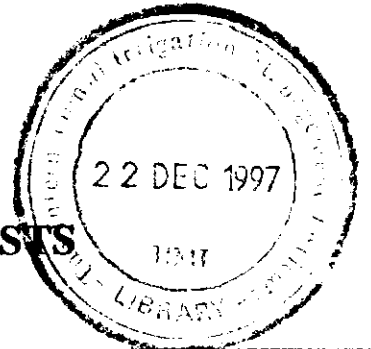


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Report No. R-34

**PILOT PROJECT FOR FARMER-MANAGED AGRICULTURE UNDER
THE LEFT BANK OUTFALL DRAIN, STAGE I PROJECT, PAKISTAN**

**FINANCIAL FEASIBILITY ANALYSIS
OF OPERATION AND MAINTENANCE COSTS
FOR WATER USERS FEDERATIONS
ON THREE PILOT DISTRIBUTARIES
IN PROVINCE OF SINDH, PAKISTAN**



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Interim Report

By

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Financial Analyst**

**SEPTEMBER 1997
HYDERABAD OFFICE
PAKISTAN NATIONAL PROGRAM
INTERNATIONAL IRRIGATION MANAGEMENT INSTITUTE**

H 9245

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ACKNOWLEDGMENTS

The author conveys his profound thanks to the following members of IIMI's field teams at Mirpurkhas, Sanghar, and Nawabshah who collected the data presented in this report.

Mirpurkhas: Mr. Waryam Baloch, Mr. Ghulam Mustafa Talpur, Mr. Nadeem Khanzada, Mr. Asghar Ali Memon and Mr. Badar-ul-Hassan Memon.

Nawabshah: Mr. Nizamuddin Bharchoond, Mr. Abdul Rehman Soomro, Mr. Muneer Ahmed Mangrio, Mr. Ishrat Amir and Mr. Pervaiz Pirzada.

Sanghar: Mr. Naveed Khayal, Mr. Niaz Hussain Sial, Mr. Abdul Majeed, Mr. Ghulam Shabir Soomro, Mr. Ghous Bux Laghari and Mr. Jalil Ursani.

The report benefited considerably from the valuable suggestions by Mr. D. J. Bandaragoda, Project Leader, Mr. Laurence Smith, Wye College University of London, Mr. Christopher J. Perry, Deputy Director General of IIMI in Srilanka, Dr. Yameen Memon, Team Leader and Mr. Mehmood ul Hassan. Thanks are also conveyed to Mr. Ashan Ali Kazi, Mr. Ayaz Anwar Solangi and Mr. Faisal Memon, Xcroxer, who extended their administrative support during the preparation of this report.

The author of this report expresses his deepest gratitude to Mr. Nadeem Khanzada of IIMI's Mirpurkhas Field Station, who extended his full cooperation and untimely support during the course of data collection.

FORWORD

The Water Users Federations are basically economic organizations. They are set up to take important management decisions regarding the operation and maintenance activities in large secondary canal systems. The office bearers of WUFs, as well as those who promote the establishment of WUFs, should be equally convinced that this serious business can be effectively accomplished by the WUFs. For this purpose, they should gain an understanding of the costs and benefits associated with the task of O&M at the secondary canal level.

This report is meant to serve that purpose partially. With the available information, Amin Sohani presents a financial feasibility analysis for the three pilot sites and raises a number of issues related to the assessment and collection of abiyana. Based on his preliminary findings further field work will be undertaken to finalize a Business Plan for each of the three pilot distributaries. I hope this report will be a good guide for us to proceed on our future work plans.

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1. INTRODUCTION

1.1 BACKGROUND

Pakistan has a long history of irrigation. The country also has considerable experience in planning and implementing large irrigation development projects. The successful completion of these projects has made irrigated agriculture the country's engine of economic growth. However, both donor agencies, as well as government policy authorities in Pakistan, have recently started to feel some concern about the inadequate return on these investments. Both of these groups are actively considering some major institutional changes in the irrigated agriculture sector as an initial step towards achieving improvements in the sector's performance. Serious attention is being given to improving the productivity of irrigated agriculture by encouraging water users' involvement in jointly managing the irrigation systems.

With this policy and research background, the Government of Sindh (GoS) authorities decided to undertake some interventions in social organization at the distributary/minor^{*} level in a pilot project mode. For this purpose, the Left Bank Outfall Drain (LBOD) Project Management in consultation with the World Bank and Swiss Development Cooperation (SDC) entered into a consultancy agreement with the International Irrigation Management Institute (IIMI) to implement three pilot projects in which Water User Organizations (WUOs) would be established to operate and maintain (O&M) irrigation and drainage facilities in distributary/minor^{*} canal command areas.

The Department of Agriculture and Wildlife, therefore, prepared a Supplementary PC-I that was approved by the GoS in September 1994, which includes the implementation strategy for the pilot projects. Based on this PC-I document, IIMI prepared a project proposal, giving the technical details and the methodology for project activities, and a financial proposal for a consultancy arrangement (IIMI, 1995). IIMI's consultancy agreement with the Agriculture Engineering and Water Management Directorate of the Government of Sindh was signed on July 1995, and became retroactive to 1 July 1995 (Inception Report, 1995).

1.2 MAJOR OBJECTIVES

The major objectives of the pilot project are:

- a) To test the viability of farmers' managing parts of the irrigation systems, more specifically, at the level of distributary/minor canals, so that more efficient and equitable allocation of water can be achieved; and
- b) To make recommendations related to future extensions on the basis of results of the pilot projects.

More specifically, the pilot project has aimed, through its activities so far accomplished, to assist in establishing water users organizations in three selected distributary/minor canal command areas, one in each of the three LBOD districts: Mirpurkhas, Nawabshah and Sanghar. In each

^{*} In the Province of Sindh, a small distributary is often called a minor, whereas by common definition a channel off-taking from a distributary that conveys water to two or more watercourses is called a minor, which is also the case in Sindh.

pilot area, Water Users Associations (WUAs) were to be established at the watercourse level, which would then be integrated appropriately to form Water Users Federations (WUFs) at the distributary or minor canal level (In this report the WUAs and WUFs are referred to in the more general term of water users organizations or WUOs.)

Another specific objective was to promote the maximum involvement of the water users and their organizations in the operation and maintenance of distributary/minor canals, without much intervention from the government agencies, but with their institutional support, particularly in the early stages of the pilot projects. Later, the legislative requirements and institutional processes would be identified for effectively organizing and strengthening water users organizations on a wider scale (Phase II Report, 1997).

1.3 NEED FOR A BUSINESS PLAN

The viability of farmers' managing parts of the irrigation system can be viewed from three perspectives, that is technical, social and financial. These three perspectives are linked with one another and are mandatory to test the viability, and then later, the sustainability of WUOs.

1.3.1 Technical Viability

The objective of the Technical Viability is to test the farmers' ability to get involved in O&M of the secondary channel (distributary/minor). If the adequate, equitable and reliable distribution of water among the outlet (moghas) and O&M of the channels (according to set standards) is achieved by the WUOs, then it can be said that Technically the WUOs are viable and can be sustained.

1.3.2 Social Viability

The objective of Social Viability is to test the farmers' ability to organize and resolve all of the disputes regarding water distribution and related matters. It can also be said that social change is brought into the area by the forming of an organization, as well as by conducting development work in the area. The organization is socially viable if the community participation is encouraged in all decisions. Specific objectives of the Social Viability is to test the ability of WUOs to handle the O&M of the distributary/minor and to resolve water distribution disputes without external intervention.

1.3.3 Financial Viability

The objective of the Financial Viability is to test the WUOs ability to bear the O&M costs of the irrigation and drainage facilities. Financial viability can also be understood in the form of a formal framework or a Business Plan. The Business Plan will not only test the financial viability of the WUOs to pay for the O&M of irrigation and drainage facilities but it will also provide a formal business structure to the WUOs so that they can conduct their tasks in a professional manner. To test the financial viability and to develop a Business Plan, a Plan of Action (PoA) was developed by the author. Essential details of this PoA are enclosed in Annexure A.

1.4 PROCESS FOR DEVELOPING A BUSINESS PLAN

A complete overview of this PoA is depicted in Figure 1 (which is also contained in Annexure A). The PoA can be viewed in following six steps:

1.4.1 Step 1, Farm Income Analysis

To test the financial viability, it is important to find out the value of production that WUOs are gaining. The value of production will determine the WUOs capacity to pay for O&M costs of irrigation and drainage facilities.

1.4.2 Step 2, Analysis of O&M Costs

O&M cost data from agencies (Irrigation and Revenue departments) will help to identify the actual O&M cost incurred at the Divisional and distributary/minor levels. Also Irrigation Yard Sticks are used to identify the reasonable levels of O&M costs to attain the required efficiency in the irrigation system. Both of these costs are also incorporated into this step. Cost recovery (abiana and related charges) data are collected from the above agencies to identify the potential of recovered amounts to pay for O&M costs.

1.4.3 Step 3, WUOs Ability to Pay for O&M Costs

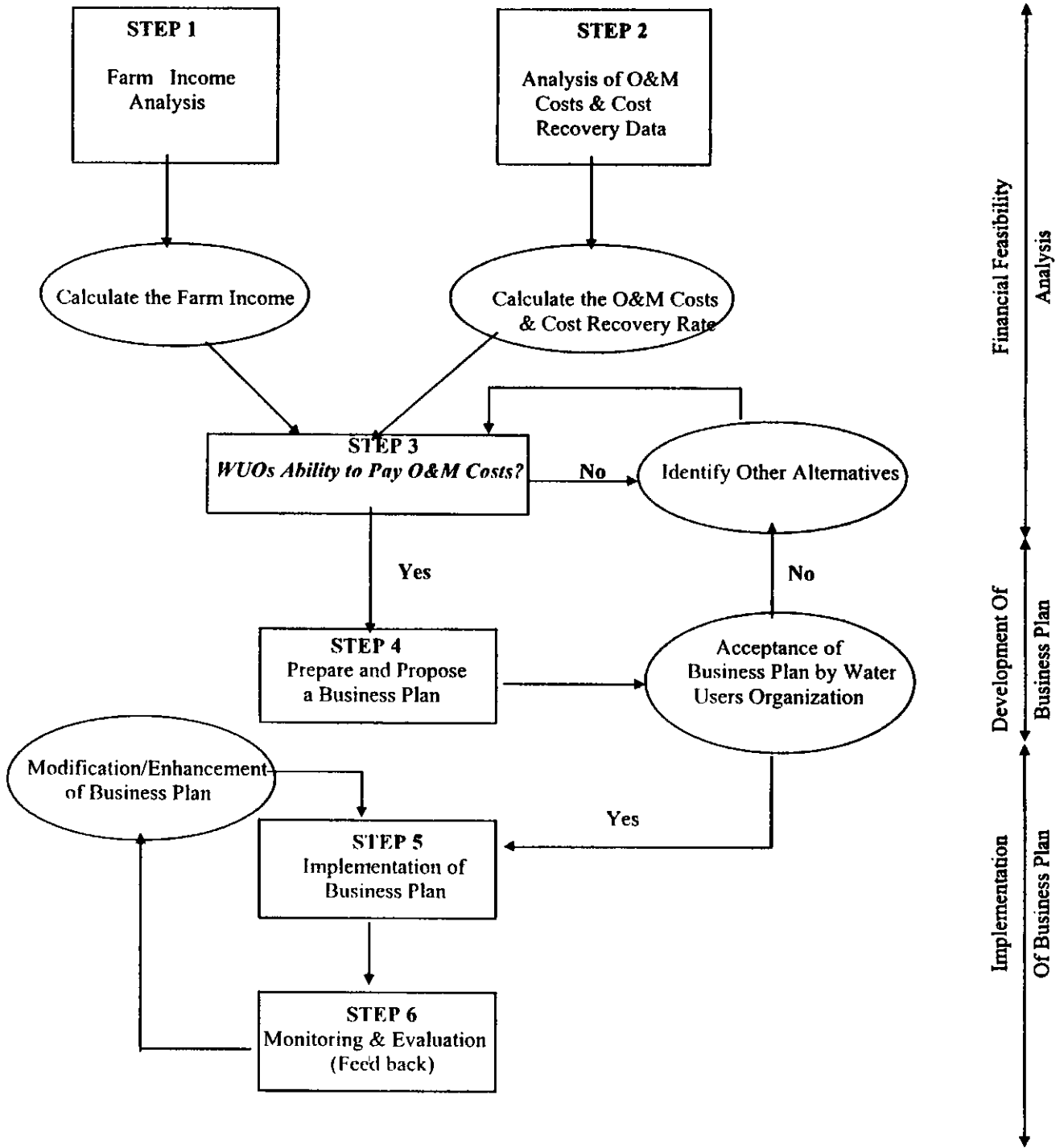
This step will consolidate steps 1 and 2. Based on historical data of O&M, cost recovery data, and farm income analysis, the WUOs' ability to pay for O&M costs will be tested. Estimates of O&M costs of LBOD drainage and reports by IIMI's short-term consultants will be incorporated into Step 3.

1.4.4 Steps 4, 5 and 6

Once Step 3 has been tested positively, that is WUOs are able to bear the O&M costs, a Business Plan will be prepared and then implemented (Step 5). During implementation, monitoring and evaluation will be conducted (Step 6). Step 6 will be repeated to accommodate any adjustments or enhancements that are observed during the implementation phase.

As indicated in Figure 1, Steps 1,2 and 3 constitute Phase I, which is the Financial Feasibility Analysis that is the subject of this Interim Report. Phase II consists of Step 4, which is the Development of Business Plan Phase. Finally, Steps 5 and 6 represent Phase III on Implementation of Business Plan.

Figure 1. Process for developing a Business Plan.



1.5 FINANCIAL FEASIBILITY ANALYSIS

At the time of writing this report, Phases I and II of the PoA (Annexure A) were accomplished. The end product for both of these phases is a report on Financial Feasibility Analysis. Therefore, the main objectives of this report are; (1) to document the results of Phase I and Phase II of PoA (or Steps 1-3 of Figure 1); and (2) to conduct the Financial Feasibility Analysis to test the financial viability of WUOs as discussed above.

2. FARM INCOME ANALYSIS

As shown in Figure 1, the first step in the Process of Developing a Business Plan is the Farm Income Analysis. This is also Step 1 (Figure 1) of three steps in the Financial Feasibility Analysis Phase.

2.1 OBJECTIVES

The objectives of this step is to document the findings of the financial data survey and through various diagrams summarize the procedure that was used to calculate the Farm Income for the WUOs at the three pilot sites. Data collection methodology, general characteristic of the sample, and the farm income findings, which included Kharif 96 and Rabi 95/96 farm costs, income and net annual farm income, are discussed under Step 1.

2.2 FINANCIAL CONCEPTS

The performance of an agriculture project can be measured with the help of three techniques (Gittinger 1992):

- a) Farm income analysis;
- b) Fund flow analysis; and
- c) Farm investment analysis.

Farm income analysis is generally used to evaluate the performance of a farm during a particular year. The objective is to help improve the management of the farm. Fund flow analysis, also called sources-and-uses-of funds analysis, is used to determine liquidity in an analysis of the farmer's credit situation. Farm investment analysis, in contrast, is undertaken to determine the attractiveness of a proposed investment for a farmer and to other participants, including the society as a whole (Gittinger 1992).

Table 1 in Annexure B summarizes the difference between the three techniques. Techniques of farm income analysis are applied here to generate the net farm income and to identify the cash position of a particular farmer.

2.2 DATA COLLECTION METHODOLOGY

According to Figure 1, Step 1 involves the collection of financial data from the water users (WUs) and this data is analyzed to calculate the farm income for the three pilot sites. In order to collect the financial data from the WUs, a questionnaire was developed. Exhibit 1 of Annexure B depicts the sample questionnaire that was used by the field teams to collect the financial data from the WUs.

2.3.1 Pre-Testing of the Questionnaire

For the pre-testing, sample interviews were conducted from selected WUs at the three pilot areas. At each pilot area, two sample interviews were conducted based on the initial format of the questionnaire. Each interview lasted for about 1.5-2 hours. During the sample interviews, it was noticed that of the WUs preferred to provide farm input costs on a per acre basis and per acre crop production on the basis of total production. Based on the outcome of the pre-testing, the questionnaire was modified to facilitate the financial data collection procedure. Before the final version of this Questionnaire was developed, the questionnaire was thoroughly reviewed by IIMI's field team, IIMI's team leader at Hyderabad and various experts at the Sindh Development Studies Center (SDSC).

2.3.2 Basic Features of the Questionnaire

The questionnaire was designed to collect a variety of informations.

- a) Basic data about the WUs, their land ownership (LOS) status and their land location with respect to the hydrological boundaries within the ditributary/minor, as well as at the watercourse level.
- b) Information collected in this questionnaire was based on the farmer re-call; therefore, efforts were made to collect the most recent data about the farm-input costs and crop production. Thus, it was decided to collect data for the Rabi 95/96 and Kharif 1996 seasons. Kharif 96 and Rabi 95/96 data included area sown, area destroyed, irrigation details, costs of various inputs, labor costs, and details regarding crop production.
- c) As mentioned earlier, the technique of Fund Flow Analysis determines the surplus (deficit) cash available to each farmer. Although the Farm Income Analysis is the main focus of Step1, data regarding Fund Flow Analysis is collected to conduct a comparative analysis if needed. Fund flow technique requires that the cash inflow from other sources (off-farm income) should be included with the farm revenue to check the liquidity of each farmer. In this regard, a section in the questionnaire was developed to capture income from other sources. This section included revenue (cash inflow) from sale of livestock, sale of livestock products, income from labor, remittances/govt. payments, and revenue from other sources (employment of other family members). Many respondents in the Mirpurkhas pilot area received govt. payments for the drainage systems, which are passing through their lands.
- d) Fund Flow Analysis also requires that non-farm cash outflow (non-farm expense) should be utilize to calculate the net cash available to each farmer. Thus, a section in

the questionnaire collected this information. Cash outflow included other farm equipment and power usage costs, livestock expenses (veterinary expense, hired labor), feed purchased for livestock, livestock purchased, equipment rent, utilities expenses for the year, farm related repairs, interest payments on the loans, capital purchased, family living and other expenses. (Both the cash inflow (off-farm income) and cash outflow (non-farm expense) were recorded on an annual basis).

- c) Estimation of O&M costs is an essential ingredient in Development of the Business Plan. A separate section in the questionnaire was designed to record O&M costs and activities conducted by the WUs who were interviewed. This section included information about the type of O&M activity conducted at the distributary and watercourse level, duration of the activity (hours and days), number of laborers utilized, total expenses, and O&M cost-sharing between the Hari (share tenant) and Zamindar.
- f) Collection of unofficial charges by the Irrigation Department and other agencies is common in the entire command area. Thus, the questionnaire was designed to collect this information regarding the amount paid by the WUs to the departments and the conditions on which this amount was paid. This data was recorded in the Tax Section (Misc. and other charges) of the questionnaire.

2.4 DATA COLLECTION ISSUES AND STRATEGY

For this questionnaire, respondents from all of the three pilot distributary sites were interviewed. Before the actual data collection took place the Financial Analyst had a meeting with selected members of IIMI's three field teams, as well as at IIMI's Hyderabad Office. The purpose of this meeting was to collectively identify the problems and issues that might be encountered during data collection, to design a strategy for efficient and accurate data collection, and discuss the changes that were made in the questionnaire after the testing.

The field teams observed that lately, on several occasions, WUs at the three pilot sites were asked by the field teams to provide various types of information related to them and their command areas. One such example was the data collection for the Baseline Survey, which was quite comprehensive. Thus, to fill out the financial data questionnaire, it was decided that the interviews would be conducted with those WUs who were not interviewed during the Baseline survey, or any other major survey.

One of the lessons learned from the Baseline Survey was that in all of the three pilot distributary areas, the main decision-makers regarding the cultivation of land and matters pertaining to water delivery were taken by the small owner-operator (self-cultivators) or by Zamindar (who share the crop out put with a Hari-share tenant, or by an individual who is leasing the land for cultivation on a cash basis, not by the tenants who are working on a temporary basis. Therefore, for this questionnaire, interviews were conducted with owner-operators, zamindars and individuals that were leasing the land. Also, as most of the data collected was quantitative and was provided on a recall basis, therefore, it was important to collect this information from the source where the actual decision was made.

One of the essential condition for the Development of a Business Plan for the WUOs is that the farm income of the WUs should adequately represent all of the reaches (head, middle and tail) of the distributary/minor. Therefore, to satisfy this condition, equal numbers of respondents were selected from the head, middle and tail reaches of the three pilot areas. Pre-testing of the questionnaire indicated that each interview (to fill out the questionnaire) takes about two hours; therefore, it was mutually decided by the IIMI field teams that two members from each field station should conduct the interviews with WUs. One member asked the questions from the WUs, while the other member recorded the information on the questionnaire.

2.4.1 Collection of Sensitive Information

The Questionnaire is in presented Exhibit 1 of Annexure B, which requested sensitive information from the WUs (such as amount for special charges, crop production and price at which it was sold, income from other sources). Therefore, the accuracy of such information is questionable. However, IIMI's field team expressed their confidence regarding this issue. IIMI's field teams believed that, since the beginning of the pilot projects, they have developed strong rapport with the WUs; therefore, they were confident that the WUs would extend their full cooperation during the financial data collection process.

2.4.2 Data Entry, Validation and Analysis

Once the data was recorded on the Questionnaire, it was entered into the computer by using MS Excel (MS Office). The data entry was quite a complicated task. Various units of cost (liters of pesticide, kg of seed per acre) and crops produced (kgs and maunds) were either not recorded or mixed with each other. Therefore, after data entry, data validation was conducted by the Financial Analyst. Each questionnaire had about 600 entries (cells); therefore, the entire procedure for data entry, validation and analysis required a lot of time.

2.4.3 Identity of Respondents

To protect the identity of the respondents, each respondent was assigned a serial number. Respondents at the Mirpurkhas command area are represented by serial numbers 101 to 124, respondents from Nawabshah are represented by serial numbers 201 to 226, respondents from Heran distributary near Sanghar were assigned serial numbers 301 to 327, while respondents from Khadwari Minor were assigned serial numbers 401 to 405.

2.5 GENERAL CHARACTERISTICS OF THE SAMPLE

Tables 2a, 2b and 2c in Annexure B depict the basic data that was collected using the questionnaire for the three pilot sites, while Table 2d shows the summary of the basic data. Exhibit 2 in Annexure B depicts the definition for all of the variables used in the various figures and tables in Annexure B. Important findings of the basic data (Table 2d) are discussed below.

2.6 FARM INCOME ANALYSIS

Tables 3 to 5 in Annexure B shows the per *acre* annual farm income for Bareji Distributary near Mirpurkhas, Dhoro Naro Minor near Nawabshah and Heran Distributary (and Khadwari Minor) near Sanghar, respectively, while Figures 2 to 5 in Annexure B demonstrates the procedures involved in these calculations. Definitions for all of the variables used in these tables and figures are given in Exhibit 2 in Annexure B before Tables 2a. Table 6 and 7 in Annexure B presents the consolidated Farm Income Analysis (from Tables 3-5) on a per *hectare* basis. Table 7 presents the consolidated Farm Income Analysis on actual data (total for the sample), while Table 6 presents the same on mean data. Important findings from Table 6 are given below:

- Mean annual per hectares (CCA) farm revenue for Bareji Distributary is Rs 18,536, Dhoro Naro Minor is Rs 5,757, and Heran Distributary is Rs 9,018, while the mean revenue for the three pilot distributaries is Rs 11,104;
- Mean annual per hectare (CCA) farm cost for Bareji Distributary is Rs 13,106, Dhoro Naro Minor is Rs 4,807, and Heran Distributary is Rs 6,405, while the mean costs for the three pilot sites is Rs 8,106; and
- Mean annual per hectare (CCA) net farm income for Bareji Distributary is Rs 5,430 Dhoro Naro Minor is Rs 950, and Heran Distributary is Rs 2,613, while the mean income for the three pilot distributaries is Rs 2,998.

2.7 MAIN FINDING

While the mean per CCA hectare of Net Farm Income in 1995/96 (one year) for the three pilot distributary sites is about Rs 3,000, or Rs. 3,000/ha/ year, this varies from Rs. 950/ha/year for Dhoro Naro Minor, to Rs. 2,600 for Heran Distributary (including Khadwari Minor) and is at a maximum of Rs. 5,400 for Bareji Distributary

3. ANALYSIS OF OPERATION AND MAINTENANCE COSTS

As portrayed in Figure 1, the second step in the Process of Developing a Business Plan is a companion of the first step. Step 2 is the Analysis of Operation and Maintenance (O&M) costs, which is required before proceeding to the final step (Step 3 in Figure 1) for completing the Financial Feasibility Analysis.

3.1 OBJECTIVES

The objective of this step is to analyze the O&M costs and cost recovery (abiana and related charges) collected from the water users by the agencies. The main outcome of this step will be the assessment of the actual O&M costs borne by the agencies, recovery of abiana (and related charges) and the estimation of required O&M costs for irrigation and drainage. The O&M data for drainage collected from the Irrigation Department was not sufficient to conduct a detailed analysis. However, efforts have been made to collect this data from other sources in order to conduct a basic analysis of O&M costs for drainage facilities.

3.2 DEFINITION OF OPERATION AND MAINTENANCE

One of the problems encountered while collecting O&M data from the agencies was with respect to having a clear definition of O&M. According to the data collected, most of the activities for O&M are inter-related. However, after thorough evaluation of the data collected from the agencies, it was observed that there are three main accounting entries that may represent the total O&M costs. These entries are listed under the categories of Maintenance and Repairs (M&R), Extension and Improvements (E&I), and Establishments.

Further study of these accounting categories indicated that activities for M&R and E&I are inter-related, therefore, for the purpose of this analysis, both M&R and E&I are discussed under a single head that is termed "Works" (or Maintenance). A study of operational costs indicated that almost all of the expenses related to the operations consisted of Establishments. Thus in this analysis, establishment costs are referred to as operational costs. Simply, these categories can be expressed as:

$$\mathbf{M\&R + E\&I + Estt = O\&M}$$

where **O&M represents only irrigation costs, not drainage and
Estt = Operation Costs**

So that M&R + E&I = Maintenance Costs

Exhibit 3 in Annexure C depicts the Form-64 Schedule of Works Expenditure that shows the typical activities of M&R. While the major activities that are conducted under E&I are:

- a) Reconditioning of Banks;
- b) Earth Work Maintenance of Banks;
- c) Re-handling of Spoils; and
- d) Re-sectioning of Soil.

A comparison of the above activities with M&R activities in Exhibit 3 of Annexure C reveals that almost all of the activities for E&I are also found under M&R.

3.3 INITIAL FINDINGS

The O&M data collection process focused on the O&M data for the pilot distributaries and their respective Division. As the O&M costs are allocated at the Division to its sub-systems (sub-divisions), it was necessary to collect data for both the Distributary and the parent Division.

3.3.1 O&M Cost for the Distributary/Minor

Bareji and Heran distributaries fall under the Jamrao and Thar Divisions of the Nara Canal system, while the Dhoro Naro minor falls under the Nustrat Division of the Rohri Canal system. The Executive Engineer offices for Jamrao and Thar divisions are located in the Mirpurkhas District while the Office of Executive Engineer of Nustrat Division is located in the Nawabshah District. During the data collection, it was observed that very little data was available for either the distributaries or the minors. Assistant Engineers (Sub-division officers, SDOs were contacted) at the respective pilot sites. Several meetings with the engineers revealed that very little O&M expenses were borne on the pilot distributaries. Even if some expenses were incurred on the O&M of the distributary, very little record was available. Table 8 in Annexure C depicts the statement showing the expenditures incurred on Bareji Distributary from 1985/86 to 1995/96. Table 8 shows separately the available M&R, E&I and Establishment expenses for Bareji Distributary, while Table 9 depicts the E&I expenses for all of the three pilot sites from 1985/86 to 1995/96. Important findings from Table 9 are:

- For a period of 11 years, the total amount incurred by the Irrigation Department on E&I is Rs 278,043 at Bareji Distributary, Rs 420,200 at Heran Distributary (and Khadwari Minor), and Rs 352,012 at Dhoro Naro Minor.

3.3.2 O&M Costs for the Divisions

Efforts were made to collect O&M data from all of the three divisions. However, sufficient data was available only on Jamrao Division. Considering the same organizational structure of the Irrigation Department, it can be assumed that an analysis of O&M data of Jamrao Division could be representative of the other two divisions. Exhibit 4 in Annexure C depicts the statement showing the staff category for Jamrao Division, including their Basic Pay Scale, while Exhibit 5 (Annexure C) shows the name of the sub-divisions under Jamrao Division, and Exhibit 6 (Annexure C) depicts the name for all of the distributaries that fall under Jamrao Division.

Table 10 in Annexure C depicts a statement showing the year-wise (85/86 to 95/96) expenditure under the Head of Establishment for Jamrao Division. The main findings from Table 10 are:

- Mean per year Establishment Cost is Rs 10,12,0648 and mean per CCA hectare Establishment Cost is Rs 28 per hectare.

Table 11 in Annexure C depicts extracts from the Annual Administrative Report of the Jamrao Division. This includes information about Capital, E&I and M&R expenses of Jamrao Division from 1983/84 to 1993/94. Important findings from Table 11 are:

- Mean per year E&I expense for Jamrao Division are Rs 1,818,128 and mean per CCA hectare E&I expenses are Rs 5.00 per hectare.
- Mean per year M&R expenses for Jamrao Division are Rs 9,282,303 and mean per CCA hectare M&R expenses are Rs 25 per hectare.

Initial findings from the O&M data analysis indicated the following outcomes at the divisional level:

- Mean Establishment charges are Rs 28/CCA ha;
- Mean E&I charges are Rs 5/CCA ha;
- Mean M&R charges are Rs 25/CCA ha; and
- Therefore, Mean Actual O&M (Estt + E&I + M&R) charges are Rs 58/ CCA ha

3.4 ANALYSIS OF O&M COSTS

The main objective of this analysis is to derive per CCA hectare O&M costs in 1996 prices at the divisional level. The above mean actual O&M costs are not adjusted to current prices. Therefore, all of the costs, that is Irrigation Works (E&I + M&R) and Establishment Costs, both for the Distributary and Division, are adjusted to 1996 prices. The Consumer Price Index (from 1996/97 economic survey of Pakistan) was used to adjust these prices. As the O&M data for Jamrao was available, to have more relevance, Bareji Distributary of Jamrao Division was selected for detailed analysis.

Table 12 in Annexure C depicts the Irrigation Works (E&I and M&R); actual as well as adjusted, expenses for both the Distributary and Division. The main findings from Table 12 are:

- Mean Irrigation Works expenses in 1996 prices are Rs 16 per CCA hectare at the Distributary level and Rs 32 / CCA hectare at the Division level.

Table 13 in Annexure C depicts the Irrigation Establishment Costs in 1996 prices for the Distributary, as well as for the Division. The main findings from Table 13 are:

- Mean Irrigation Establishment expenses in 1996 prices are Rs 30 per / CCA hectare at the Distributary level and Rs 48 / CCA hectare at the Division level.

3.4.1 Verification of Establishment Costs

In order to verify the Establishment Costs data collected from Jamrao Division, a cross-checking was done. All of the staff categories for Jamrao Division, their total numbers and their Basic Pay Scale (BPS) were obtained from Exhibit 4 in Annexure C to determine their annual salary. There was difficulty in determining the status (grade step) of particular staff at their BPS, therefore; the BPS for all of the staff categories was adjusted to their mid-BPS level to obtain their estimated salary. Table 14 in Annexure C depicts the estimation of Establishment Costs for the entire Jamrao Division in current prices. The results from Table 14 indicate that per CCA hectare Establishment costs for Jamrao Division are about Rs 51/CCA hectare. This estimation is quite close to the actual Establishment expenses of Rs 48 per CCA hectare calculated from the actual data.

Analysis of O&M data resulted in following outcome at the Divisional level:

- Mean Establishment charges in 1996 prices are Rs 48/CCA ha;
- Mean Irrigation Works (E&I and M&R) charges in 1996 prices are 32/CCA ha; and
- Therefore, mean actual O&M charges in current prices are Rs 80/ CCA ha.

3.4.2 Reasonable Requirements for Irrigation & Drainage O&M

The above O&M costs only reflect the actual cost which was borne by the Irrigation Department. However, this actual cost does not reflect the expenses that should be incurred to attain the minimum efficiency level in the irrigation system.

In 1986/87, a detailed Yard Stick for O&M costs was prepared by the Irrigation Department and submitted to the Government of Sindh. According to this Yard Stick in 1986/87, Rs 25.16 per CCA *acre* was required for Irrigation O&M Costs to attain a reasonable efficiency level in the system and Rs 38.03 were required for both Irrigation and Drainage O&M to attain the same level.

Although this Yard Stick is a good measurement for required O&M costs, it does not take into account the Establishment Cost which are a major fixed portion of the O&M costs. In order to calculate true O&M costs, the 86/87 Yard Stick and per acre actual establishment costs were added and adjusted for the current prices to attain the per CCA hectare required O&M costs. Table 15 in Annexure C shows the O&M costs based on the 86/87 Yard Stick and actual Establishment costs. The main findings from Table 15 are:

- 1995/96 Irrigation O&M Costs are Rs 198/CCA ha.
- 1995/96 Irrigation and Drainage O&M Costs are Rs 276/CCA ha.

3.5 ANALYSIS OF ABIANA AND RELATED CHARGES (COST RECOVERY)

So far, the actual and required O&M costs have been analyzed. This section will focus on the recovery and analysis of abiana and related charges. The objective of this section is to compare, contrast and analyze the revenue assessed and recovered as collected from the agencies and to estimate the per acre (and per hectare) total water charges (abiana and related charges) paid by the water users in the Bareji Distributary command area in Mirpurkhas District. Sufficient revenue data was available for Bareji Distributary; therefore, it was selected for revenue analysis. It is assumed that this revenue analysis will be representative for the other two pilot distributaries.

3.5.1 Deh Acres

According to the data collected from the Mukhtiarkar's Office of Mirpurkhas, the command area of Bareji Distributary is divided into 12 Dehs. The acres in some Dehs overlaps with the acres of neighboring command areas. A Deh is an administrative unit. A Deh is comprised of the entire geographical area including the buildings, roads, land etc. Table 16 in Annexure D depicts that

the entire geographical area (or GCA) is 18,217 acres. However, the GCA of Bareji Distributary, according to the Irrigation Department is 14,842 acres.

3.5.2 Revenue Assessed and Recovered

Table 17 in Annexure D shows of revenue data collected during eleven years for the Bareji distributary from the Mukhtiarkar's Office of Mirpurkhas. Total revenue in Table 17 is analyzed on the basis of abiana assessed and recovered and other revenue assessed and recovered. The "other" revenue portion of the total revenue is comprised of land revenue, local cess, water management charges, Usher, etc. Important findings from Table 17 are listed below:

- The mean acres cultivated in a year (out of 18,217) is 9094 (or 50%).
- Mean abiana assessed in a year is Rs 282,756, while the recovered abiana is Rs. 218,327, with a mean recovery rate of 75%. Similarly, mean per acre abiana assessed based for a year on area cultivated is Rs. 31 and recovered per acre is Rs 24.
- Mean other revenue assessed for a year is Rs 120,693 and recovered is 99,145, with recovery rate of 84%.
- Mean total (abiana + other) revenue assessed for a years is Rs 403,449, while recovered is 317,472, with a recovery rate of 77%. Similarly, mean per acre total revenue assessed in a year is Rs 44.66 and recovered is 34.43.

Based on Table 17, it may be inferred that, on average, abiana recovered is approximately 68 % of the total revenue recovered. Mean per acre abiana assessed and recovered is low for Bareji Distributary. There may be various reasons for low assessment and recovery of Abiana. One obvious reason could be the under-reporting of assessed abiana by the Revenue Department so that the revenue collectors can collect their unofficial abiana-related charges from the WUs (water users). On various occasions, (last JRM visit to Bareji) when interviewing WUs, it was explored that often the Revenue Collector does not issue a revenue receipt to the WUs, or the receipt issued by them does not reflect the actual amount paid by the WUs.

Another reason for under-reporting of abiana assessed would be to facilitate the abiana recovery process. During revenue data collection, one Mukhtiarkar said that they would like to recover 100% abiana. Low abiana recovery could go against their reputation and, hence, may not allow them to be transferred to their desired district (where higher unofficial abiana-related charges can be collected). In most cases, revenue is first recovered and than assessed. For instance, when the revenue data was collected for Heran Distributary of Sanghar District, there were no assessment figures available. According to the Revenue Department, the revenue assessed is equal to the revenue recovered. Data from Sanghar District will be discussed later in this section.

3.5.3 Revenue Data from Irrigation Department

In order to cross check the abiana data collected for Bareji Distributary from the Revenue Department, data from the Assistant Executive Engineer, Assessment Sub-Division, and Mirpurkhas was collected. Abiana assessed and cultivation figures for three years (1993-1995) for Bareji Distributary were obtained from the above office. Table 18 in Annexure D displays the crop-wise cultivation (acres) for the Bareji Distributary command area and abiana assessed

for both of the seasons during three years. Total abiana recovered (Revenue Dept. Records) from 1993-1995 in Table 17 of Annex D does not match with the total Abiana assessed from 1993-1995 in Table 18 (Irrigation dept. Records). This miss-match in total could be because of the inclusion of revenue from overlapped area that is reported by the revenue department while the Irrigation assessment may not have accounted for this overlapped area for the Bareji Distributary. However, per acre abiana assessed in Table 17 (Revenue) and Table 18 (Irrigation) should be the same.

The goal in analyzing Tables 17 and 18 is to identify the per acre abiana assessed and recovered so that some kind of conclusion can be drawn regarding the accuracy for the per acre abiana assessed and recovered. The main conclusion drawn from Table 18 (Irrigation Dept.) as compared with Table 17 (Revenue Dept.) is:

- Per acre abiana assessed for the years 1993, 1994 and 1995 in Table 17 (Revenue) is Rs 30, 37 and 39, respectively, with an average of Rs 35 while the abiana assessed in Table 18 (Irrigation) is Rs 38, 46 and 56, respectively, with an average of Rs 47.

An important observation is that the per acre abiana assessed in Table 18 (Irrigation Dept.) is 34 % higher than abiana recovered in Table 17 (Revenue Dept.). The abiana assessed in Table 18 seems more reliable than those in Table 17. To confirm this fact, the following analysis was conducted.

Exhibit A. Area cultivated and abiana recovered taken from Tables 17 and 18.

Agency	GCA	Area cult. 93-94	Percent cult. 93-94	Abiana Assessed/acre 93-94	Area cult. 94-95	% cult 94-95	Abiana assessed/acre 94-95	Area cult 95-96	% Cult 95-96	Abiana assessed/acre 95-96	%Avg. acre cult 3yr	Avg. Abiana Rec./acre 3yr
Revenue	18,216	8462	46%	36	8781	48%	37	10766	59%	39	51%	35
Irrigation	14,842	7642	51%	37.92	6295	42%	45.25	8140	55%	55.27	50%	46

According to the Revenue Department, the GCA of Bareji Distributary is 18,216, which includes the overlapped area, while the GCA according to the Irrigation Department is 14,842 acres, which does not include the overlapped area. It can be inferred from Exhibit A. that, if the abiana rates are the same and if the mean cultivation percentage (for 3 years) is the same for the Revenue and Irrigation Departments, then the mean per acre abiana assessed should also be the same. This can be understood from the following example:

Assume that the year is 1997.

Year is 1997

R= Revenue Dept., GCA of R= 1000 acres

I= Irrigation Dept., GCA of I=700 acres

The Abiana rate set by GoS is Rs 25/acre (average for all crops) for the year.

The cropping pattern is also the same since both R & I departments are evaluating abiana for Bareji Distributary.

If R cultivates 50% of the acres for the three years, then the acres cultivated should be $1000 \times .5 = 500$.

Abiana for the Year = $500 \times 25 = \text{Rs } 12,500$.

Per acre abiana assessed would be $\text{Total Abiana/Acre cultivated} = 12500/500 = \text{Rs } 25/\text{acre}$

If I cultivates 50% of the acres for the three years, then the acres cultivated should be $700 \times .5 = 350$.

Abiana for the year = $350 \times 25 = \text{Rs } 8750$.

Per acre abiana assessed would be $\text{Total Abiana/Acres cultivated} = 8750/350 = \text{Rs } 25/\text{acre}$.

From the above calculations, it is clear that the abiana assessed should be the same for both the Revenue and Irrigation Departments, while Exhibit A does not confirm this fact. Average (3 yrs) abiana assessed by the Revenue Dept. is 34 % lower than that of the Irrigation Department. An obvious reason for this difference could be the under-reporting of abiana by the Revenue Department. However, to further verify the per acre abiana assessed in Table 18, the following analysis was conducted.

3.5.4 Abiana Assessment Using GoS Crop Rates

Acres cultivated for various crops for three years in the Bareji Distributary command area were taken from Table 18 and were multiplied by the abiana rates for each crop provided by the GoS Revenue Department. Table 19 in Annexure D depicts the assessed abiana for the three years. Interestingly, per acre abiana assessed in Table 19 is almost equal to abiana assessed in Table 18. Table 20 in Annexure D presents the summary of Table 18 and Table 19. Important results from this Table 20 are given below.

- Per acre abiana assessed (Table 18) for three years (1993-1996) is Rs 37.92, 45.25 and 55.27, respectively, with the average for three years being 46, while abiana assessed (Table 19) for three years is Rs 37.92, 45.11, 55.08, respectively, with an average for three years also being 46.

- The mean per acre rate of abiana for all of the crops for three years (93-96) is Rs 49.91, 57.40 and 71.77, respectively, and the average rate for three years is Rs 60.

An important observation is that the mean per acre rate of Abiana for all of the crops for three years is Rs 60. According to Table 17, abiana recovery rate for the last 11 years is 75%. Thus, 75% of the mean abiana rate (Rs 60/acr) is Rs 45. This means that according to the Revenue Department records, the mean (93-96) per acre abiana recovered in a year should be Rs 45, while the mean actual recovered abiana in Table 17 is Rs 33 per acre.

So far, the detailed analysis of Tables 17, 18, 19 and 20 strongly suggests that the per acre abiana assessed for three year is between Rs 45 and Rs 46. To further support the results of Tables 17,18,19 and 20, the analysis reported in the next section was conducted.

3.5.5 Verification of Revenue Assessed and Recovered

Table 21 (two pages) in Annexure D presents the revenue recovered by the Mukhtiarkar Office at Sangher. As discussed above, at this office the revenue assessed data is not available. According to the Mukhtiarkar, revenue recovered is equal to revenue assessed. Analysis of Sanghar revenue data is not conducted in detail. The analysis of Heran Distributary is only conducted to support per acre abiana recovered and analyzed from Tables 17, 18, 19, and 20. Some important findings from Table 21 are listed below.

- Mean per acre abiana assessed (or recovered) for nine years at Heran Distributary is Rs 4.53 (see pg. 2 of Table 21).
- Abiana recovered at Heran Distributary is 63% of the total revenue recovered, while at Bareji the recovered abiana was 68% of the total revenue recovered.

Results from Tables 17-21 and other analyses indicate that the mean per acre abiana assessed at Bareji Distributary for three years was Rs 45. A study of Tables 17-21 and its thorough analysis can be viewed as described below.

Mean (93-96) per acre abiana assessed by Irrigation department	= Rs 46 (Table 18)
Mean (93-96) per acre abiana assessed through GoS crop rates	= Rs 46 (Table 19)
Mean (93-96) per acre abiana assessed (or recovered) by Sanghar Revenue Dept.	= Rs 44.53 (Table 21)
Average abiana assessed from Tables 18, 19 and 21	<hr/> = Rs 45.51
Mean (93-96) per acre abiana assessed by Revenue Dept. at Bareji	= Rs 35.00 (Table 17)
Difference in assessment	<hr/> = Rs 10.51
Mean (93-96) per acre abiana recovered (Revenue) in Bareji	Rs. 32.65.
Difference between Average Abiana assessed from Tables 18, 19 and 21 and Abiana recovered by Revenue dept. At Bareji	Rs 45.51- 32.65 = Rs 12.86

Thus, from the above discussion it can be inferred that:

- Abiana assessed by the Revenue Department at Bareji is 30% lower than that of other sources (Tables 18,19 and 21);
- *Abiana recovered by the Revenue Department at Bareji is 39% lower than assessed by other sources (Tables 18,19 and 21); and
- The difference between average assessed abiana (Rs 45.51) and recovered abiana (Rs 32.65) is Rs 10.51. This difference could be treated as related charges collected by the staff of the Revenue Department.

**(This result almost complies with the study conducted by Associated Consulting Engineers (ACE) under the LBOD Stage I project).*

3.5.6 Other Water-related Charges

These are the unofficial charges paid by the WUs to the Irrigation staff to buy extra water for their farms. The mechanism and collection of these charges were reported in IIMI's April 97 Monthly Progress Report. Also, when the Financial Survey of WUs was conducted, at that time the data on water-related charges were collected. Table 22 in Annexure D depicts the extract from this Survey for Bareji Distributary. Table 22 indicates that for this sample size, the total water-related charges paid by the WUs are Rs 69,165 for the year. For this Survey, 24 WUs were interviewed from various watercourses of the Bareji Distributary. According to Table 22, per acre water-related charges paid by WUs to the Irrigation staff is Rs 53.80 acre for the year.

As mentioned above, another study about water-related charges was conducted by the IIMI staff and its results were documented in IIMI's April 97 MPR. According to this study, WUs pay between Rs 20,000 to 40,000 per watercourse (WC) per year as water-related charges.

The CCA for Bareji Distributary is 14,300 acres (IIMI Phase II Report) and actual annual cropping intensity (CI) of Bareji is 62% (IIMI Phase II Report); thus, the area cultivated would be 8866 acres for the year.

If the water-related charges are Rs 20,000 per WC, then the total water related charges for Bareji would be $24 \text{ WCs} \times 20,000 = \text{Rs } 480,000$.

Therefore, per acre water-related charges based on area cultivated would be $480,000/8866 = \text{Rs } 54.1$

Thus, the above two independent analyses suggest that the per acre water-related charges paid by the WUs at Bareji distributary is Rs 54 per acre.

From the above analysis and discussion, it can be concluded that the total per year water charges (including abiana and related charges) paid by the WUs at Bareji are:

Mean official per acre abiana paid	Rs 32.65
Mean per acre related charges paid to Revenue Department	Rs 10.51
Mean per acre water-related charges paid to Irrigation Department	Rs 54.00
	<hr/>
Mean total water charges per cropped acre	Rs 97.16 /acre
Mean total water charges per CCA acre	Rs.60/CCAcree
Mean total water charges per CCA hectare	Rs.150/CCA ha
If water-related charges per WC is	Rs. 40,000
Then,	
Mean total water charges per CCA hectare	Rs. 230/CCA ha

Thus, it is safe to assume that, on average for three years (93-96), the minimum per year total water charges paid by the WUs at Bareji is Rs 60/CCA acre or Rs 150 /CCA ha.

3.6 MAIN FINDINGS OF STEP 2

- Actual irrigation O&M Costs in 1995/96 borne by the Irrigation Department was Rs 80 / CCA hectares/year
- Reasonable requirements for irrigation O&M costs in 1995/96 that were Rs 198/CCA ha/year.
- Reasonable requirements in 1995/96 for Irrigation and Drainage O&M costs were Rs 276/CCA ha/year.
- Mean total water charge (abiana and water-related charges) is at least Rs 150 /CCA ha/year and could be as much as Rs. 230/CCA ha/year.

4. ABILITY OF WATER USERS ORGANIZATIONS TO PAY

4.1 OBJECTIVES

The objectives of this step (Step 3) are to consolidate the findings of Step 1 and Step 2 and to evaluate the ability of the WUs to pay for the O&M costs for irrigation and drainage infrastructure. This step will also summarize the reports of IIMI's short-term consultants who had analyzed the ability of the WUs to pay for these O&M costs. LBOD O&M costs are also summarized in this step.

4.2 CURRENT SITUATION

The main findings from Step 2 revealed that currently the Irrigation Department is spending about Rs 80/ CCA hectare on irrigation O&M, while the recovery against this O&M is only Rs 33 /CCA ha. This shows that the recovery rate is only 40%. This, in fact, demonstrates the failure to address the needs of the system, both for client farmers and the general welfare of the nation.

However, the main questions that need to be addressed here is the utilization of this actual amount (Rs 80/ CCA ha) incurred by the Irrigation Department and how it is benefiting the WUs. Analysis of actual per CCA hectare Irrigation O&M expenses reveal that of the total O&M expenses, Rs 48 are accounted against for Establishment and Rs 32 for the Irrigation Works. This means that 60% of the actual O&M expenses are fixed costs (Establishments) and 40% is for variable costs.

The Financial Feasibility Analysis (Figure 1) consists of three steps. The final step is an evaluation of the water users organizations (WUOs) ability to pay the operation and maintenance costs for the irrigation and drainage facilities.

4.3 BENCH MARKS FOR IRRIGATION AND DRAINAGE O&M COSTS

An Irrigation Yardstick was used to identify the minimum level of O&M costs required maintaining the efficiency in the Irrigation system. Table 23 in Annexure E depicts a Consolidated Statement of Reasonable Requirements for Operation and Maintenance of Irrigation Infrastructure. According to this statement in 1986/87, reasonable requirements for Irrigation O&M was Rs 25.16/ Acre of CCA and for Irrigation and Drainage O&M was Rs 38.03 /Acre of CCA These figures were translated in 1995/96 prices and Bench Mark figures for both the Irrigation and Drainage O&M costs. The main findings of Step 2 depicts that reasonable requirements for O&M of Irrigation in 1995/96 prices is Rs 198/ CCA hectare, while requirements for both Irrigation and Drainage O&M is Rs 276 / CCA hectare.

4.4 COSTS RECOVERY AND O&M BENCH MARKS

However, the recovery against these O&M Bench Mark figures is very low. The official recovery is only Rs 32/ acre, which is only quite low when compared with the Bench Marks. However, the total cost recovery figures indicate that water users are paying a minimum of Rs. 150/CCA cropped hectare, while the maximum amount is about Rs. 230/CCA hectare. This amount

includes official recovery as well as related charges. Thus, if the total recovered cost (official as well as related charges) is considered and then compared with the Bench Marks, the following inferences can be made:

- The total amount recovered (between Rs 150/CCA hectare and Rs. 230/CCA hectare) is 76-116 percent of the Irrigation O&M Bench Mark (Rs 198/CCA hectare)
- The total amount recovered (between Rs 150/CCA hectare and Rs. 230/CCA hectare) is 54-83 percent of the Irrigation and Drainage O&M Bench Mark (Rs 276/CCA hectare).

4.5 WUS ABILITY TO PAY THE IRRIGATION O&M DIFFERENCE

The above facts indicate that in order to pay for the reasonably required Irrigation O&M, the WUs are either short by Rs 48/CCA hectare, or have an excess of Rs. 32/CCA hectare. The current total cost recovered is roughly 5-8 percent of the mean net farm income of Rs 3000/CCA hectare. The reasonable level of Irrigation O&M would be 6.6% (198/3000). Thus, the WUs are presently paying the required costs for an effective program of Irrigation O&M.

The real question is whether the funds presently being paid by the WUs can be applied to Irrigation O&M. If so; this would have a significant impact on the WUs net value of production. For example, if the Adequacy, Reliability and Equity (ARE) of the water delivered to the WUs is improved, and then very large increases in crop yields will follow. This issue can be addressed by the WUOs. The efficient functioning of the WUOs and its sustainability will ensure the ARE of water. It can also be assumed here that once ARE is achieved, there will be a very positive impact on the net value of the agricultural production. Thus, it is safe to assume that collectively the WUOs should be able to bear the full costs of Irrigation O&M costs. However, the difference between Bench Mark O&M costs of Irrigation and Drainage is quite high and is also a point of concern for the agencies as well as the WUOs.

4.6 WUS ABILITY TO PAY THE IRRIGATION & DRAINAGE O&M DIFFERENCE

In order to pay for the reasonably required costs for Irrigation and Drainage O&M, the WUs are either short by Rs 126/CCA hectare (Rs 276 - 150), or Rs. 46/CCA hectare (276-230). The current total cost recovered is 5-8 percent of the mean net farm income of Rs 3000/CCA hectare. The reasonably required level of Irrigation and Drainage O&M is 9% (276/3000) of the net farm income. Clearly, an increase of 1-4 percent in total water charges will be accepted by the WUs if they perceive significant increases in crop yields. During the course of data collection from the pilot sites and interviews/meetings with WUs, it was observed that WUOs know very little about Drainage O&M. Also, they know that the capital costs for drainage is quite high; therefore, O&M costs for drainage is also high.

4.7 O&M COSTS OF DRAINAGE IN LBOD AREA

Table 24 in Annexure E depicts 1984 LBOD-Stage I project estimated annual recurrent O&M costs for its sub-areas and overall Stage I project. Table 24 shows that the O&M costs are composed of personnel costs, power costs, other maintenance costs, and capital replacement costs. The main findings from Table 24 are:

- Total 1984 O&M costs of Drainage in LBOD Stage-I was Rs. 343.7 million , of which 8.5% of this amount was for personnel costs, 32% was for power costs, 38% was for other maintenance costs, and 20% was the Capital replacement cost; and
- O&M costs for drainage in LBOD Stage-I area was Rs 666/CCA hectare.

According to recent estimates of Mott MacDonald (LBOD consultants), the O&M costs for LBOD Stage I is about Rs 570 million per year. If the CCA of LBOD Stage I is 500,000 hectares, then the O&M costs for drainage is about Rs 1200 per hectare per year.

These figures prove that once the O&M of Drainage are added to the Irrigation O&M, the total cost of O&M becomes quite high. Similar results were derived by the IIMI's short term consultants who visited the pilot sites and documented their results.

4.8 FINDINGS OF IIMI'S CONSULTANTS

IIMI engaged the services of two short-term consultants who conducted their studies at the pilot sites focusing on the analysis of O&M costs and WUs ability to pay the costs. Exhibit 7 in Annexure E depicts the consultancy report of Mr. Christopher Perry, Deputy Director General of IIMI and Exhibit 8 in Annexure E is the consultancy report of Mr. Laurnce Smith, Lecturer at Wye College, London.

Mr. L. Smith conducted his consultancy during December 1996. He conducted his study at the Heran Distributary (and Khadwari Minor) and developed a Cash Flow (CF) model (Exhibit 8) to identify current and future O&M costs of Irrigation and Drainage. The principal observations from the Cash Flow (CF) model are:

- Estimates of CFs indicate that it should be financially feasible for the WUOs to assume responsibility for the irrigation O&M activities envisaged; and
- Once the drainage costs are included, the net CF per season turns negative in Year 5; the deficit however is manageable and given the number of WUs on the distributary, drainage O&M contributions could be increased to cover the cost.

Mr. C. Perry conducted a study of pilot sites in July 1997. The main findings of Mr. Perry's report are:

- The current Irrigation O&M costs below the distributary head regulator is Rs 46 per CCA hectare, while above the distributary the costs are Rs 34 per CCA hectares;
- Estimated required Irrigation O&M expenditure below the distributary head regulator is Rs 106 per CCA hectare, while above the distributary head regulator the costs are Rs 94 per CCA hectares; and
- Estimated full O&M of Irrigation and Drainage infrastructure is between Rs 1200 - 2000 per CCA hectares

5. CONCLUSIONS

From the above detail it is quite clear that, at this point, financially it will be feasible for the WUOs to bear the O&M costs of Irrigation. However, various facts, figures and analysis reveal that the full costs for Irrigation and Drainage O&M are high.

6. RECOMENDATIONS

The most immediate need is to clarify the O&M costs for various drainage technologies available in the three pilot distributaries. At this time, the estimated O&M drainage costs prepared by the LBOD consultants will be used to refine the Financial Feasibility Analysis reported herein. This will allow initial Business Plans to be prepared.

An evaluation of irrigation and drainage facilities is underway at the three pilot sites. An initial evaluation of the surface water hydrology and groundwater hydrology will be completed in late 1997. For the Dhoro Minor command area, including field evaluations of tubewell drainage facilities and surface drains. Similar work will be completed during 1998 for the other two pilot distributaries. This will provide the necessary information for preparing a Proposed Business Plan as shown in Figure 1 for each Water Users Federation.

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ANNEXURE A

**PLAN OF ACTION
FOR DEVELOPING
A BUSINESS PLAN**

Plan of Action Prepared by Financial Analyst

Introduction

The plan of Action (POA) highlights the initial investigation to be undertaken by the Financial Analyst of IIMI regarding the Financial Management and Operations (FM&Os) of the Water Users Organizations (WUOs). It will also outline a plan for formulating the strategies to develop and execute the Business Plan for the WUOs.

Plan of Action (PoA)

The PoA is divided into four phases: Initial Investigation; Feasibility Analysis; Formation of Business Plan and the implementation of the Business Plan.

Phase One

Initial Investigation Report

The main focus of Phase One is to collect the financial data and facts related to the management activities of water users and the Irrigation Department. To precisely define the activities of Phase One, the following questions have been developed. These questions will provide qualitative and quantitative answers that will help determine the logical sequence of the activities in Phase One and will lead Phase Two.

General

- What are the major objectives of IIMI?
- What is the purpose and role of WUOs?
- At each command area under the pilot projects, what is the condition of water distribution at the distributary/minor and watercourse levels?
- Identify the O&M problems and other management problems at the distributary/minor and watercourse levels?
- Evaluate and quantify the production losses and other economic and financial losses due to these problems?
- Are there any actual WUAs at the watercourse level?
- What is the structure of these WUAs?
- What are the strengths and weaknesses of WUAs?
- What are the FM&O procedures of these WUAs?

Irrigation Dept.

- How is the Irrigation Department managing the water distribution at the distributary/minor level?

- What are the various activities conducted by the Irrigation Dept. as far as O&M and the management of distributaries/minors are concerned?
- What are various costs associated with these activities?
- What is the formal cost structure for O&M at the Irrigation Dept.?
- How is the budget allocated by the Irrigation Dept. for O&M and the management of distributaries/minors?
- In the Irrigation Dept., who is responsible for the management at the distributaries/minors level?

Water Users

- What are the various inputs required by the farmers for the effective & efficient production of crops?
- What are the various costs associated with these inputs?
- Who is the decision-maker as far as costs of inputs are concerned?
- What is the income of water users related to their operational costs?
- Water being one input for crop production, how much does it cost?

These are very basic questions, and answers to some of these questions may be redundant. Some of the questions can be addressed by evaluating the outcome of the baseline survey. However, there may be other questions that need to be answered by contacting the right individual or agency. The outcome of Phase One will be an Initial Investigation Report that will respond to the above questions and other issues that may arise during the fieldwork.

Phase Two

Feasibility Analysis

In this phase, the facts and data that are collected from Phase One will be used to conduct a feasibility analysis for FM&Os of the WUOs. Following are the main questions that will help to define the activities for Phase Two:

Cost Analysis

- How much it will cost each water user to conduct the O&M and the management of the distributary/minor?
- Can the water users afford this cost?
- Will the overall production cost be affected?
- What will be the group cost to maintain the O&M and the management of the distributary/minor?
- What will be the return on this cost to each individual water users?
- Whether the return would be value-added or simply monetary?
- How should the cost of O&M and the management of the distributary/minor be allocated?
-

- What is the estimated cost of water to each individual water user before and after the formation of WUOs?

Irrigation Dept. & WUOs

- What should be the structure of the WUOs?
- What will be the nature of responsibilities for each member of the WUOs?
- What will be the role of the Irrigation Dept.?
- What will be their financial, technical and economic contribution towards the WUOs?
- What will be the overall effect of WUOs on the Irrigation Dept.?
- What will be the strength of WUOs?
- What will be the weaknesses of WUOs?
- What are the opportunities that will arise from the formation of WUOs?
- What are the threats that need to be addressed by the WUOs?
- How can the WUOs be sustained?

Phase Three and Four

Formulation and Implementation of the Business Plan:

The analysis of Phase Two will be documented and used in Phases Three and Four to formulate the Business Plan and outline its Implementation. Phase Three and Four will overlap each other because there will be several modifications and enhancements in the Business Plan. Result of the feasibility analysis will be shared with various individuals, groups, teams and agencies so that the input from all of the parties concerned with the WUOs can be obtained to form a Business Plan. A team effort will be required to identify the proper mechanism for the Implementation of the Business Plan and training for the members of WUOs.

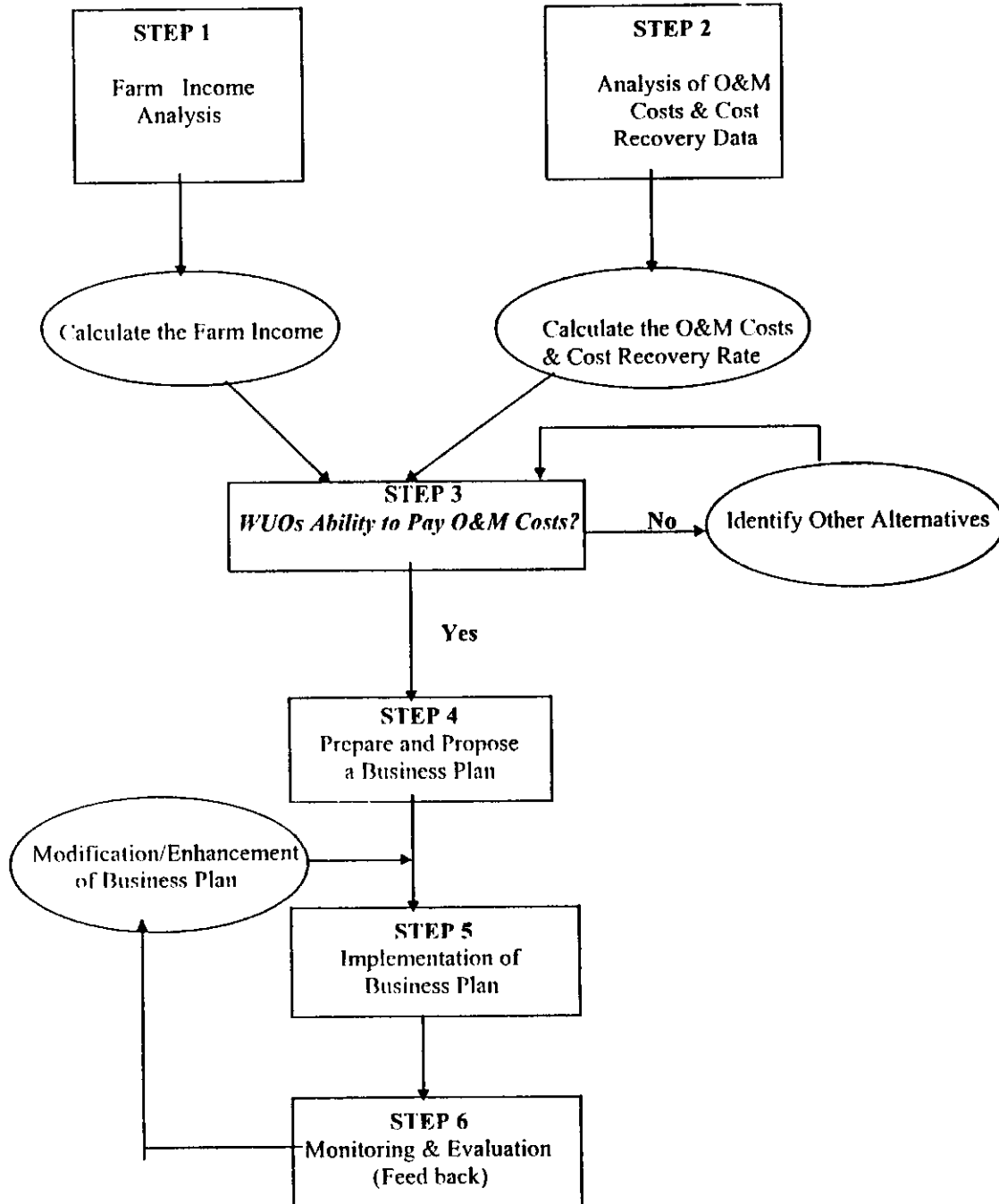
The basic financial and accounting principles, software programs and the modern financial management & operations methods will be used to formulate the Business Plan in Phase Three. A FM&Os manual will be developed that will describe the procedures for the financial management of the WUOs. Thus, the feasibility analysis of Phase Two and the finance, accounting and management concepts will primarily drive the activities of phases Three and Four.

Planned output

Following is a tentative list of the outputs that is expected to be compiled during and after the execution of the PoA:

- a) Initial Investigation report;
- b) Feasibility Analysis Report;
- c) Business Plan;
- d) Financial Management and Operations Manual; and
- e) Implementation Plan.

Figure 1. Process for developing a Business Plan.



ANNEXURE B

SUPPORTING INFORMATION FOR FARM INCOME ANALYSIS

Table 1. Differences between Farm Income Analysis, Funds Flow Analysis, and Farm Investment Analysis

Item	Farm income analysis	Funds flow analysis	Farm investment analysis
General objective	Check current performance of farm	Check farmer's liquidity	Check attractiveness of additional investment
Period usually analyzed	Individual years	Loan repayment period	Useful life of investment
Prices used	Current prices	Current prices	Constant prices
Treatment of capital	Annual depreciation charge	Cash purchases and sales	Initial investment, residual value
Off-farm income	Excluded	Cash portion included	Cash and non cash included
Home-consumed farm production	Included	Excluded	Included
Performance criteria	Return to capital and labor engaged on farm	Cash available to farm family	Return to additional resources engaged
Time value	Undiscounted	Undiscounted	Discounted
Performance indicators	Profit as a percentage of net worth, family income	Cash surplus or deficit	Net present worth, internal rate of return, benefit-cost ratio, net benefit-investment ratio, net benefit increase

Source: Schaefer-Dehnert (1980)

Exhibit 1. Sample Questionnaire

Financial Data of the Water Users
Initial Investigation Survey for the Business Plan
Pilot Project for Farmer Managed Irrigated Agriculture Under Left Bank Outfall
Drainage (LBOD) Stage I Project, Sindh Pakistan

Interview Date: (month/day/year) _____

Name of water user: (Last, First) _____

Distributary/Minor: _____

Watercourse No. & Location (H/M/T) _____

Sanctioned discharge at the watercourse: _____

Time allocated to irrigate your land (hours & minutes): _____

Farm location at the WC (H/M/T): _____

Land ownership Status:

Acres

- 1) Owner-operator (No. Hari) _____
- 2) Land owner(with Hari) _____ (50% or 25%)
- 3) Lessee (on cash) _____
- 4) Tenant (share cropper) _____ (50% or 25%) _____
- 5) Others _____

Kharif 1996 Data

Total Land Cultivated during Kharif 1996 (acres) _____

Net area cultivated & irrigation details for Kharif 1996 (acres)

Crop	Area sown a Acres	Area destroyed b Acres	Area destroyed because 1 or 2 1.Shortage of water 2. Other (specify)	Net area cultivate C= a-b Acres	Time required to irrigate one Acre (hours & minutes per acre)	Number of irrigation this season (Actual)
Cotton						
S. cane						
Rice						
Maize						
Fodder						
Orchard						
V.table						

Cost of Seed for Kharif 1996

Crop	Quantity of seed sown Kg or Mds or Bags per Acre	Price of Seed per Kg or Mds or Bags	Interest if Paid on seed purchase	Total Cost of Seed
Cotton				
S.cane				
Rice				
Maize				
Fodder				
Orchard				
V.table				

Cost of Fertilizer for Kharif 1996

Crop	Quantity of Type 1 Bags	Price & Interest per Bag	Quantity of Type 2 Bags	Price & Interest per Bag	Quantity of Type 3 Bags	Price & Interest per Bag	Other (Eg Natural) cost per Acre	Total cost
Cotton								
S.cane								
Rice								
Maize								
Fodder								
Orchard								
V.table								

Cost of Pesticides for Kharif 1996

Crop	Quantity of Type 1	Price & Interest per unit	Quantity of Type 2	Price & Interest per unit	Other Cost per Acre	Total cost
Cotton						
S.cane						
Rice						
Maize						
Fodder						
Orchard						
V.table						

Taxes and Cesses for Kharif 1996

Crop	Total Land Cultivated	<u>Dhal</u> Usher + Abiana for season	Drainage Cess for season	Misc and other charges paid for season	Total Taxes Paid
Cotton					
S.cane					
Rice					
Maize					
Fodder					
Orchard					
V.table					

Approximate Cost of Manual Labour Shared between Zamindar & Hari for the Year

Crop	Ploughing/Land leveling		Picking / cutting		Threshing		Others		Total Cost per acre
	Z	H	Z	H	Z	H	Z	H	
Cotton									
S.cane									
Rice									
Maize									
Fodder									
V.table									
Wheat									
Oil Seed									
Orchard									
Other									

** If paid in Kg/Mds get the market price and than calculate cost per acre*

Production and Transportation details Kharif 96

Crop	Total Production (Maunds)	Hari's Share (Maunds)	Selling price per Maunds	Transportation (tool tax, etc.) per Maunds	% of Transportation shared by Hari & Zamindar Z=?, H=?
Cotton					
S.cane					
Rice					
Maize					
Fodder					
Orchard					
V.table					