost estimation has been Worked out as under.

S. No.	Item	Rate	Quantity	Amount
1	Length of channel (mile)		7	
2	Width of Inspection path (ft)		12	
3	Width of Non Inspection path (ft)		8	
4	Running feet		20	
5	Earth work per mile (cft)		50,000	
6	Total earth work		350,000	
7	Considering 20% of length will require earth work		70,000	
8	Average rate (machine and manual) per 1000 cft of earth work (Rs)	616		<b>43,120</b>
9	Cost per mile (Rs)			<b>6,160</b>
10	Earth work for closing leaks, breaches etc will be @ 5% of cost of bank work			<b>308</b>
	<b>Total cost of earth work per mile</b>			<b>6,468</b>
	<b>Total cost of earth work per km</b>			<b>4,020</b>

**Silt Clearance**

The normal silt charge is assumed 4gms/lit of water. If only half percent of this quantity gets. Deposited in the bed of channel, then it is worked out silt deposited will be 0.44 foot. Considering 20 feet width of channels the quantity and cost have been worked out as under.

S. #	Item	Rate	Quantity	Amount
1	Channel length (mile)		7	
2	Channel width (ft)		20	
3	Quantity silt deposited (cft/mile)	0.44*20*5000	44,000	
4	Assuming 30% silt clearance of total length (cft)		92,400	
5	Desilting cost (Rs)	500		46,200
6	Desilting cost/mile (Rs)			<b>6,600</b>
7	Groynes, weed clearance etc will be @ 5% of desilting cost/mile (Rs)			<b>330</b>
	<b>Total cost per mile (Rs)</b>			<b>6,930</b>
	<b>Total per km cost (Rs)</b>			<b>4,307</b>

**M&R to Structures**

It is considered that the representative channel will have one X -regulator/ fall structure, Two road bridges, one syphone and some out lets to be repaired. The M&R cost for Cost of above referred structures has been worked out as under.

S. #	Item	Rate	Quantity	Amount
1	One X- regulator (75 cusec)		1	
2	Capital cost Rs/cusec	3,494		
3	Capital cost of the structure			262,050
4	Road bridges ( 90 & 50 cusecs)		2	
5	Capital cost Rs /cusec	2,905		
6	Capital cost of the structures Rs			813,400
7	Capital cost of syphone / aqueduct Rs			34,252
	<b>Total capital cost</b>			<b>1,109,702</b>
	M&R to structures will be @ 2 % of the capital cost			22,194
8	Water courses to be repaired	1,500	4	6,000
	Total M&R cost (Rs)			28,194
	<b>Cost per mile (Rs)</b>			<b>4,028</b>
	<b>Cost per km (Rs)</b>			<b>2,503</b>

**Annex-4****Expenditure on Operational Staff at Distributary/Minor (7 Miles).**

S #	Item	No	Unit Cost	Unit	Total Cost Rs.	Per Mile Cost
1	Beldar	2	3,000	12	72,000	
2	Darogha	1	4,000	2	8,000	
3	Abdar	1	4,000	4	16,000	
4	Technical Assistant	1	8,000	1	8,000	
5	Book Keeper	1	4000	12	48,000	
	Total				<b>152,000</b>	
	Contingency @ 10% of Op. Cost				15,200	
	Grand Total				<b>167,200</b>	<b>23,886</b>
	<b>Per km Cost (Rs.)</b>					<b>14,845</b>



Annex-5		
FINANCING IRRIGATION AND DRAINAGE FACILITIES		
<u>PILOT DISTRIBUTARY HERAN</u>		
PARTICULARS	Unit	
<b><u>I. ABIANA ASSESSMENT</u></b>		
1. Cropped Area	acres	18,287
3. Waterlogged Area	acres	870
4. Salinized Area	acres	1,673
5. Abandoned Area	acres	1,802
6. CCA	acres	15,073
7. Cropping Intensity	%age	121
<b>la. Total Annual Abiana Receipts (@Rs. 69/acre)</b>	<b>Rupees</b>	<b>1,261,773</b>
<b>lb. Annual Receipts from Non-Agri Allocations</b>	<b>Rupees</b>	<b>0</b>
<b>lc. Assessment of Drainage Cess</b>	<b>Rupees</b>	<b>0</b>
<b>A. Total Receipts from Abiana and Drainage Cess</b>	<b>Rupees</b>	<b>1,261,773</b>
<b>B. Payment of Royalty to SIDA</b>	<b>60%</b>	<b>757,064</b>
<b>C. Fund Available to FO</b>	<b>Rupees</b>	<b>504,709</b>
<b><u>II. O&amp;M COST</u></b>		
<b>a. Irrigation Facilities</b>		
1. Length of the Disty/Minor	km	11
2. Bank work (Rs. 4,020/km)	Rupees	42,612
3. Silt clearance (Rs. 4,307/km)	Rupees	45,654
4. M&R of Structures (Rs. 2,503/km)	Rupees	26,532
5. Operational Cost (Staff & Supplies) (Rs.14,845/km)	Rupees	157,357
Transaction Cost	Rupees	27,216
<b>s Total O&amp;M Cost</b>	<b>Rupees</b>	<b>299,371</b>
<b>b. Drainage Facilities</b>		
1. Length of the Drain (<15 cfs Discharge)	km	-
2. M&R of Structures	Rupees	-
3. No. of sump houses/tubewells	No.	-
4. Security of sump houses/tubewells (Rs. 4.000/head)	Rupees	-
<b>Total O&amp;M Cost</b>	<b>Rupees</b>	<b>0</b>
<b>D. Total Costs (IIa+IIb)</b>	<b>Rupees</b>	<b>299,371</b>
<b>E. FO Balance Amount (C-D)</b>	<b>Rupees</b>	<b>205,338</b>

## FINANCING IRRIGATION AND DRAINAGE FACILITIES

## PILOT DISTRIBUTARY: BAREJI

PARTICULARS	Unit	
<b><u>I. ABIANA ASSESSMENT</u></b>		
1. Cropped Area	acres	12,997
3. Waterlogged Area	acres	133
4. Salinized Area	acres	798
5. Abandoned Area	acres	3,938
6. CCA	acres	11,924
7. Cropping Intensity	%age	109
<b>Ia. Total Annual Abiana Receipts (@Rs. 69/acre)</b>	<b>Rupees</b>	<b>896,804</b>
<b>Ib. Annual Receipts from Non-Agri Allocations</b>	<b>Rupees</b>	<b>0</b>
<b>Ic. Assessment of Drainage Cess</b>	<b>Rupees</b>	<b>0</b>
<b>A. Total Receipts from Abiana and Drainage Cess</b>	<b>Rupees</b>	<b>896,804</b>
<b>B. Payment of Royalty to SIDA</b>	<b>60%</b>	<b>538,082</b>
<b>C. Fund Available to FO</b>	<b>Rupees</b>	<b>358,722</b>
<b><u>II. O&amp;M COST</u></b>		
<b>a. Irrigation Facilities</b>		
1. Length of the Disty/Minor	km	12
2. Bank work (Rs. 4,020/km)	Rupees	48,240
3. Silt clearance (Rs. 4,307/km)	Rupees	51,684
4. M&R of Structures (Rs. 2,503/km)	Rupees	30,036
5. Operational Cost (Staff & Supplies) (Rs.14,845/km)	Rupees	178,140
6. Transaction Cost	Rupees	30,810
<b>Total O&amp;M Cost</b>	<b>Rupees</b>	<b>338,910</b>
<b>b. Drainage Facilities</b>		
1. Length of the Drain (<15 cfs Discharge)	km	7+5+4
2. M&R of Structures	Rupees	0
3. No. of sump houses/tubewells	No.	13
4. Security of sump houses/tubewells (Rs. 4.000/head)	Rupees	
<b>Total O&amp;M Cost</b>	<b>Rupees</b>	<b>s</b>
<b>D. Total Costs (IIa+IIb)</b>	<b>Rupees</b>	<b>338,910</b>
<b>E. FO Balance Amount (C-D)</b>	<b>Rupees</b>	<b>19,812</b>

## FINANCING IRRIGATION AND DRAINAGE FACILITIES

## PILOT DISTRIBUTARY: DHORO NARO

PARTICULARS	Unit	
<b><u>I. ABIANA ASSESSMENT</u></b>		
1. Cropped Area	acres	14,960
3. Waterlogged Area	acres	185
4. Salinized Area	acres	1,680
5. Abandoned Area	acres	1,178
6. CCA	acres	13,161
7. Cropping Intensity	%age	114
<b>Ia. Total Annual Abiana Receipts (@Rs. 69/acre)</b>	<b>Rupees</b>	<b>1,032,248</b>
<b>Ib. Annual Receipts from Non-Agri Allocations</b>	<b>Rupees</b>	<b>0</b>
<b>Ic. Assessment of Drainage Cess</b>	<b>Rupees</b>	<b>0</b>
<b>A. Total Receipts from Abiana and Drainage Cess</b>	<b>Rupees</b>	<b>1,032,248</b>
<b>B. Payment of Royalty to SIDA</b>	<b>60%</b>	<b>619,349</b>
<b>C. Fund Available to FO</b>	<b>Rupees</b>	<b>412,899</b>
<b><u>II. O&amp;M COST</u></b>		
<b>a. Irrigation Facilities</b>		
1. Length of the Disty/Minor	km	10
2. Bank work (Rs. 4,020/km)	Rupees	39,557
3. Silt clearance (Rs. 4,307/km)	Rupees	42,381
4. M&R of Structures (Rs. 2,503/km)	Rupees	24,630
5. Operational Cost (Staff & Supplies) (Rs.14,845/km)	Rupees	146,075
6. Transaction Cost	Rupees	25,264
<b>Total O&amp;M Cost</b>	<b>Rupees</b>	<b>277,906</b>
<b>b. Drainage Facilities</b>		
1. Length of the Drain (<15 cfs Discharge)	km	5
2. M&R of Structures	Rupees	0
3. No. of sump houses/tubewells	No.	8
4. Security of sump houses/tubewells (Rs. 4,000/head)	Rupees	
<b>Total O&amp;M Cost</b>	<b>Rupees</b>	
<b>D. Total Costs (Ila+lib)</b>	<b>Rupees</b>	<b>277,906</b>
<b>E. Balance Amount (C-D)</b>	<b>Rupees</b>	<b>134,993</b>

<b>Annex-8</b>		
<b>FINANCING IRRIGATION AND DRAINAGE FACILITIES</b>		
<b>PILOT DISTRIBUTARY: SANHRO</b>		
<b>PARTICULARS</b>	<b>Unit</b>	
<b><u>I. ABIANA ASSESSMENT</u></b>		
1. Cropped Area	acres	16,750
3. Waterlogged Area	acres	NA
4. Salinized Area	acres	NA
5. Abandoned Area	acres	NA
6. CCA	acres	15,367
7. Cropping Intensity	%age	109
<b>la. Total Annual Abiana Receipts (@Rs. 69/acre)</b>	Rupees	<b>1,155,752</b>
<b>lb. Annual Receipts from Non-Agri Allocations</b>	Rupees	0
<b>lc. Assessment of Drainage Cess</b>	Rupees	0
<b>A. Total Receipts from Abiana and Drainage Cess</b>	Rupees	<b>1,155,752</b>
<b>B. Payment of Royalty to SIDA</b>	<b>60%</b>	<b>693,451</b>
<b>Fund Available to FO</b>	<b>40%</b>	<b>462,301</b>
<b><u>II. O&amp;M COST</u></b>		
<b>a. Irrigation Facilities</b>		
1. Length of the Disty/Minor	km	10
2. Bank work (Rs. 4,020/km)	Rupees	40,200
3. Silt clearance (Rs. 4,307/km)	Rupees	43,070
4. M&R of Structures (Rs. 2,503/km)	Rupees	25,030
5. Operational Cost (Staff & Supplies) (Rs.14,845/km)	Rupees	148,450
6. Transaction Cost (1% of the Total O&M Cost)	Rupees	25,675
<b>Total O&amp;M Cost</b>	Rupees	<b>282,425</b>
<b>b. Drainage Facilities</b>		
1. Length of the Drain (<15 cfs Discharge)	km	-
2. M&R of Structures	Rupees	-
3. No. of sump houses/tubewells	No.	-
4. Security of sump houses/tubewells (Rs. 4.000/head)	Rupees	0
<b>Total O&amp;M Cost</b>	Rupees	<b>0</b>
<b>C. Total Costs (IIa+IIb)</b>	Rupees	<b>282,425</b>
<b>E. Balance Amount (C-D)</b>	Rupees	<b>179,876</b>

## FINANCING IRRIGATION AND DRAINAGE FACILITIES

## PILOT DISTRIBUTARY: BELHARO

PARTICULARS	Unit	
<b><u>I. ABIANA ASSESSMENT</u></b>		
1. Cropped Area	acres	18,614
3. Waterlogged Area	acres	NA
4. Salinized Area	acres	NA
5. Abandoned Area	acres	NA
6. CCA	acres	17,077
7. Cropping Intensity	%age	109
<b>Ia. Total Annual Abiana Receipts (@Rs. 69/acre)</b>	Rupees	<b>1,284,361</b>
<b>Ib. Annual Receipts from Non-Agri Allocations</b>	Rupees	0
<b>Ic. Assessment of Drainage Cess</b>	Rupees	0
<b>A. Total Receipts from Abiana and Drainage Cess</b>	Rupees	<b>1,284,361</b>
<b>B. Payment of Royalty to SIDA</b>	<b>60%</b>	<b>770,617</b>
<b>C. Fund Available to FO</b>	<b>40%</b>	<b>513,744</b>
<b><u>II. O&amp;M COST</u></b>		
<b>a. Irrigation Facilities</b>		
1. Length of the Disty/Minor	km	13.87
2. Bank work (Rs. 4,020/km)	Rupees	55,757
3. Silt clearance (Rs. 4,307/km)	Rupees	59,738
4. M&R of Structures (Rs. 2,503/km)	Rupees	34,717
5. Operational Cost (Staff & Supplies) (Rs.14,845/km)	Rupees	205,900
6. Transaction Cost (1% of the Total O&M Cost)	Rupees	35,611
<b>Total O&amp;M Cost</b>	Rupees	<b>391,723</b>
<b>b. Drainage Facilities</b>		
1. Length of the Drain (<15 cfs Discharge)	km	-
2. M&R of Structures	Rupees	-
3. No. of sump houses/tubewells	No.	-
4. Security of sump houses/tubewells (Rs. 4,000/head)	Rupees	0
<b>Total O&amp;M Cost</b>	Rupees	<b>0</b>
<b>D. Total Costs (IIa+IIb)</b>	Rupees	<b>391,723</b>
<b>E. FO Balance Amount (C-D)</b>	<b>Rupees</b>	<b>122,021</b>

**FINANCING IRRIGATION AND DRAINAGE FACILITIES**  
**PILOT DISTRIBUTARY: MIRPUR**

PARTICULARS	Unit	
<b><u>I. ABIANA ASSESSMENT</u></b>		
1. Cropped Area	acres	17678
3. Waterlogged Area	acres	NA
4. Salinized Area	acres	NA
5. Abandoned Area	acres	NA
6. CCA	acres	16218
7. Cropping Intensity	%age	109
<b>la. Total Annual Abiana Receipts (@Rs. 69/acre)</b>	Rupees	<b>1,219,756</b>
<b>lb. Annual Receipts from Non-Agri Allocations</b>	Rupees	0
<b>lc. Assessment of Drainage Cess</b>	Rupees	0
<b>A. Total Receipts from Abiana and Drainage Cess</b>	Rupees	<b>1,219,756</b>
<b>B. Payment of Royalty to SIDA</b>	<b>60%</b>	<b>731,853</b>
<b>C. Fund Available to FO</b>	<b>40%</b>	<b>487,902</b>
<b><u>II. O&amp;M COST</u></b>		
<b>a. Irrigation Facilities</b>		
1. Length of the Disty/Minor	km	14.80
2. Bank work (Rs. 4,020/km)	Rupees	59,496
3. Silt clearance (Rs. 4,307/km)	Rupees	63,744
4. M&R of Structures (Rs. 2,503/km)	Rupees	37,044
5. Operational Cost (Staff & Supplies) (Rs.14,845/km)	Rupees	219,706
6. Transaction Cost (1% of the Total O&M Cost)	Rupees	37,999
<b>Total O&amp;M Cost</b>	Rupees	<b>417,989</b>
<b>b. Drainage Facilities</b>		
1. Length of the Drain (<15 cfs Discharge)	km	-
2. M&R of Structures	Rupees	-
3. No. of sump houses/tubewells	No.	-
4. Security of sump houses/tubewells (Rs. 4.000/head)	Rupees	0
<b>Total O&amp;M Cost</b>	Rupees	<b>0</b>
<b>D. Total Costs (IIa+IIb)</b>	Rupees	<b>417,989</b>
<b>E. FO Balance Amount (C-D)</b>	Rupees	<b>69,913</b>

## FINANCING IRRIGATION AND DRAINAGE FACILITIES

## PILOT DISTRIBUTARY: DIGHRI

PARTICULARS	Unit	
<b><u>I. ABIANA ASSESSMENT</u></b>		
1. Cropped Area	acres	34,473
3. Waterlogged Area	acres	NA
4. Salinized Area	acres	NA
5. Abandoned Area	acres	NA
6. CCA	acres	31,627
7. Cropping Intensity	%age	109
<b>Ia. Total Annual Abiana Receipts (@Rs. 69/acre)</b>	Rupees	<b>2,378,667</b>
<b>Ib. Annual Receipts from Non-Agri Allocations</b>	Rupees	0
<b>Ic. Assessment of Drainage Cess</b>	Rupees	0
<b>A. Total Receipts from Abiana and Drainage Cess</b>	Rupees	<b>2,378,667</b>
<b>B. Payment of Royalty to SIDA</b>	<b>60%</b>	<b>1,427,200</b>
<b>C. Fund Available to FO</b>	<b>40%</b>	<b>951,467</b>
<b><u>II. O&amp;M COST</u></b>		
<b>a. Irrigation Facilities</b>		
1. Length of the Disty/Minor	km	29.35
2. Bank work (Rs. 4,020/km)	Rupees	117,987
3. Silt clearance (Rs. 4,307/km)	Rupees	126,410
4. M&R of Structures (Rs. 2,503/km)	Rupees	73,463
5. Operational Cost (Staff & Supplies) (Rs.14,845/km)	Rupees	435,701
6. Transaction Cost (1% of the Total O&M Cost)	Rupees	75,356
<b>Total O&amp;M Cost</b>	Rupees	<b>828,917</b>
<b>b. Drainage Facilities</b>		
1. Length of the Drain (<15 cfs Discharge)	km	-
2. M&R of Structures	Rupees	-
3. No. of sump houses/tubewells	No.	-
4. Security of sump houses/tubewells (Rs. 4.000/head)	Rupees	0
<b>Total O&amp;M Cost</b>	Rupees	<b>0</b>
<b>D. Total Costs (IIa+IIb)</b>	Rupees	<b>828,917</b>
<b>E. FO Balance Amount (C-D)</b>	Rupees	<b>122,549</b>

## FINANCING IRRIGATION AND DRAINAGE FACILITIES

## PILOT DISTRIBUTARY: POTHO

PARTICULARS	Unit	
<b><u>I. ABIANA ASSESSMENT</u></b>		
1. Cropped Area	acres	8,789
3. Waterlogged Area	acres	NA
4. Salinized Area	acres	NA
5. Abandoned Area	acres	NA
6. CCA	acres	8,063
7. Cropping Intensity	%age	109
<b>Ia. Total Annual Abiana Receipts (@Rs. 69/acre)</b>	Rupees	<b>606,418</b>
<b>Ib. Annual Receipts from Non-Agri Allocations</b>	Rupees	0
<b>Ic. Assessment of Drainage Cess</b>	Rupees	0
<b>A. Total Receipts from Abiana and Drainage Cess</b>	Rupees	<b>606,418</b>
<b>B. Payment of Royalty to SIDA</b>	<b>60%</b>	<b>363,851</b>
<b>C. Fund Available to FO</b>	<b>40%</b>	<b>242,567</b>
<b><u>II. O&amp;M COST</u></b>		
<b>a. Irrigation Facilities</b>		
1. Length of the Disty/Minor	km	10.35
2. Bank work (Rs. 4,020/km)	Rupees	41,607
3. Silt clearance (Rs. 4,307/km)	Rupees	44,577
4. M&R of Structures (Rs. 2,503/km)	Rupees	25,906
5. Operational Cost (Staff & Supplies) (Rs.14,845/km)	Rupees	153,646
6. Transaction Cost (<1% of the Total O&M Cost)	Rupees	11,500
<b>Total O&amp;M Cost</b>	Rupees	<b>277,236</b>
<b>b. Drainage Facilities</b>		
1. Length of the Drain (<15 cfs Discharge)	km	-
2. M&R of Structures	Rupees	-
3. No. of sump houses/tubewells	No.	-
4. Security of sump houses/tubewells (Rs. 4,000/head)	Rupees	0
<b>Total O&amp;M Cost</b>	Rupees	<b>0</b>
<b>D. Total Costs (IIa+IIb)</b>	Rupees	<b>277,236</b>
<b>E. FO Balance Amount (C-D)</b>	Rupees	<b>-34,669</b>



## FINANCING IRRIGATION AND DRAINAGE FACILITIES

## PILOT DISTRIBUTARY: BAGHI

PARTICULARS	Unit	
<b><u>I. ABIANA ASSESSMENT</u></b>		
1. Cropped Area	acres	8,860
3. Waterlogged Area	acres	NA
4. Salinized Area	acres	NA
5. Abandoned Area	acres	NA
6. CCA	acres	8,128
7. Cropping Intensity	%age	109
<b>Ia. Total Annual Abiana Receipts (@Rs. 69/acre)</b>	Rupees	<b>611,307</b>
<b>Ib. Annual Receipts from Non-Agri Allocations</b>	Rupees	0
<b>Ic. Assessment of Drainage Cess</b>	Rupees	0
<b>A. Total Receipts from Abiana and Drainage Cess</b>	Rupees	<b>611,307</b>
<b>B. Payment of Royalty to SIDA</b>	<b>60%</b>	<b>366,784</b>
<b>C. Fund Available to FO</b>	<b>40%</b>	<b>244,523</b>
<b><u>II. O&amp;M COST</u></b>		
<b>a. Irrigation Facilities</b>		
1. Length of the Disty/Minor	km	7.60
2. Bank work (Rs. 4,020/km)	Rupees	30,552
3. Silt clearance (Rs. 4,307/km)	Rupees	32,733
4. M&R of Structures (Rs. 2,503/km)	Rupees	19,023
5. Operational Cost (Staff & Supplies) (Rs.14,845/km)	Rupees	112,822
6. Transaction Cost (1% of the Total O&M Cost)	Rupees	19,513
<b>Total O&amp;M Cost</b>	Rupees	<b>214,643</b>
<b>b. Drainage Facilities</b>		
1. Length of the Drain (<15 cfs Discharge)	km	-
2. M&R of Structures	Rupees	-
3. No. of sump houses/tubewells	No.	-
4. Security of sump houses/tubewells (Rs. 4,000/head)	Rupees	0
<b>Total O&amp;M Cost</b>	Rupees	<b>0</b>
<b>D. Total Costs (IIa+IIb)</b>	Rupees	<b>214,643</b>
<b>E. FO Balance Amount (C-D)</b>	Rupees	<b>29,880</b>

## FINANCING IRRIGATION AND DRAINAGE FACILITIES

## PILOT DISTRIBUTARY: KHATIAN TANDO

PARTICULARS	Unit	
<b><u>I. ABIANA ASSESSMENT</u></b>		
1. Cropped Area	acres	12,397
3. Waterlogged Area	acres	NA
4. Salinized Area	acres	NA
5. Abandoned Area	acres	NA
6. CCA	acres	11,373
7. Cropping Intensity	%age	109
<b>Ia. Total Annual Abiana Receipts (@Rs. 69/acre)</b>	Rupees	<b>855,363</b>
<b>Ib. Annual Receipts from Non-Agri Allocations</b>	Rupees	0
<b>Ic. Assessment of Drainage Cess</b>	Rupees	0
<b>A. Total Receipts from Abiana and Drainage Cess</b>	Rupees	<b>855,363</b>
<b>B. Payment of Royalty to SIDA</b>	<b>60%</b>	<b>513,218</b>
<b>C. Fund Available to FO</b>	<b>40%</b>	<b>342,145</b>
<b><u>II. O&amp;M COST</u></b>		
<b>a. Irrigation Facilities</b>		
1. Length of the Disty/Minor	km	12.80
2. Bank work (Rs. 4,020/km)	Rupees	51,456
3. Silt clearance (Rs. 4,307/km)	Rupees	55,130
4. M&R of Structures (Rs. 2,503/km)	Rupees	32,038
5. Operational Cost (Staff & Supplies) (Rs.14,845/km)	Rupees	190,016
6. Transaction Cost (1% of the Total O&M Cost)	Rupees	32,864
<b>Total O&amp;M Cost</b>	Rupees	<b>361,504</b>
<b>b. Drainage Facilities</b>		
1. Length of the Drain (<15 cfs Discharge)	km	-
2. M&R of Structures	Rupees	-
3. No. of sump houses/tubewells	No.	-
4. Security of sump houses/tubewells (Rs. 4.000/head)	Rupees	0
<b>Total O&amp;M Cost</b>	Rupees	<b>0</b>
<b>D. Total Costs (IIa+IIb)</b>	Rupees	<b>361,504</b>
<b>E. FO Balance Amount (C-D)</b>	Rupees	<b>-19,359</b>

## FINANCING IRRIGATION AND DRAINAGE FACILITIES

## PILOT DISTRIBUTARY: RAWTIANI

PARTICULARS	Unit	
<b><u>I. ABIANA ASSESSMENT</u></b>		
1. Cropped Area	acres	9,838
3. Waterlogged Area	acres	NA
4. Salinized Area	acres	NA
5. Abandoned Area	acres	NA
6. CCA	acres	9,026
7. Cropping Intensity	%age	109
<b>Ia. Total Annual Abiana Receipts (@Rs. 69/acre)</b>	Rupees	<b>678,845</b>
<b>Ib. Annual Receipts from Non-Agri Allocations</b>	Rupees	0
<b>Ic. Assessment of Drainage Cess</b>	Rupees	0
<b>A. Total Receipts from Abiana and Drainage Cess</b>	Rupees	<b>678,845</b>
<b>B. Payment of Royalty to SIDA</b>	<b>60%</b>	<b>407,307</b>
<b>C. Fund Available to FO</b>	<b>40%</b>	<b>271,538</b>
<b><u>II. O&amp;M COST</u></b>		
<b>a. Irrigation Facilities</b>		
1. Length of the Disty/Minor	km	8.83
2. Bank work (Rs. 4,020/km)	Rupees	35,497
3. Silt clearance (Rs. 4,307/km)	Rupees	38,031
4. M&R of Structures (Rs. 2,503/km)	Rupees	22,101
5. Operational Cost (Staff&Supplies) (Rs.14,845/km)	Rupees	131,081
6. Transaction Cost (1% of the Total O&M Cost)	Rupees	22,671
<b>Total O&amp;M Cost</b>	Rupees	<b>249,381</b>
<b>b. Drainage Facilities</b>		
1. Length of the Drain (<15 cfs Discharge)	km	3.03
2. M&R of Structures	Rupees	0
3. No. of sump houses/tubewells	No.	15
4. Security of sump houses/tubewells (Rs. 4.000/head)	Rupees	
<b>Total O&amp;M Cost</b>	Rupees	
<b>D. Total Costs (IIa+IIb)</b>	Rupees	<b>249,381</b>
<b>E. FO Balance Amount (C-D)</b>	Rupees	<b>22,157</b>

## FINANCING IRRIGATION AND DRAINAGE FACILITIES

## PILOT DISTRIBUTARY: TAIL

PARTICULARS	Unit	
<b><u>I. ABIANA ASSESSMENT</u></b>		
1. Cropped Area	acres	9,032
3. Waterlogged Area	acres	NA
4. Salinized Area	acres	NA
5. Abandoned Area	acres	NA
6. CCA	acres	8,286
7. Cropping Intensity	%age	109
<b>Ia. Total Annual Abiana Receipts (@Rs. 69/acre)</b>	Rupees	<b>623,190</b>
<b>Ib. Annual Receipts from Non-Agri Allocations</b>	Rupees	0
<b>Ic. Assessment of Drainage Cess</b>	Rupees	0
<b>A. Total Receipts from Abiana and Drainage Cess</b>	Rupees	<b>623,190</b>
<b>B. Payment of Royalty to SIDA</b>	<b>60%</b>	<b>373,914</b>
<b>C. Fund Available to FO</b>	<b>40%</b>	<b>249,276</b>
<b><u>II. O&amp;M COST</u></b>		
<b>a. Irrigation Facilities</b>		
1. Length of the Disty/Minor	km	5.15
2. Bank work (Rs. 4,020/km)	Rupees	20,703
3. Silt clearance (Rs. 4,307/km)	Rupees	22,181
4. M&R of Structures (Rs. 2,503/km)	Rupees	12,890
5. Operational Cost (Staff & Supplies) (Rs.14,845/km)	Rupees	76,452
6. Transaction Cost (1% of the Total O&M Cost)	Rupees	13,223
<b>Total O&amp;M Cost</b>	Rupees	<b>145,449</b>
<b>b. Drainage Facilities</b>		
1. Length of the Drain (<15 cfs Discharge)	km	-
2. M&R of Structures	Rupees	-
3. No. of sump houses/tubewells	No.	<b>2</b>
4. Security of sump houses/tubewells (Rs. 4,000/head)	Rupees	
<b>Total O&amp;M Cost</b>	Rupees	
<b>D. Total Costs (IIa+IIb)</b>	Rupees	<b>145,449</b>
<b>E. FO Balance Amount (C-D)</b>	Rupees	<b>103,827</b>

IWMI Pakistan  
Regional Office  
12km  
Multan Road  
Chowk Thokar Niaz Baig  
Lahore 53700  
Pakistan

Headquarters  
127, Sunil Mawatha  
Pelawatta  
Battaramulla  
Sri Lanka

Mailing Address  
P O Box 2075  
Colombo  
Sri Lanka

Tel.  
94-1-867404, 869080

Fax  
94-1-866854

E-mail  
[iwmi@cgiar.org](mailto:iwmi@cgiar.org)

Website  
[www.iwmi.org](http://www.iwmi.org)



FUTURE  
HARVEST  
IWMI is a Future Harvest Center  
Supported by the CGIAR

## TABLE OF CONTENTS

<b>ACKNOWLEDGEMENTS</b> .....	<b>IV</b>
<b>SUMMARY</b> .....	<b>V</b>
<b>1. INTRODUCTION</b> .....	<b>1</b>
1.1 Current Irrigation Facilities .....	1
1.2 Drainage Facilities.....	3
1.3 Tasks of Farmer Organizations .....	4
1.3.1 Irrigation Management .....	5
1.4 Need for the Business Plan.....	6
1.5 Objectives of the Business Plan.....	7
1.6 Preliminary Business Plans .....	7
1.7 Issues and Constraints of FOs.....	9
<b>2. FINANCIAL OBLIGATIONS AND SOURCES OF INCOME</b> .....	<b>10</b>
2.1 Financial Obligations .....	10
2.1.1 Payments to Area Water Board (AWB) .....	10
2.1.2 Costs of Operating and Maintaining Irrigation Facilities .....	10
2.1.3 O&M Cost for Drainage Facilities .....	12
2.3 Revenue/Sources of Income .....	12
2.4 Current Revenue Assessment .....	12
2.5 Revenue Assessment and Collection Strategy .....	15
2.5.1 Revenue Assessment .....	15
2.5.2 Revenue Collection .....	15
2.5.3 Surcharge .....	15
2.6 Other Sources of Income.....	16
<b>3. CONFLICT RESOLUTION AND PENALTIES</b> .....	<b>17</b>
<b>4. FINANCIAL RECORD KEEPING</b> .....	<b>18</b>
<b>5. REVISION OF BUSINESS PLANS</b> .....	<b>19</b>
<b>6. SUMMARY AND CONCLUSIONS</b> .....	<b>20</b>
<b>REFERENCES</b> .....	<b>22</b>
<b>ANNEXTURES</b> .....	<b>23</b>

## **ACKNOWLEDGEMENTS**

This paper is based on field studies conducted by IWMI as part of its larger research program, “Extended Project on Farmer Managed Irrigated Agriculture in LBOD Area of Sindh Province,” funded by the Government of Sindh under the National Drainage Program. This donor support is gratefully acknowledged.

The authors owe thanks to the field team members of Mirpurkhas, Sanghar, Nawabshah and Dighri who were involved in the data collection for their contributions in pilot testing Farmer Organizations (FOs), which would have not been possible without their untiring and endless efforts. Their efforts are gratefully appreciated.

IWMI staff has been successful in organizing 13 Farmer Organizations, which are ready to takeover control of irrigated command areas of these channels. This is a beginning of a new era in the history of Sindh Province and these farmers have to go a long way to make this business sustainable and beneficial. We are thankful to all the farmers of these pilot areas for their cooperation.

The authors specially thank to Ms. Shahnaz Akhtar for formatting and Ms. Sofiya Saeed for editing the report.

## SUMMARY

The approaches to irrigation management transfer and its financing needs must be understood in irrigation development program in a certain area. The effects of financing policies depend on the Farmer Organizations who control the resources obtained from the beneficiaries with full or partial financial autonomy. With financial dependence, Farmer organization has no control over any funds collected from the water users, and is dependent on the resources allocated to it through the government procedures.

For the past several years, the top priority of Sindh Irrigation and Drainage Authority (SIDA) has been on how to organize farmers at the secondary canal level. SIDA is working on issues related to irrigation management transfer especially on how to give legal authority in managing parts of the irrigation system and on how to share the irrigated cropland taxes. With these legal authorities, farmers are ready to takeover the irrigation system from the Government.

This document provides guidelines in general to the Farmer Organization (FOs) on how to get economic viability and how to carry out effective monitoring through an accountability mechanism. The proposed business plan is an important document that could be helpful in developing the future action plan after irrigation management transfer takes place. The potential for implementing an effective action plan would depend on an operation plan indeed.

Farmer Organizations have been provided with guiding principles to implement tasks of water supply and distribution, operation and maintenance, assessment and collection of water rates and financial record keeping. The procedure for the revision of the proposal has been laid down for efficient irrigation and drainage management. It has been emphasized that scrutiny of expenditures should be done carefully.

Finally, revision of the proposed business plan has been suggested from time to time depending upon the needs when actual business takes place. For determining O&M expenditures, assessment of “requirements” for operating and maintaining physical structures in the irrigation and drainage facilities would be needed every year after the IMT.



## 1. INTRODUCTION

The Irrigation System of Pakistan is the largest integrated irrigation network in the world. Despite heavy investments in irrigation infrastructure by the government, the annual Operation and Maintenance (O&M) allocations for the Provincial Irrigation Departments (PIDs) gradually became insufficient. The O&M became increasingly ineffective due to insufficient funds and changing socio-economic conditions. Increases in O&M costs, low assessment of water charges and low recovery rates, all combined to form this imbalance in the irrigation sector (**WSIP, 1990**). To overcome the poor performance of the canal irrigation system as compared to its expected return on investment in irrigation, the World Bank proposed a reorganization of the whole irrigation sector in the year 1994 and put forward the ideas of participatory irrigation management and decentralization. These proposed reforms started with the enactment of new laws commonly known as the Provincial Irrigation and Drainage Authority (PIDA) Acts of 1997 (**World Bank, 1994**). Following this proposal, the Government of Sindh decided to initiate pilot projects at distributary level by involving the farmers in managing irrigation and drainage systems. The Department of Agriculture (DoA) Sindh requested International Water Management Institute (IWMI) to assist in the social organization of Farmer Organizations (FOs) at distributary level to implement this pilot project.

Since July 1995, 13 Farmer Organizations have been formed at distributary level. Farmers of all outlets of these distributaries were assisted to organize into Watercourse Associations (WCAs) with the help of experience gained on first three pilot channels namely Dhoro Naro, Heran, and Bareji. The success of these reforms with the help of farmers' organizations to manage parts of the irrigation system is heavily dependent on financial viability. This requires an accurate assessment of crops and collection of appropriate water charges for operation and maintenance (O&M) costs of irrigation and drainage facilities in the distributary command areas. To assist FOs in managing the financial liabilities of the farmers, including O&M costs of the distributary command areas and payments to the Sindh Irrigation and Development Authority (SIDA), this business plan has been drafted to provide the financial guidelines. The proposed business plan could be adopted and later may be modified by any FO, to derive financial and economic motive, by participatory irrigation management from their collective action.

### 1.1 CURRENT IRRIGATION FACILITIES

The waters of the Indus River feed the irrigation system of Sindh. There are three barrages, fourteen main canals, 118 feeders and branches and 1, 163 distributaries and minors. The completion of the Sukkur Barrage in 1932 and construction of the Rohri, Nara and Jamrao Canals allowed River Indus water to be diverted for perennial irrigation of large areas of the province. Later on with the construction of Kotri Barrage in 1955 and Guddu Barrage in 1962, canal irrigation was supplied to remaining areas. It has been assessed that canal network in the Sindh Province supplies water to an area of about 13.615 million acres. The length of the main canals is

about 2, 242 miles, branch canals are about 1, 515 miles and secondary canals (distributaries/minors) are about 8, 049 miles long. The overall length of the conveyance system is about 11, 846 miles.

All of the 13 pilot sites are provided irrigation water from three main canals namely Nara, Jamrao and Rohri, and all of them off take from the left side of the Indus River just upstream from Sukkur Barrage. Nara Canal is an excavated channel from the Indus River to intercept the old Nara River; Jamrao Canal off takes from this river channel at RD 129 (129,000 feet) downstream from the head regulator for Nara Canal. Dhoro Naro irrigation channel receives water from Gajrah Branch of Nusrat Canal, which off takes from Rohri Canal.

The irrigation water is distributed through a number of distributing points. The hierarchy of channels in terms of size in descending order is: main canal, branch canal, distributary, minor and watercourses. In the Sindh Province, the term “minor” is often used to mean a small distributary off taking from a main or branch canal. Actually, any secondary canal off taking from a distributary is referred to as a minor. Since the FOs are being organized on distributary channels, therefore, general characteristics of the pilot distributaries and minors are presented in Table 1.1.

The smallest command area in the pilot sites is of Mohammad Ali Minor with a CCA of 3, 833 acres and having only 10 outlets (minimum), whereas the Dighri Distributary has the largest command area of 31, 627 acres and maximum outlets with a number of 72. Similarly, the discharge ranges between 10.90 to 101.80 cusecs for all the pilot channels.

**Table 1.1. Characteristics of the pilot distributaries/minors.**

<b>Name of the Pilot Distributary/Minor</b>	<b>CCA (acres)</b>	<b>Design Discharge (cusecs)</b>	<b>Design Cropping Intensity (%)</b>	<b>Length of Channel (Km)</b>	<b>No. of Outlets</b>
Bareji	13, 049	41.50	81	12	24
Sanhro	15, 367	53.80	81	10	25
Belharo	17, 077	58.60	81	13.87	32
Mirpur	16, 218	63.80	81	14.80	53
Dighri	31, 627	101.80	81	29.35	72
Potho	8, 063	30.00	81	10.35	19
Baghi	8, 128	28.00	81	7.60	14
Khatian Tando	11, 373	33.00	81	12.80	27
Heran	15, 410	62.50	81	10.60	31
Muhammad Ali	3, 833	10.90	81	4.67	10
Rawtiani	9, 026	29.00	81	8.83	19
Tail	8, 286	27.00	81	5.15	14
Dhoro Naro	13, 382	51.60	81	9.84	25

Source: Sindh Irrigation and Development Authority (SIDA).

## 1.2 DRAINAGE FACILITIES

Due to flat topography of Sindh Province, natural drainage is slow and over the years, traditional flood irrigation practices resulted in a steady rise in water table. Groundwater levels, which were lower than 12 feet in 1930's, had risen to less than 4 feet over large areas by 1980s. The rising watertable resulted in water logging of agricultural lands. High evaporation rates with low annual rainfall flushed the salts from the soil profile, causing widespread salinization. As a result, agricultural production declined in large areas of Sindh and land became abandoned in most of the areas.

Due to Government's efforts, the Left Bank Outfall Drain (LBOD) Project-Stage 1 commenced in 1986 to control water logging and salinity by draining waterlogged soils in the districts of Nawabshah, Sanghar, and Mirpur, on the left bank of the Indus River. LBOD installed 2,000 tube wells to lower the watertable and to discharge the drainage saline effluent to the sea via a network of about 2, 000 kilometers of surface drains. Table 1.2 provides information on various components of the LBOD Project.

**Table 1.2. Components of the LBOD Project.**

Description	Nawabshah	Sanghar	Mirpur	Total
Area Served (CCA) 1.270 M. Acres	0.550	0.362	0.358	1.270
Spinal drain (km) KPOD & DPOD	-	-	-	285
Tidal Link (km)	-	-	-	42
Surface Drains (km)	628	554	441	1623
Tile Drains (km)	-	-	1500	1500
Inceptor Drains	154	141	-	295
Standard Tubewells	275	597	769	1641
Rehabilitation of Tubewells	28	-	-	28
Scavenger Tubewells s	189	175	-	364
Transmission Lines-11kv (km)	1313	1440	1380	4133
Distribution Transformers	680	745	860	2285

Source: WAPDA-Left Bank Outfall Drain (LBOD) Project, Sindh.

Pilot areas where FOs were organized, three types of drainage facilities were found i.e. vertical drainage (saline and scavenger tube wells), subsurface (tile) drainage and surface drains. There are two types of drainage facilities in the Bareji Distributary command area. About 70 percent of

the Bareji command area is underlain by subsurface (tile) drainage. However, the pumps at thirteen sump houses are only partially operated but these facilities have the capacity of providing drainage in the future. The details of the tube wells (saline, scavenger), sump houses (tile) and surface drains for the pilot areas are given in Table 1.3.

**Table 1.3. Drainage facilities in pilot areas of Sindh Province.**

Name of the Pilot Channel (Disty/Minor)	Tubewells		Surface Drains				
	No.	Type	No.	Design discharge (cfs)	Total length (km)	Length within command area (km)	No. of drains <15 cfs
Heran	14	Saline	4	96.6	20.73	9.75	-
	3	Scavenger		17.60	7.10	3.76	
				79.50	23.29	3.66	
				43.90	11.30	11.21	
Rawtiani	15	Saline	1	5.00	3.03	3.03	1
Mohammad Ali	2	Saline	-	-	-	-	-
Tail	2	Saline	-	-	-	-	-
Bareji	13	Sump (Tile)	5	25.6	7.00	4.7	-
				16.5	5.00	1.0	
				NA	30.97	12.98	
				NA	4	4	
				NA	NA	10	
Dhoro Naro	8	Saline	2	7.90	5.70	5.18	1
				132.00	146.6	8.53	

Source: WAPDA, Left Bank Outfall Drain (LBOD) Project, Sindh.  
NA: Not Available.

In the pilot area, vertical drainage systems have been installed in 6 sites to lower groundwater levels. Similarly, scavenger tubewells have been provided which have two separate discharge pipes, one for deeper saline water and other for skimming shallow fresh groundwater.

### 1.3 TASKS OF FARMER ORGANIZATIONS

For managing parts of the irrigation and drainage systems on viable basis, following tasks will play a role in efficient working of the FOs:

### 1.3.1 Irrigation Management

- **Reliable Water Supply:** The most important task of FOs would be to obtain a reliable water supply instead of getting more water. This would require an efficient flow monitoring system throughout agricultural seasons.
- **Equitable Water Distribution:** Once the water enters through the gate into the distributary, the first immediate task would be to maintain high degree of equity in water distribution to the best possible level among the outlets of the respective distributary command area as per distribution criteria. FO is required to keep all hydraulic structures in functional condition, check the discharge rating of each outlet, and if necessary to make structural adjustments like resetting the B-Y dimensions and crest elevation for the affected outlets.
- **Efficient O&M of Distributary/Minor:** For efficient running of the system, FO would be responsible to carry out annual, seasonal and routine maintenance of the channel, which includes regular de-silting, repair of hydraulic and non-hydraulic structures, embankment and weed clearance.
- **Financing Irrigation Services:** Legally, FO has to provide for the O&M of the distributary/minor with the help of the Watercourse Associations (WCAs) at the tertiary level. The assessment of the water charges, dues, fees, surcharge in case of defaulters, levy of charges for additional services, management service cost and collection of revenues is formally a responsibility of the FO.
- **Appropriate Staffing:** SIDA rules and regulations make it legally possible to employ a suitable number of technical and non-technical staff for the operation and maintenance of the system and assessment and collection of water charges. Therefore, FO will have to appoint appropriate staff for operation and maintenance of the channel for assessment and collection of water and other charges.
- **Water related Conflict Resolution:** Disputes relating to water resources such as problem of water stealing, controversy over labour contribution, sharing of water between old and new users, inclusion of unirrigated land, revenue assessment and collection may arise as serious problems within the jurisdiction of an FO. It would be the responsibility of the FO to resolve such conflicts by maintaining harmonious relations between the FO and farmers. The method of settlement of disputes may be adopted with the help of the concerned WUA by involving local influential persons. It should be ensured that chances to file cases in the SIDA or state courts should be minimal.
- **Drainage Tubewells:** To benefit significantly from LBOD drainage facilities, FOs have to take a leading role in operating and maintaining the installed drainage facilities (tubewells). In many locations of the pilot area, the groundwater levels are too high such as in the Heran and Bareji Distributary command areas, to control the depth to water table, tubewell operations would be required. FO will be playing a key role to get the benefits associated with the available LBOD drainage facilities.

- **O&M of Surface Drains (<15 cfs):** The Farmer Organization (FO) for each pilot distributary will be responsible for the operation and maintenance of surface drains which have design discharge less than 15 cubic feet per second (cfs). Each FO has to devise a maintenance program and operational plan with particular emphasis on combined management of the irrigation and drainage facilities.

#### **1.4 NEED FOR THE BUSINESS PLAN**

Fundamentally, every business has an economic purpose and all efforts should be made to bring a business into existence based on careful investigations to determine:

- i) Its viability
- ii) The amount of funds required to start it and continue it on sound basis
- iii) Procurement of properly qualified associates;
- iv) Necessary contracts and procurement of option and charter
- v) The methods through which necessary funds for the business shall be raised
- vi) The actual raising of funds

Thus, main task in business relates to financing and indeed, financing activities would be directed to devise the plan and methods of raising necessary funds for starting and carrying out the business. Financing an organization involves raising funds for three distinct purposes:

- 1) Financing during the organization period which means meeting the cost of all intangible property such as expenses on legal, economic and accounting advice on the project from the very start until the time when the business is ready to begin actual operation
- 2) Financing the actual construction, which means meeting the cost of all tangible property. It covers the cost of real estate, labour, materials, contractor's fee, machinery, furniture, fixture equipment, stationary etc.
- 3) Financing the business itself means providing the funds needed over and above the actual receipts of the business to operate it until such time as the receipts are sufficient to cover all outgoing expenses.

Hence, a comprehensive business plan is an important requirement of any FO for irrigation system management. It would primarily assist in shift in responsibility and authority for O&M, revenue assessment and collection for managing the irrigated agriculture from the government to the farmers.

## **1.5 OBJECTIVES OF THE BUSINESS PLAN**

Assessment of financial obligations is usually based on either cost or benefit standard. Enforcement of the rules for water allocation, O&M, payment of charges and taxes is critical to the long-term sustainability of financing system. But effective use of irrigation water charges to ensure efficient irrigation business is the prime objective of any FO in the pilot areas. Therefore, the main objective of writing this plan is to provide guidelines to FOs in gaining financial viability while they manage parts of the irrigation system.

The specific objectives of this business plan are:

- To assist FOs in identifying the O&M costs of the irrigation and drainage facilities for allocating resources to improve the irrigation service at distributary/minor level;
- To provide guidelines to FOs in the assessment and collection of water charges and expected sources of income for financing irrigation services in the pilot areas;
- To assist in assessing the financial obligations of FOs
- To suggest ways and means for financial autonomy of the FOs remaining within the specified rules and regulations of SIDA.

## **1.6 PRELIMINARY BUSINESS PLANS**

Any method of financing irrigation involves collection of revenue from a large number of farmers and requires enough resources for the assessment and collection of these revenues. In Sindh Province, a special revenue group is assigned to assess water charges. SIDA is fully responsible for this work and yet has minimum interaction with the farmers other than pilot areas.

IWMI and Agriculture Department of the Government of Sindh designed an action research program for three pilot distributaries in Sindh. They organized one-day workshop on 26 November 1995. The three pilot distributaries selected were Bareji in Mirpur Khas, Dhoru Naro in Nawab Shah and Heran in Sanghar districts. During the project period, the irrigation facilities were field evaluated, but not the drainage facilities. An initial farm survey was conducted during the Rabi 1996-97 season by IWMI field staff and was reported by Sohani (1997). This was followed by another farm survey during Kharif 1997 and watercourse command areas were the basis for analysis. In these surveys, farm income and farm revenues analysis was carried out. The analysis was reported in the Preliminary Business Plan for each of the pilot distributary. Table 1.4 provides information about the farm income for the three pilot distributaries. The farmers of Heran Distributary command area have the lowest farm income that is Rupees 6, 705 per cropped acre, whereas farmers of Bareji Distributary have double of this amount, which is Rupees 13, 445 per cropped acre.

**Table 1.4. Net annual farm income analysis of the three pilot areas.**

Pilot Distributary	Dhoro Naro		Heran		Bareji	
	Totals		Totals		Totals	
	Per Cropped CCA	Per CCA Acre	Per Cropped CCA	Per CCA Acre	Per Cropped CCA	Per CCA Acre
Gross Revenue (Rs.)	16, 115	8, 905	17, 202	10, 396	23, 397	10, 805
Gross Input Costs (Rs.)	7, 841	4, 330	9, 964	5, 981	9, 408	4, 291
Total Taxes (Rs.)	552	304	533	320	543	248
Total Expenditure (Rs.)	8, 392	9, 634	10, 497	6, 301	9, 951	4, 539
Farm Income (Rs.)	7, 723	4, 270	6, 705	4, 095	13, 445	6, 266

The farmers of Dhoro Naro Distributary have farm income 15 percent higher that is Rupees 7, 723 per cropped acre. If we make comparison in terms of acres of CCA, Dhoro Naro Distributary is only 4 percent greater than Heran Distributary, whereas Bareji is 50 percent greater.

All of the three Preliminary Business Plans also provide information on the gross revenue for the watercourse command areas in each pilot distributary. For the farm income analysis, data were collected for two watercourses of each distributary which were 6R and 10L of Dhoro Naro, 4R and Khadwari Minor's 2R of Heran Distributary, 5L and 7R of Bareji. The analysis shows that for the Heran and Bareji distributaries, the maximum gross watercourse revenue is more than double the minimum gross watercourse revenue. However, when net farm income per cropped acre was compared, the differences are not so great.

In the Preliminary Business Plans, operation and maintenance (O&M) for a Water Users Federation was estimated including the establishment costs and capital costs. Also, based on the Maintenance Plan for each pilot distributary, an annual maintenance budget was calculated. Table 1.5 shows the establishment and maintenance costs for each pilot distributary which were calculated based on annual costs in rupees per CCA acre.

**Table 1.5. Estimation of O&M costs of WUF for each pilot distributary.**

Description	Annual Costs in Rupees Per CCA acre		
	Dhoro Naro	Heran	Bareji
Establishment Costs	36.8	34.5	40.6
Maintenance Costs	19.9	25.9	19.4
Total O&M Budget	56.7	60.4	60.0

The establishment and maintenance costs for each pilot channel vary only from Rs.56.7 to Rs.60.4 per CCA acre per year. Average O&M costs were Rs.59 per CCA acre per year. When we subtract this amount from the total, irrigation system costs are Rs.108 per CCA per acre per year, which means that Rs.49/CCA acre/year should be paid to the area water board, and each



WUF should retain Rs.59/CCA acre/year. These costs were quite close to what farmers were paying at that time. The analysis showed that combined sum of *abiana* plus the money paid illegally for water varied from Rs.88.11 to 111.89 per CCA acre for the three pilot distributaries, with average being Rs.100 per CCA acre.

## **1.7 ISSUES AND CONSTRAINTS OF FOS**

In this section, it is discussed how Irrigation Management Transfer (IMT) intervention in parts of irrigation systems in Sindh affected the farming community in the pilot sites. The key issue is how to manage water resources in an efficient, productive, sustainable, and equitable way. The common problems and concerns that FO may face during the turn over are described below:

1. The decisions taken jointly by the SIDA and FO may face problems during the implementation period because enforcement of the rules for water allocation, adjustment of outlets etc., is a critical matter and disputes between FO and water users may arise over water distribution.
2. While implementing participatory approach to achieve most of its intended targets, the most important issue would be recovery of water charges because already cases exist where cost recovery is a big problem. Hence, collection of water rates may become a problem in the pilot areas. Therefore laws should empower FOs to impose penalties in such cases because collection is not linked with service delivery.
3. Another constraint FO may face is the timely acquisition of its share, which is 40% of the water charges. According to present rules, all the money will be deposited to SIDA's account and later on FO will get its share. Therefore, timely transfer of money will be a problem.
4. In present circumstances, financial management capacity of FO is limited. Because spending of available monetary funding, and accountability system could be a big constraint for FO. They would require an internal and external monitoring system otherwise there is a danger of weak organization.
5. In the local social system, elected members would be required to execute a voluntary service to a certain FO; there are chances that some of them may loose their interest in the course of time. This can be a problem for FO to keep the long-term interest of WCA elected members for sustainability of the organization. In the local social setup, farming community may divide into groups and often-elected groups depress opponents.

## **2. FINANCIAL OBLIGATIONS AND SOURCES OF INCOME**

To meet its financial obligations, farmer organizations should levy charges for all types of water-related services. The cost of operating irrigation and drainage systems is the basis commonly used for determining service charges in the water sector throughout the world. Therefore, the cost of a service delivery can be determined easily when services are rendered by a single farmer organization. Therefore, a realistic assessment should be made before launching a transfer program.

### **2.1 FINANCIAL OBLIGATIONS**

In accordance with Sindh Irrigation and Drainage Authority Act 1997, farmer organizations are liable to meet some financial obligations while managing parts of irrigation system. They are discussed in detail below:

#### **2.1.1 Payments to Area Water Board (AWB)**

According to the act, FO shall remit to AWB, the amount required to meet the costs for the management and operation of the canal system supplying water to the area under the jurisdiction of FO. The act empowers FO to keep operating and reserve funds under interest bearing fixed deposits in a Bank. FO is bound to spend interest accrued from the fixed deposit amount on operation and maintenance including allied activities of the irrigation system.

After careful evaluation and estimation SIDA and pilot FOs have to reach an agreement according to which all the sums receivable for water charges in lieu of delivery of irrigation and drainage services to agricultural/non-agricultural users will be divided between the SIDA and FO. Whatever income comes from *abiana*, development *cess* or drainage *cess* will be divided with a ratio of 60:40. Which means 60% of the total revenue from the sources will be the share of Area Water Board and 40% share will be retained by a farmer organization.

#### **2.1.2 Costs of Operating and Maintaining Irrigation Facilities**

For the preparation of an annual O&M budget for its irrigation facilities, FOs would need guidance because the size of the O&M budget will thus affect the revenue available to farmer organizations. IWMI Sindh team has prepared recently a detailed document within a clearly defined framework established by the Government of Sindh which is based on actual walk thru surveys in the field, on-site inspections of the hydraulic/non-hydraulic structures and actual staffing needs. In this estimation, on the basis of yardsticks, the total cost has been estimated for O&M expenditure. The main components of O&M estimates are described as below:

##### ***2.1.2.1 Bank work***

In this item inspection/non-inspection costs have been estimated keeping in view the wear and tear of banks, cutting of banks due to flow variations, cattle tress passes, weather action and

breaches. Following the yardstick, the total cost per kilometer has been estimated at Rs. 4,020/-. The details of the estimation work are given in Annex-1.

#### ***2.1.2.2 Silt Clearance***

Continuous irrigation supply and velocity on hard soils and flat gradient of Sindh silt deposit is a problem. Hence, desilting cost was calculated at Rs. 4,102/km. Second costs for the construction of groynes, weed clearance and canal trimming were worked out at Rs.205/km. Therefore, total cost for silt clearance comes to Rs.4, 307/km. All details are available in Annex-2.

#### ***2.1.2.3 Maintenance and Repair (M&R) of Structures***

In this analysis, damage to road culverts, bridge parapets, cross regulators/outlet structures, repair to structure floor and repairs of gate and gearing machinery were estimated at Rs.2, 503/km. Annex-3 provides the detailed analysis of M&R.

#### ***2.1.2.4 Other Operational Cost***

For the operation of pilot distributary/minor, first the staffing requirement for a FO has been estimated keeping in view the staff strength under present conditions and then, for running and maintaining the FO office cost has been worked out which totals to Rs.14,845/km. The details are appended in Annex-4.

#### ***2.1.2.5 Total O&M Cost***

Total cost to operate and maintain the pilot channels have been worked out by adding the costs related to bank work, silt clearance, M&R of structures and other operational costs. The estimated total O&M cost for per kilometer of any distributary or minor comes out as Rs.25, 675/-.

#### ***2.1.2.6 Transaction Cost***

FO members would be closely interacting with the AWB/SIDA staff for smoothly running the pilot distributaries/minors. To meet the traveling costs, photocopying, sketching, drafting of various forms etc. 1% of the total O&M cost is suggested for making provision while preparing annual budget estimates for any distributary and minor.

Considering this principle, the transaction cost can be made available from own resources and by this way FO would be in good shape to meet any business related to respective irrigation channel in pilot areas.

#### ***2.1.2.7 Cost Reduction Measures***

Any FO may adopt various costs cutting measures depending upon the degree of cooperation extended by the water users of any distributary/minor in the pilot areas. This would need resource mobilization. Resource mobilization is the most significant and potential area where farmer's participation could be achieved on voluntary basis. For cost reduction, mobilization of manpower and tools might be available for bank work and silt clearance. There are the two

potential items where a FO will be able to save the money but contributions by farmers would vary from one irrigation channel to other.

### **2.1.3 O&M Cost for Drainage Facilities**

To assess the current needs for drainage facilities in the pilot areas is a hard part because it is not yet clear that who will manage the vertical drainage and scavenger tubewells. Therefore, to assess the mechanical costs for making tubewells operational, working hours, repairs and maintenance costs of machinery and as well as of the allied channels which discharge effluent into the nearby surface drains, a sound working would be required. Thus, it is suggested that these cost estimates should be deferred for the time being due to the unclear situation. Since no drainage cess has been finalized and also drainage O&M is not taking place in the pilot areas, thus, as a notion, calculations have been made but these have not been accounted for analysis purpose.

As it has been already decided that surface drains of capacity less than 15 cubic feet per second discharge will be operated and maintained by the respective FOs. From the currently available data about the drainage facilities, only the FOs of Dhoro Naro Minor and Rawtiani distributary would be required to manage surface drains which are below 15 cfs discharge. It is suggested that all of the bank work, weed cleaning and drain maintenance work should be carried out by the farmers on participatory basis to minimize management costs. And for maintenance and repair (M&R) of the structures, a provision of 25% of the Irrigation facilities M&R cost should be made to meet this cost.

Considering the present M&R cost estimates, this amount would be Rs.949/km of the drain length. For the purpose of analysis this cost has not been used.

## **2.3 REVENUE/SOURCES OF INCOME**

An important principal underlying the financing of irrigation and drainage services is based on the framework of prices which are established by the government policies and rules and secondly water charges should be linked to benefits received and the cost of service delivery. In the Sindh Province, the main mechanism of direct charges for irrigation facilities is on per acre basis for agricultural users. Second source of income is from charging water for nonagricultural purposes and revenue from the interest of deposits in the banks plus the income from the sale of assets within the jurisdiction of irrigation authorities.

## **2.4 CURRENT REVENUE ASSESSMENT**

For the purpose of preparation and execution of the IMT, the possible revenue from water charges has been worked out on the basis of current water rates. For the Rabi 1996-97 and Kharif 1997 seasons, a Primary Business Plan has been prepared for each of the pilot distributary. The data from these three Business Plans of Heran, Dhoro Naro and Bareji distributaries have been used as the basis for assessing the income from water charges. Because gross watercourse revenues were

calculated from the original data collected from the field. The actual cropped area and *Abiana* assessment for the three pilot distributaries is given in Table 2.1. On the basis of these figures per acre *abiana* have been calculated which has been used to estimate the revenue from water charges for the case of all the pilot distributaries (**Government of Sindh, 2001**). Here, the assumption has been made that cropping pattern on other pilot distributaries and minors will be same as prevailed on three pilot distributaries namely Heran, Bareji and Dhoro Naro. It has been reported that Heran Distributary has annual cropping Intensity of 121.32%, Dhoro Naro with 113.63, whereas Bareji has only 90.59 percent (**Pirzada et al, 1997; Khanzada et al, 1997; Sial et al, 1997**). Therefore, on average 109% cropping intensity has been considered for the calculation of *Abiana* for all the pilot distributaries. The cropping intensity has been taken from the referred reports and is based on actual surveys in the field. Since *Abiana* is levied on the actual cropped area basis, therefore, cropping intensity has been taken from the actual reported data. The higher cropping intensities have been due to rise in watertable after operation of canals which has reduced the crop water requirements resulting in more crops from the same available quantity of water.

**Table 2.1. Assessment of abiana on per acre basis pilot from three distributaries.**

Distributary/ Minor	Rabi 1996-97		Kharif 1997		Total	
	Cropped Area (Acre)	Abiana (Rs.)	Cropped Area (Acre)	Abiana (Rs.)	Cropped Area (Acre)	Abiana (Rs.)
Heran	8, 513	429, 314	9, 323	801, 871	17, 836	1,231,185
Bareji	4, 970	205, 590	5, 684	535, 689	10, 654	741, 279
Dhoro Naro	7, 894	413, 181	6, 869	600, 913	14, 763	1, 014, 094
Total	21377	1048085	21876	1938473	43253	2986558
Abiana per Acre (Rs.)	49		89		69	

The above table shows that on average Rupees 49 *abiana* was assessed on per acre basis for the Rabi season, whereas Rupees 89 per acre for Kharif season. On average annual *abiana* rate comes out Rupees 69 per acre for the three pilot distributaries (**Pirzada et al, 1997; Khanzada et al, 1997; Sial et al, 1997**). Thus, *abiana* rate of Rs.69/acre has been used to assess the revenue for the cropped areas in pilot areas. This method has been employed only to make estimates prior to the irrigation management transfer.

The financial analysis for the 13 FOs has been given in Table 2.2, which indicates positive balance for 10 FOs. In this analysis, the assessment of drainage cess and O&M costs for the case of surface drains have been left open due to the non-availability of the actual data pertaining to pilot areas. Thus farmers will have to make careful assessment of operation and maintenance costs and as well as the assessment of the actual benefiting CCA from these surface drains. This is the hard part of the Irrigation and Drainage Transfer and will be the responsibility of the drainage committee(s).

**Table 2.2. Assessing the Viability of FOs in pilot areas of Sindh.**

Distributary/Minor	FO Share in Revenue (Rs.)	Total O&M Cost		Balance
		Irrigation	Drainage	Amount (Rs.)
Heran	504,709	299,371	-	205,338
Bareji	358,722	338,910	-	19,812
Dhoro Naro	412,899	277,906	-	134,993
Sanhro	462,301	282,425	-	179,876
Belharo	513,744	391,723	-	122,021
Mirpur	487,902	417,989	-	69,913
Dighri	951,467	828,917	-	122,549
Potho	242,567	277,236	-	-34,669
Baghi	244,523	214,643	-	29,880
Khatian Tando	342,145	361,504	-	-19,359
Muhammad Ali	115,312	123,702	-	-8,390
Rawtiani	271,538	249,381	-	22,157
Tail	249,276	145,449	-	103,827

On the other hand, three FO have shown a negative balance that ranges between rupees 8,390 and 34,669. The analysis of the discharge and length of the distributary with respect to balance of FOs indicates a clear relationship. The ratio between discharge of the irrigation channel and its length shows that discharge varies with respect to distributary or minor length with a ratio of 2.37 to 5.90. The data presented in Table 2.3 depicts that irrigation channels those have less than 3 cusec discharge per kilometer length shows a negative balance for the respective FOs. Therefore, on the prevailing rate of Abiana, O&M costs cannot be met by these FOs. As the Government is progressively increasing the Abiana on annual basis, therefore, improvement in funds availability will facilitate FOs for being on sound footing in running the irrigation system.

**Table 2.3. Relationship Between Discharge and Length of Irrigation Channels With Respect to Financial Gains of FOs in Pilot Area.**

Distributary / Minor	Discharge in cfs	Length in Kilometers	Ratio of Discharge / Length	Financial Balance in Rs.
Muhammad Ali	10.90	4.67	2.33	-8,390
Khatian Tando	33.00	12.80	2.58	-19,359
Potho	30.00	10.35	2.90	-34,669
Bareji	41.50	12.00	3.46	19,812
Rawtiani	29.00	8.83	3.28	22,157
Baghii	28.00	7.60	3.68	29,880
Mirpur	63.80	14.80	4.31	69,913
Tail	27.00	5.15	5.24	103,827
Belharo	58.60	13.87	4.22	122,021
Dighri	101.80	29.35	3.47	122,549
Dhoro Naro	51.60	9.84	5.24	134,993
Sanhro	53.80	10.00	5.38	179,876
Heran	62.50	10.60	5.90	205,338

## **2.5 REVENUE ASSESSMENT AND COLLECTION STRATEGY**

### **2.5.1 Revenue Assessment**

FO should obtain and maintain the record of land holdings, cultivators and ownership and ownership record should be compiled from the record of Revenue Department. Land record will be helpful in water allocations, water distribution to the new entrants. For the cases where changes occur, new and old record must be maintained.

Once record has been established, a FO member or his nominee shall carry out the crop assessment survey for each season that is kharif and Rabi at appropriate time. Fallow area and area with damaged crop must be noted separately to avoid any disputes on assessment. After the completion of the survey, a summary statement should be prepared and treasurer of the FO must check the assessment lists and its summary sheet. The assessed area should be compared with the total distributary or minor area to avoid and misconceptions.

Currently, the revenue staff of the SIDA assess crops on Deh basis and in several cases these Deh comes under the command area of more than one canal. Since the in pilot areas, irrigation allocations are made on the basis of outlet command area, a immediate shift would be required necessarily for the assessment and collection from Deh level to Watercourse command level in the pilot distributaries.

### **2.5.2 Revenue Collection**

A staff member should prepare a bill on the basis of crop assessment survey by applying the prevalent water rate in the name of each water user. The crop assessment must be completed in accordance with the notified water rates by the SIDA. Any claims for the remission either partial or full on the basis of crop failure must be received by the FO and may be examined by the President to avoid any dispute. On the verification of the President, Committee should grant any concession or remission. In case of any adjustment in the bill, revised bills should be issued.

For depositing the full amount shown in the bill, the committee of farmer organization should open an account in the Bank and FO should keep record of the collections. Assessment, collection and record maintenance is only the responsibility of the FO and they should have control in it.

### **2.5.3 Surcharge**

Whenever an assessed amount is paid after the due date, a surcharge should be levied on the defaulters and like energy/electricity bills, these should be notified on the bills. FO should decide the rate of surcharge to be imposed before the end of the season.

The billing exercise must be completed before the start of harvesting season and there should be deadline for issuing these bills. Rules should be framed to tackle all complaints regarding assessment, payment and proper investigation of such cases.

## **2.6 OTHER SOURCES OF INCOME**

Indirect methods of financing irrigation and drainage service are pretty much needed for supporting the conventional methods. Secondary income to be earned from a variety of resources would be the sale of surplus water for nonagricultural uses, for example allocation for the industrial use, interest on funds, FOs can impose additional charges on the water users which could increase the income of the farmer organizations.

In the long run, farmer organizations can plan tree plantations along the distributary canal banks, FOs can sell water for fish farms. Some income may come from selling few assets available in the canal commands. Some contributions will come from penalties sanctioned on the defaulters.

The immediate income is possible if pilot farmer organizations impose a membership fee on the each water user on per acre basis of CCA. A reasonable rate must be decided before the IMT process starts.



### **3. CONFLICT RESOLUTION AND PENALTIES**

There is a proposition that conflicts can be a means to acquire water rights and often conflicts are used to express dominance. Hence, for participatory irrigation management agreements and negotiations between individual users and collective claims by water users is the fundamental basis to avoid tension and open conflict among the farmers drawing water from the farmer managed irrigation systems.

Conflicts between farmers over water allocation and distribution are common in all over the world. Many conflicts are related with minor disputes on diverting water out of turn or using more excess water as compared to allocated. This kind of disputes can be resolved with the help of WCAs. These are the problems those often arise in the daily irrigation business and are easy to resolve.

Other conflicts arise due to the stealing of water by the farmers on distributary canal and within watercourse commands. Some problems occur at times when changes in water allocation or physical structure are introduced. Hence, farmers use different means to protect their water needs.

The crop assessment and recovery of the water rates is the potential area where dispute and conflicts among the farmers arise. Therefore, it would be nice to formulate a dispute resolution committee by the respective FO to avoid such problems.

#### 4. FINANCIAL RECORD KEEPING

Although the treasurer is considered as the financial in-charge of the Accounts of any organization, but financial record keeping is an independent job and it requires lot of time and input in big organizations. As far as the Former Organizations are concerned, they should keep the maximum record with them and minimum record should be maintained by the Watercourse Associations (WCAs). All the land record pertaining to each watercourse should be the responsibility of the FO. All the documents related to official water allocations and revisions should be kept by the respective FO so that whenever need arises, FO should be able to consult those record with the help of respective WCAs.

It would be wise to advice that a Revenue Assistant should be hired by each FO for keeping the record of the financial functions like abiana assessment/collection. Although the number of employed persons would pretty much depend upon the workload. For the case of smaller FOs, this Assistant may work for several organizations if it is practicable. The following record would be necessary to maintain for each FO:

1. **Book of Assets:** This will have a complete inventory of the assets at the time of irrigation management transfer and subsequently addition or deletion of any items.
2. **Book of Accounts for Revenue:** This book will contain several heads like Resources at the time of transfer, income from water rates on the basis of abiana assessment, income from non-agricultural water allocations, income from additional surcharge and penalties.
3. **Book of O&M Costs:** All the record related to operation and maintenance costs for irrigation and drainage facilities including the transaction costs of the respective FOs should be maintained in a separate register. Because these costs will be a regular feature of each FO, thus, its record must be separate from any other financial activity.
4. **Book of Billing:** A register should be maintained in which all the record related to bills for each WCA should be available. Also relief/remission and complaints related to billing should be recorded together with the particulars against each WCA.
5. **Book of Salaries and Wages:** Each FO should maintain a register bearing all the particulars of salaries and labor with reference to appointment letters and subsequent pay change or if any deductions for loans and taxes.
6. **Book of Reserve Fund:** This record would be a quick check for excess of income over expenditure or vice versa at any particular time. This record should also include particulars about grants from Government, SIDA, Area Water Board or finance from any other source.

Each FO must be careful in chalking out the nature of transactions and financial functions to carry out the proper record keeping and subsequently its audit.

## **5. REVISION OF BUSINESS PLANS**

In the earlier three primary business plans for pilot distributaries, the emphasis was to operate and maintain the irrigation facilities but in this proposed business plan, both irrigation and drainage facilities have been considered to provide guidelines to farmer organizations. The drainage part is still unclear and it would be required to see that what would be managed by the farmers, how much will be the O&M cost. Also the rate of drainage cess has not been yet decided, although National Drainage Consultants (NDC) has worked out that Rupees 84 per acre is the appropriate rate but how much would be imposed. Once the irrigation and drainage management is transferred, certainly, the revision of this proposed business plan would be required as per the actual jurisdiction of each FO.

Once the O&M costs for drainage facilities are known, along with the benefits to the farmers, they can be combined with the irrigation facilities to update this Proposed Business Plan (PBP), which will be different for each pilot distributary. That updated version of this PBP will be presented to appropriate Farmer Organization for debate and agreement among the water users. Once the Farmer Organization members come to an agreement, any necessary changes can be made and then a Final Business Plan would be published.

## **6. SUMMARY AND CONCLUSIONS**

In July 1995, the Department of Agriculture Engineering and Water Management of the Government of Sindh (GoS) requested the International Irrigation Management Institute (IIMI) to undertake an action research program for three pilot distributaries in the LBOD project area. The pilot project was established by organizing three Water Users Federations (WUFs), which were to take the part of the irrigation system for operation and maintenance. In the second phase the three pilot FOs were mobilized and ten additional FOs were formed. These FOs are now ready to takeover various channels as pilot sites to effectively improve the O&M of both the irrigation and drainage facilities on participatory basis.

This pilot project has succeeded through its activities so far to assist in establishing water users organizations in several canal command areas. Currently, the legislative and institutional processes are under way for effectively organizing and strengthening water user organizations on a wider scale. This proposed business plan (PBP) has been drafted to assist the FOs in carrying out the actual business after irrigation management transfer in the pilot areas. This document should be used as guidelines in future in the pilot areas to manage the irrigation system on viable basis.

For managing the irrigation facilities, reliable and equitable water supply, efficient O&M of the irrigation units, proper and timely financing of irrigation service, appointment of appropriate staff, and conflict resolution would be the major tasks of any FO in the pilot areas. While managing the drainage facilities, operation and maintenance of drainage tubewells and O&M of the surface drains below discharge of 15 cfs would require particular attention of the respective FOs.

To meet the costs of operation and maintenance of the irrigation and drainage facilities, FOs would need guidance in assessment and collection of the water rates and drainage cess. For the business of assessment of water rates, FOs, first of all, a shift from Deh to Watercourse command would be needed immediately after the irrigation management transfer (IMT) which will not correspond with the current practice being implemented.

Each FO has been suggested a revenue assessment and collection strategy for financing the irrigation and drainage facilities. The absence of actual data on O&M of drainage facilities and cess collection makes it difficult to assess the actual costs that would require special attention after IMT.

For dealing with conflicts between farmers over water allocation and distribution a Water Committee has been proposed which will help in sorting out various issues related with water.

For financial record keeping, maximum record should be maintained with FOs and minimum record with WCAs to run the business smoothly. Six types of record books have been recommended. Also it has been suggested to hire a FO Assistant for maintaining this record.

Once the O& M costs for irrigation and drainage facilities are known to FOs, they would require a combined effort to revise the proposed business plan which would be finalized after debate and agreement among the water users to convert it to Final Business Plan. Therefore, every FO has been recommended a revision of the currently proposed business plan.

## REFERENCES

- Government of Sindh 2001. Water Rates (ABIANA) 1980-81 To 19980-99. Irrigation and Power Department, Sindh.
- Khazada, M. N. et al. 1997. Preliminary Business Plan for Bareji Distributary. Report No. R-41.2, International Irrigation Management Institute, Lahore, Pakistan.
- Pirzada, A. P. et al. 1997. Preliminary Business Plan for Dhoro Naro Minor. Report No. R-41.1, International Irrigation Management Institute, Lahore, Pakistan.
- Sial, N. H. et al. 1997. Preliminary Business Plan for Heran Distributary. Report No. R-41.3, International Irrigation Management Institute, Lahore, Pakistan.
- SIDA 2000. Irrigation and Drainage Management Transfer (IDMT) Agreement Between SIDA/AWB and Farmer Organizations (FO). Working Paper. Sindh Irrigation & Drainage Authority, National Drainage Program (NDP) Sindh.
- World Bank. 1994. Pakistan Irrigation and Drainage: issues and options. Report No. 11884-Pak, AOD, World Bank, 25 March 1994.
- WSIP. 1990. Water sector investment plan (1990-2000). Lahore: Federal Planning Cell, WAPDA, Pakistan.

## ANNEXTURES

### Annex-1

#### Bank work

Considering 0.5 ft depletion of earth work of in one year, the following cost estimation has been Worked out as under.

S. No.	Item	Rate	Quantity	Amount
1	Length of channel (mile)		7	
2	Width of Inspection path (ft)		12	
3	Width of Non Inspection path (ft)		8	
4	Running feet		20	
5	Earth work per mile (cft)		50,000	
6	Total earth work		350,000	
7	Considering 20% of length will require earth work		70,000	
8	Average rate (machine and manual) per 1000 cft of earth work (Rs)	616		<b>43,120</b>
9	Cost per mile (Rs)			<b>6,160</b>
10	Earth work for closing leaks, breaches etc will be @ 5% of cost of bank work			<b>308</b>
	<b>Total cost of earth work per mile</b>			<b>6,468</b>
	<b>Total cost of earth work per km</b>			<b>4,020</b>

**Silt Clearance**

The normal silt charge is assumed 4gms/lit of water. If only half percent of this quantity gets. Deposited in the bed of channel, then it is worked out silt deposited will be 0.44 foot. Considering 20 feet width of channels the quantity and cost have been worked out as under.

S. #	Item	Rate	Quantity	Amount
1	Channel length (mile)		7	
2	Channel width (ft)		20	
3	Quantity silt deposited (cft/mile)	0.44*20*5000	44,000	
4	Assuming 30% silt clearance of total length (cft)		92,400	
5	Desilting cost (Rs)	500		46,200
6	Desilting cost/mile (Rs)			<b>6,600</b>
7	Groynes, weed clearance etc will be @ 5% of desilting cost/mile (Rs)			<b>330</b>
	<b>Total cost per mile (Rs)</b>			<b>6,930</b>
	<b>Total per km cost (Rs)</b>			<b>4,307</b>



**M&R to Structures**

It is considered that the representative channel will have one X -regulator/ fall structure, Two road bridges, one syphone and some out lets to be repaired. The M&R cost for Cost of above referred structures has been worked out as under.

S. #	Item	Rate	Quantity	Amount
1	One X- regulator (75 cusec)		1	
2	Capital cost Rs/cusec	3,494		
3	Capital cost of the structure			262,050
4	Road bridges ( 90 & 50 cusecs)		2	
5	Capital cost Rs /cusec	2,905		
6	Capital cost of the structures Rs			813,400
7	Capital cost of syphone / aqueduct Rs			34,252
	<b>Total capital cost</b>			<b>1,109,702</b>
	M&R to structures will be @ 2 % of the capital cost			22,194
8	Water courses to be repaired	1,500	4	6,000
	Total M&R cost (Rs)			28,194
	<b>Cost per mile (Rs)</b>			<b>4,028</b>
	<b>Cost per km (Rs)</b>			<b>2,503</b>

**Annex-4****Expenditure on Operational Staff at Distributary/Minor (7 Miles).**

S #	Item	No	Unit Cost	Unit	Total Cost Rs.	Per Mile Cost
1	Beldar	2	3,000	12	72,000	
2	Darogha	1	4,000	2	8,000	
3	Abdar	1	4,000	4	16,000	
4	Technical Assistant	1	8,000	1	8,000	
5	Book Keeper	1	4000	12	48,000	
	Total				<b>152,000</b>	
	Contingency @ 10% of Op. Cost				15,200	
	Grand Total				<b>167,200</b>	<b>23,886</b>
	<b>Per km Cost (Rs.)</b>					<b>14,845</b>

Annex-5		
FINANCING IRRIGATION AND DRAINAGE FACILITIES		
<u>PILOT DISTRIBUTARY HERAN</u>		
PARTICULARS	Unit	
<b><u>I. ABIANA ASSESSMENT</u></b>		
1. Cropped Area	acres	18,287
3. Waterlogged Area	acres	870
4. Salinized Area	acres	1,673
5. Abandoned Area	acres	1,802
6. CCA	acres	15,073
7. Cropping Intensity	%age	121
<b>la. Total Annual Abiana Receipts (@Rs. 69/acre)</b>	<b>Rupees</b>	<b>1,261,773</b>
<b>lb. Annual Receipts from Non-Agri Allocations</b>	<b>Rupees</b>	<b>0</b>
<b>lc. Assessment of Drainage Cess</b>	<b>Rupees</b>	<b>0</b>
<b>A. Total Receipts from Abiana and Drainage Cess</b>	<b>Rupees</b>	<b>1,261,773</b>
<b>B. Payment of Royalty to SIDA</b>	<b>60%</b>	<b>757,064</b>
<b>C. Fund Available to FO</b>	<b>Rupees</b>	<b>504,709</b>
<b><u>II. O&amp;M COST</u></b>		
<b>a. Irrigation Facilities</b>		
1. Length of the Disty/Minor	km	11
2. Bank work (Rs. 4,020/km)	Rupees	42,612
3. Silt clearance (Rs. 4,307/km)	Rupees	45,654
4. M&R of Structures (Rs. 2,503/km)	Rupees	26,532
5. Operational Cost (Staff & Supplies) (Rs.14,845/km)	Rupees	157,357
Transaction Cost	Rupees	27,216
<b>s Total O&amp;M Cost</b>	<b>Rupees</b>	<b>299,371</b>
<b>b. Drainage Facilities</b>		
1. Length of the Drain (<15 cfs Discharge)	km	-
2. M&R of Structures	Rupees	-
3. No. of sump houses/tubewells	No.	-
4. Security of sump houses/tubewells (Rs. 4.000/head)	Rupees	-
<b>Total O&amp;M Cost</b>	<b>Rupees</b>	<b>0</b>
<b>D. Total Costs (IIa+IIb)</b>	<b>Rupees</b>	<b>299,371</b>
<b>E. FO Balance Amount (C-D)</b>	<b>Rupees</b>	<b>205,338</b>

## FINANCING IRRIGATION AND DRAINAGE FACILITIES

## PILOT DISTRIBUTARY: BAREJI

PARTICULARS	Unit	
<b><u>I. ABIANA ASSESSMENT</u></b>		
1. Cropped Area	acres	12,997
3. Waterlogged Area	acres	133
4. Salinized Area	acres	798
5. Abandoned Area	acres	3,938
6. CCA	acres	11,924
7. Cropping Intensity	%age	109
<b>Ia. Total Annual Abiana Receipts (@Rs. 69/acre)</b>	<b>Rupees</b>	<b>896,804</b>
<b>Ib. Annual Receipts from Non-Agri Allocations</b>	<b>Rupees</b>	<b>0</b>
<b>Ic. Assessment of Drainage Cess</b>	<b>Rupees</b>	<b>0</b>
<b>A. Total Receipts from Abiana and Drainage Cess</b>	<b>Rupees</b>	<b>896,804</b>
<b>B. Payment of Royalty to SIDA</b>	<b>60%</b>	<b>538,082</b>
<b>C. Fund Available to FO</b>	<b>Rupees</b>	<b>358,722</b>
<b><u>II. O&amp;M COST</u></b>		
<b>a. Irrigation Facilities</b>		
1. Length of the Disty/Minor	km	12
2. Bank work (Rs. 4,020/km)	Rupees	48,240
3. Silt clearance (Rs. 4,307/km)	Rupees	51,684
4. M&R of Structures (Rs. 2,503/km)	Rupees	30,036
5. Operational Cost (Staff & Supplies) (Rs.14,845/km)	Rupees	178,140
6. Transaction Cost	Rupees	30,810
<b>Total O&amp;M Cost</b>	<b>Rupees</b>	<b>338,910</b>
<b>b. Drainage Facilities</b>		
1. Length of the Drain (<15 cfs Discharge)	km	7+5+4
2. M&R of Structures	Rupees	0
3. No. of sump houses/tubewells	No.	13
4. Security of sump houses/tubewells (Rs. 4.000/head)	Rupees	
<b>Total O&amp;M Cost</b>	<b>Rupees</b>	<b>s</b>
<b>D. Total Costs (IIa+IIb)</b>	<b>Rupees</b>	<b>338,910</b>
<b>E. FO Balance Amount (C-D)</b>	<b>Rupees</b>	<b>19,812</b>

## FINANCING IRRIGATION AND DRAINAGE FACILITIES

## PILOT DISTRIBUTARY: DHORO NARO

PARTICULARS	Unit	
<b><u>I. ABIANA ASSESSMENT</u></b>		
1. Cropped Area	acres	14,960
3. Waterlogged Area	acres	185
4. Salinized Area	acres	1,680
5. Abandoned Area	acres	1,178
6. CCA	acres	13,161
7. Cropping Intensity	%age	114
<b>Ia. Total Annual Abiana Receipts (@Rs. 69/acre)</b>	<b>Rupees</b>	<b>1,032,248</b>
<b>Ib. Annual Receipts from Non-Agri Allocations</b>	<b>Rupees</b>	<b>0</b>
<b>Ic. Assessment of Drainage Cess</b>	<b>Rupees</b>	<b>0</b>
<b>A. Total Receipts from Abiana and Drainage Cess</b>	<b>Rupees</b>	<b>1,032,248</b>
<b>B. Payment of Royalty to SIDA</b>	<b>60%</b>	<b>619,349</b>
<b>C. Fund Available to FO</b>	<b>Rupees</b>	<b>412,899</b>
<b><u>II. O&amp;M COST</u></b>		
<b>a. Irrigation Facilities</b>		
1. Length of the Disty/Minor	km	10
2. Bank work (Rs. 4,020/km)	Rupees	39,557
3. Silt clearance (Rs. 4,307/km)	Rupees	42,381
4. M&R of Structures (Rs. 2,503/km)	Rupees	24,630
5. Operational Cost (Staff & Supplies) (Rs.14,845/km)	Rupees	146,075
6. Transaction Cost	Rupees	25,264
<b>Total O&amp;M Cost</b>	<b>Rupees</b>	<b>277,906</b>
<b>b. Drainage Facilities</b>		
1. Length of the Drain (<15 cfs Discharge)	km	5
2. M&R of Structures	Rupees	0
3. No. of sump houses/tubewells	No.	8
4. Security of sump houses/tubewells (Rs. 4,000/head)	Rupees	
<b>Total O&amp;M Cost</b>	<b>Rupees</b>	
<b>D. Total Costs (Ila+lib)</b>	<b>Rupees</b>	<b>277,906</b>
<b>E. Balance Amount (C-D)</b>	<b>Rupees</b>	<b>134,993</b>

<b>Annex-8</b>		
<b>FINANCING IRRIGATION AND DRAINAGE FACILITIES</b>		
<b>PILOT DISTRIBUTARY: SANHRO</b>		
<b>PARTICULARS</b>	<b>Unit</b>	
<b><u>I. ABIANA ASSESSMENT</u></b>		
1. Cropped Area	acres	16,750
3. Waterlogged Area	acres	NA
4. Salinized Area	acres	NA
5. Abandoned Area	acres	NA
6. CCA	acres	15,367
7. Cropping Intensity	%age	109
<b>la. Total Annual Abiana Receipts (@Rs. 69/acre)</b>	Rupees	<b>1,155,752</b>
<b>lb. Annual Receipts from Non-Agri Allocations</b>	Rupees	0
<b>lc. Assessment of Drainage Cess</b>	Rupees	0
<b>A. Total Receipts from Abiana and Drainage Cess</b>	Rupees	<b>1,155,752</b>
<b>B. Payment of Royalty to SIDA</b>	<b>60%</b>	<b>693,451</b>
<b>Fund Available to FO</b>	<b>40%</b>	<b>462,301</b>
<b><u>II. O&amp;M COST</u></b>		
<b>a. Irrigation Facilities</b>		
1. Length of the Disty/Minor	km	10
2. Bank work (Rs. 4,020/km)	Rupees	40,200
3. Silt clearance (Rs. 4,307/km)	Rupees	43,070
4. M&R of Structures (Rs. 2,503/km)	Rupees	25,030
5. Operational Cost (Staff & Supplies) (Rs.14,845/km)	Rupees	148,450
6. Transaction Cost (1% of the Total O&M Cost)	Rupees	25,675
<b>Total O&amp;M Cost</b>	Rupees	<b>282,425</b>
<b>b. Drainage Facilities</b>		
1. Length of the Drain (<15 cfs Discharge)	km	-
2. M&R of Structures	Rupees	-
3. No. of sump houses/tubewells	No.	-
4. Security of sump houses/tubewells (Rs. 4,000/head)	Rupees	0
<b>Total O&amp;M Cost</b>	Rupees	<b>0</b>
<b>C. Total Costs (IIa+IIb)</b>	Rupees	<b>282,425</b>
<b>E. Balance Amount (C-D)</b>	Rupees	<b>179,876</b>

## FINANCING IRRIGATION AND DRAINAGE FACILITIES

## PILOT DISTRIBUTARY: BELHARO

PARTICULARS	Unit	
<b><u>I. ABIANA ASSESSMENT</u></b>		
1. Cropped Area	acres	18,614
3. Waterlogged Area	acres	NA
4. Salinized Area	acres	NA
5. Abandoned Area	acres	NA
6. CCA	acres	17,077
7. Cropping Intensity	%age	109
<b>Ia. Total Annual Abiana Receipts (@Rs. 69/acre)</b>	Rupees	<b>1,284,361</b>
<b>Ib. Annual Receipts from Non-Agri Allocations</b>	Rupees	0
<b>Ic. Assessment of Drainage Cess</b>	Rupees	0
<b>A. Total Receipts from Abiana and Drainage Cess</b>	Rupees	<b>1,284,361</b>
<b>B. Payment of Royalty to SIDA</b>	<b>60%</b>	<b>770,617</b>
<b>C. Fund Available to FO</b>	<b>40%</b>	<b>513,744</b>
<b><u>II. O&amp;M COST</u></b>		
<b>a. Irrigation Facilities</b>		
1. Length of the Disty/Minor	km	13.87
2. Bank work (Rs. 4,020/km)	Rupees	55,757
3. Silt clearance (Rs. 4,307/km)	Rupees	59,738
4. M&R of Structures (Rs. 2,503/km)	Rupees	34,717
5. Operational Cost (Staff & Supplies) (Rs.14,845/km)	Rupees	205,900
6. Transaction Cost (1% of the Total O&M Cost)	Rupees	35,611
<b>Total O&amp;M Cost</b>	Rupees	<b>391,723</b>
<b>b. Drainage Facilities</b>		
1. Length of the Drain (<15 cfs Discharge)	km	-
2. M&R of Structures	Rupees	-
3. No. of sump houses/tubewells	No.	-
4. Security of sump houses/tubewells (Rs. 4,000/head)	Rupees	0
<b>Total O&amp;M Cost</b>	Rupees	<b>0</b>
<b>D. Total Costs (IIa+IIb)</b>	Rupees	<b>391,723</b>
<b>E. FO Balance Amount (C-D)</b>	<b>Rupees</b>	<b>122,021</b>

**FINANCING IRRIGATION AND DRAINAGE FACILITIES**  
**PILOT DISTRIBUTARY: MIRPUR**

PARTICULARS	Unit	
<b><u>I. ABIANA ASSESSMENT</u></b>		
1. Cropped Area	acres	17678
3. Waterlogged Area	acres	NA
4. Salinized Area	acres	NA
5. Abandoned Area	acres	NA
6. CCA	acres	16218
7. Cropping Intensity	%age	109
<b>la. Total Annual Abiana Receipts (@Rs. 69/acre)</b>	Rupees	<b>1,219,756</b>
<b>lb. Annual Receipts from Non-Agri Allocations</b>	Rupees	0
<b>lc. Assessment of Drainage Cess</b>	Rupees	0
<b>A. Total Receipts from Abiana and Drainage Cess</b>	Rupees	<b>1,219,756</b>
<b>B. Payment of Royalty to SIDA</b>	<b>60%</b>	<b>731,853</b>
<b>C. Fund Available to FO</b>	<b>40%</b>	<b>487,902</b>
<b><u>II. O&amp;M COST</u></b>		
<b>a. Irrigation Facilities</b>		
1. Length of the Disty/Minor	km	14.80
2. Bank work (Rs. 4,020/km)	Rupees	59,496
3. Silt clearance (Rs. 4,307/km)	Rupees	63,744
4. M&R of Structures (Rs. 2,503/km)	Rupees	37,044
5. Operational Cost (Staff & Supplies) (Rs.14,845/km)	Rupees	219,706
6. Transaction Cost (1% of the Total O&M Cost)	Rupees	37,999
<b>Total O&amp;M Cost</b>	Rupees	<b>417,989</b>
<b>b. Drainage Facilities</b>		
1. Length of the Drain (<15 cfs Discharge)	km	-
2. M&R of Structures	Rupees	-
3. No. of sump houses/tubewells	No.	-
4. Security of sump houses/tubewells (Rs. 4.000/head)	Rupees	0
<b>Total O&amp;M Cost</b>	Rupees	<b>0</b>
<b>D. Total Costs (IIa+IIb)</b>	Rupees	<b>417,989</b>
<b>E. FO Balance Amount (C-D)</b>	Rupees	<b>69,913</b>



## FINANCING IRRIGATION AND DRAINAGE FACILITIES

## PILOT DISTRIBUTARY: DIGHRI

PARTICULARS	Unit	
<b><u>I. ABIANA ASSESSMENT</u></b>		
1. Cropped Area	acres	34,473
3. Waterlogged Area	acres	NA
4. Salinized Area	acres	NA
5. Abandoned Area	acres	NA
6. CCA	acres	31,627
7. Cropping Intensity	%age	109
<b>Ia. Total Annual Abiana Receipts (@Rs. 69/acre)</b>	Rupees	<b>2,378,667</b>
<b>Ib. Annual Receipts from Non-Agri Allocations</b>	Rupees	0
<b>Ic. Assessment of Drainage Cess</b>	Rupees	0
<b>A. Total Receipts from Abiana and Drainage Cess</b>	Rupees	<b>2,378,667</b>
<b>B. Payment of Royalty to SIDA</b>	<b>60%</b>	<b>1,427,200</b>
<b>C. Fund Available to FO</b>	<b>40%</b>	<b>951,467</b>
<b><u>II. O&amp;M COST</u></b>		
<b>a. Irrigation Facilities</b>		
1. Length of the Disty/Minor	km	29.35
2. Bank work (Rs. 4,020/km)	Rupees	117,987
3. Silt clearance (Rs. 4,307/km)	Rupees	126,410
4. M&R of Structures (Rs. 2,503/km)	Rupees	73,463
5. Operational Cost (Staff & Supplies) (Rs.14,845/km)	Rupees	435,701
6. Transaction Cost (1% of the Total O&M Cost)	Rupees	75,356
<b>Total O&amp;M Cost</b>	Rupees	<b>828,917</b>
<b>b. Drainage Facilities</b>		
1. Length of the Drain (<15 cfs Discharge)	km	-
2. M&R of Structures	Rupees	-
3. No. of sump houses/tubewells	No.	-
4. Security of sump houses/tubewells (Rs. 4.000/head)	Rupees	0
<b>Total O&amp;M Cost</b>	Rupees	<b>0</b>
<b>D. Total Costs (IIa+IIb)</b>	Rupees	<b>828,917</b>
<b>E. FO Balance Amount (C-D)</b>	Rupees	<b>122,549</b>

## FINANCING IRRIGATION AND DRAINAGE FACILITIES

## PILOT DISTRIBUTARY: POTHO

PARTICULARS	Unit	
<b><u>I. ABIANA ASSESSMENT</u></b>		
1. Cropped Area	acres	8,789
3. Waterlogged Area	acres	NA
4. Salinized Area	acres	NA
5. Abandoned Area	acres	NA
6. CCA	acres	8,063
7. Cropping Intensity	%age	109
<b>Ia. Total Annual Abiana Receipts (@Rs. 69/acre)</b>	Rupees	<b>606,418</b>
<b>Ib. Annual Receipts from Non-Agri Allocations</b>	Rupees	0
<b>Ic. Assessment of Drainage Cess</b>	Rupees	0
<b>A. Total Receipts from Abiana and Drainage Cess</b>	Rupees	<b>606,418</b>
<b>B. Payment of Royalty to SIDA</b>	<b>60%</b>	<b>363,851</b>
<b>C. Fund Available to FO</b>	<b>40%</b>	<b>242,567</b>
<b><u>II. O&amp;M COST</u></b>		
<b>a. Irrigation Facilities</b>		
1. Length of the Disty/Minor	km	10.35
2. Bank work (Rs. 4,020/km)	Rupees	41,607
3. Silt clearance (Rs. 4,307/km)	Rupees	44,577
4. M&R of Structures (Rs. 2,503/km)	Rupees	25,906
5. Operational Cost (Staff & Supplies) (Rs.14,845/km)	Rupees	153,646
6. Transaction Cost (<1% of the Total O&M Cost)	Rupees	11,500
<b>Total O&amp;M Cost</b>	Rupees	<b>277,236</b>
<b>b. Drainage Facilities</b>		
1. Length of the Drain (<15 cfs Discharge)	km	-
2. M&R of Structures	Rupees	-
3. No. of sump houses/tubewells	No.	-
4. Security of sump houses/tubewells (Rs. 4,000/head)	Rupees	0
<b>Total O&amp;M Cost</b>	Rupees	<b>0</b>
<b>D. Total Costs (IIa+IIb)</b>	Rupees	<b>277,236</b>
<b>E. FO Balance Amount (C-D)</b>	Rupees	<b>-34,669</b>

## FINANCING IRRIGATION AND DRAINAGE FACILITIES

## PILOT DISTRIBUTARY: BAGHI

PARTICULARS	Unit	
<b><u>I. ABIANA ASSESSMENT</u></b>		
1. Cropped Area	acres	8,860
3. Waterlogged Area	acres	NA
4. Salinized Area	acres	NA
5. Abandoned Area	acres	NA
6. CCA	acres	8,128
7. Cropping Intensity	%age	109
<b>Ia. Total Annual Abiana Receipts (@Rs. 69/acre)</b>	Rupees	<b>611,307</b>
<b>Ib. Annual Receipts from Non-Agri Allocations</b>	Rupees	0
<b>Ic. Assessment of Drainage Cess</b>	Rupees	0
<b>A. Total Receipts from Abiana and Drainage Cess</b>	Rupees	<b>611,307</b>
<b>B. Payment of Royalty to SIDA</b>	<b>60%</b>	<b>366,784</b>
<b>C. Fund Available to FO</b>	<b>40%</b>	<b>244,523</b>
<b><u>II. O&amp;M COST</u></b>		
<b>a. Irrigation Facilities</b>		
1. Length of the Disty/Minor	km	7.60
2. Bank work (Rs. 4,020/km)	Rupees	30,552
3. Silt clearance (Rs. 4,307/km)	Rupees	32,733
4. M&R of Structures (Rs. 2,503/km)	Rupees	19,023
5. Operational Cost (Staff & Supplies) (Rs.14,845/km)	Rupees	112,822
6. Transaction Cost (1% of the Total O&M Cost)	Rupees	19,513
<b>Total O&amp;M Cost</b>	Rupees	<b>214,643</b>
<b>b. Drainage Facilities</b>		
1. Length of the Drain (<15 cfs Discharge)	km	-
2. M&R of Structures	Rupees	-
3. No. of sump houses/tubewells	No.	-
4. Security of sump houses/tubewells (Rs. 4,000/head)	Rupees	0
<b>Total O&amp;M Cost</b>	Rupees	<b>0</b>
<b>D. Total Costs (IIa+IIb)</b>	Rupees	<b>214,643</b>
<b>E. FO Balance Amount (C-D)</b>	Rupees	<b>29,880</b>

## FINANCING IRRIGATION AND DRAINAGE FACILITIES

## PILOT DISTRIBUTARY: KHATIAN TANDO

PARTICULARS	Unit	
<b><u>I. ABIANA ASSESSMENT</u></b>		
1. Cropped Area	acres	12,397
3. Waterlogged Area	acres	NA
4. Salinized Area	acres	NA
5. Abandoned Area	acres	NA
6. CCA	acres	11,373
7. Cropping Intensity	%age	109
<b>Ia. Total Annual Abiana Receipts (@Rs. 69/acre)</b>	Rupees	<b>855,363</b>
<b>Ib. Annual Receipts from Non-Agri Allocations</b>	Rupees	0
<b>Ic. Assessment of Drainage Cess</b>	Rupees	0
<b>A. Total Receipts from Abiana and Drainage Cess</b>	Rupees	<b>855,363</b>
<b>B. Payment of Royalty to SIDA</b>	<b>60%</b>	<b>513,218</b>
<b>C. Fund Available to FO</b>	<b>40%</b>	<b>342,145</b>
<b><u>II. O&amp;M COST</u></b>		
<b>a. Irrigation Facilities</b>		
1. Length of the Disty/Minor	km	12.80
2. Bank work (Rs. 4,020/km)	Rupees	51,456
3. Silt clearance (Rs. 4,307/km)	Rupees	55,130
4. M&R of Structures (Rs. 2,503/km)	Rupees	32,038
5. Operational Cost (Staff & Supplies) (Rs.14,845/km)	Rupees	190,016
6. Transaction Cost (1% of the Total O&M Cost)	Rupees	32,864
<b>Total O&amp;M Cost</b>	Rupees	<b>361,504</b>
<b>b. Drainage Facilities</b>		
1. Length of the Drain (<15 cfs Discharge)	km	-
2. M&R of Structures	Rupees	-
3. No. of sump houses/tubewells	No.	-
4. Security of sump houses/tubewells (Rs. 4.000/head)	Rupees	0
<b>Total O&amp;M Cost</b>	Rupees	<b>0</b>
<b>D. Total Costs (IIa+IIb)</b>	Rupees	<b>361,504</b>
<b>E. FO Balance Amount (C-D)</b>	Rupees	<b>-19,359</b>

## FINANCING IRRIGATION AND DRAINAGE FACILITIES

## PILOT DISTRIBUTARY: RAWTIANI

PARTICULARS	Unit	
<b><u>I. ABIANA ASSESSMENT</u></b>		
1. Cropped Area	acres	9,838
3. Waterlogged Area	acres	NA
4. Salinized Area	acres	NA
5. Abandoned Area	acres	NA
6. CCA	acres	9,026
7. Cropping Intensity	%age	109
<b>Ia. Total Annual Abiana Receipts (@Rs. 69/acre)</b>	Rupees	<b>678,845</b>
<b>Ib. Annual Receipts from Non-Agri Allocations</b>	Rupees	0
<b>Ic. Assessment of Drainage Cess</b>	Rupees	0
<b>A. Total Receipts from Abiana and Drainage Cess</b>	Rupees	<b>678,845</b>
<b>B. Payment of Royalty to SIDA</b>	<b>60%</b>	<b>407,307</b>
<b>C. Fund Available to FO</b>	<b>40%</b>	<b>271,538</b>
<b><u>II. O&amp;M COST</u></b>		
<b>a. Irrigation Facilities</b>		
1. Length of the Disty/Minor	km	8.83
2. Bank work (Rs. 4,020/km)	Rupees	35,497
3. Silt clearance (Rs. 4,307/km)	Rupees	38,031
4. M&R of Structures (Rs. 2,503/km)	Rupees	22,101
5. Operational Cost (Staff&Supplies) (Rs.14,845/km)	Rupees	131,081
6. Transaction Cost (1% of the Total O&M Cost)	Rupees	22,671
<b>Total O&amp;M Cost</b>	Rupees	<b>249,381</b>
<b>b. Drainage Facilities</b>		
1. Length of the Drain (<15 cfs Discharge)	km	3.03
2. M&R of Structures	Rupees	0
3. No. of sump houses/tubewells	No.	15
4. Security of sump houses/tubewells (Rs. 4.000/head)	Rupees	
<b>Total O&amp;M Cost</b>	Rupees	
<b>D. Total Costs (Ila+Ilb)</b>	Rupees	<b>249,381</b>
<b>E. FO Balance Amount (C-D)</b>	Rupees	<b>22,157</b>

## FINANCING IRRIGATION AND DRAINAGE FACILITIES

## PILOT DISTRIBUTARY: TAIL

PARTICULARS	Unit	
<b><u>I. ABIANA ASSESSMENT</u></b>		
1. Cropped Area	acres	9,032
3. Waterlogged Area	acres	NA
4. Salinized Area	acres	NA
5. Abandoned Area	acres	NA
6. CCA	acres	8,286
7. Cropping Intensity	%age	109
<b>Ia. Total Annual Abiana Receipts (@Rs. 69/acre)</b>	Rupees	<b>623,190</b>
<b>Ib. Annual Receipts from Non-Agri Allocations</b>	Rupees	0
<b>Ic. Assessment of Drainage Cess</b>	Rupees	0
<b>A. Total Receipts from Abiana and Drainage Cess</b>	Rupees	<b>623,190</b>
<b>B. Payment of Royalty to SIDA</b>	<b>60%</b>	<b>373,914</b>
<b>C. Fund Available to FO</b>	<b>40%</b>	<b>249,276</b>
<b><u>II. O&amp;M COST</u></b>		
<b>a. Irrigation Facilities</b>		
1. Length of the Disty/Minor	km	5.15
2. Bank work (Rs. 4,020/km)	Rupees	20,703
3. Silt clearance (Rs. 4,307/km)	Rupees	22,181
4. M&R of Structures (Rs. 2,503/km)	Rupees	12,890
5. Operational Cost (Staff & Supplies) (Rs.14,845/km)	Rupees	76,452
6. Transaction Cost (1% of the Total O&M Cost)	Rupees	13,223
<b>Total O&amp;M Cost</b>	Rupees	<b>145,449</b>
<b>b. Drainage Facilities</b>		
1. Length of the Drain (<15 cfs Discharge)	km	-
2. M&R of Structures	Rupees	-
3. No. of sump houses/tubewells	No.	<b>2</b>
4. Security of sump houses/tubewells (Rs. 4,000/head)	Rupees	
<b>Total O&amp;M Cost</b>	Rupees	
<b>D. Total Costs (IIa+IIb)</b>	Rupees	<b>145,449</b>
<b>E. FO Balance Amount (C-D)</b>	Rupees	<b>103,827</b>

IWMI Pakistan  
Regional Office  
12km  
Multan Road  
Chowk Thokar Niaz Baig  
Lahore 53700  
Pakistan

Headquarters  
127, Sunil Mawatha  
Pelawatta  
Battaramulla  
Sri Lanka

Mailing Address  
P O Box 2075  
Colombo  
Sri Lanka

Tel.  
94-1-867404, 869080

Fax  
94-1-866854

E-mail  
[iwmi@cgiar.org](mailto:iwmi@cgiar.org)

Website  
[www.iwmi.org](http://www.iwmi.org)



FUTURE  
HARVEST  
IWMI is a Future Harvest Center  
Supported by the CGIAR