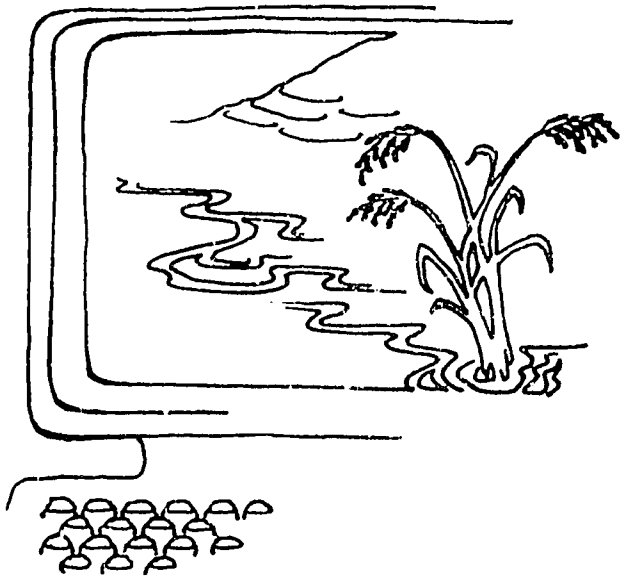

IRRIGATION REHAB

User's Manual

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CORRECTIONS

Please refer to this sheet when page numbers are referred to in the text of IRRIGATION REHAB USER'S MANUAL.

On page	Reference to page	Should refer to page
13	12	8
	14	10
23	31	27
24	33	29
25	30	26
30	36	32
43	21	17

Preface

REHAB was originally created in 1981 by Cornell University consultants and their Agrarian Research and Training Institute Colleagues as a special activity for the Sri Lanka Water Management Project, a USAID-assisted project to rehabilitate the Gal Oya Left Bank irrigation system. The purpose was to involve senior officials, project officers, and technical consultants in a creative, interdisciplinary activity that would demonstrate the necessity and value of anticipating and dealing in advance with potential project problems - both social and technical - as well as increase their understanding of the knowledge needs for and process variables affecting successful rehabilitation. When first played - with small sets of photocopied maps, problem cards, felt-tip pens, and large sheets of plain newsprint - the original REHAB was a much less complex, more limited and environmentally specific game/simulation than the computer-assisted version presented here. However, it was the substantial success of that initial version in achieving its objectives, coupled with the encouragement, advice, and criticism of several subsequent users that stimulated the further development and refinement of REHAB.

Redesigning REHAB for use with a microcomputer has facilitated the following improvements: 1) a greatly expanded information base, 2) a provision for accessing information in three different ways and 3) the ability to obtain information in several forms such as text, maps, slides, and combinations thereof, including an extensive composite map capability. In addition, with the optional plug-in Relay Adapter Card (RAC) the computer has the ability to *automatically* access the slide set provided with REHAB, thus providing an exceptionally user-friendly means of illustrating various aspects of the irrigation system. Finally, REHAB now can be readily used in both a self-paced, individual "stand-alone" mode or as a group activity involving teams of players.

Overview of the User's Manual

This manual has three chapters and two appendices.

Chapter 1. Getting Started includes a list of system requirements - the hardware and software you must have in order to use REHAB on your computer - and step by step instructions for the preparation and backup of the REHAB diskette. These steps must be followed before the REHAB software can be used.

Chapter 2. Using REHAB is a non-software oriented discussion of REHAB. It is in this section that the AB-99 irrigation system is introduced and placed in its proper historical and social context, so that a basic understanding of the system can be obtained. Included in this section is a description of the rehabilitation objectives and the suggested phases of play.

Chapter 3. Software Operating Instructions consists of detailed instructions for operating the Environment Description Module, the Information Acquisition Module, and the Farmer Meeting Module. These are the three modules which constitute the actual REHAB software.

Appendix A. Using REHAB With The Relay Adapter Card describes the special steps which must be taken in order to prepare REHAB for use with the Relay Adapter Card (RAC). With this plug-in card installed your computer has the ability to automatically access the slide set included with REHAB.

Appendix B. REHAB Start-Up Options discusses the optional methods for starting REHAB. The various start-up options affect certain operational characteristics of REHAB, such as display writing speed.

Table of Contents

Chapter 1. Getting Started

Chapter 2. Using REHAB

Chapter 3. Software Operating Instructions

Chapter 1. Getting Started

Typographical Conventions

A few simple typographical conventions are used in this manual:

1. Messages which actually appear on the screen are in **boldface**, but are otherwise printed exactly as they appear on the screen.

2. Commands which users are intended to type are printed in boldface and entirely capitalized, except for commands which are issued by typing a single letter in the command word; these commands are printed with *only* that letter capitalized and in boldface. Also, references to keys on the keyboard are in boldface and entirely capitalized (for example, ALT). Note that the following are keys to be pressed and *not* commands to be typed in: **ALT, PGUP, PGDN, CTRL, DEL, ENTER, BREAK, SHIFT, PRTSC** and **SPACE BAR**.

3. In general, when a new term or concept is introduced it is printed in boldface the first time it is used in the text but not thereafter. On occasion, clarity will dictate that a term or concept be boldfaced more than once where it is introduced in seperate sections of the manual.

System Requirements

REHAB runs on IBM-PC, XT, or AT computers with the following hardware and software:

At least 256K bytes of Random Access Memory (RAM);

One or two double-sided diskette drives *or* one diskette drive and a hard disk;

IBM color/graphics adapter card (CGA) *or* IBM enhanced graphics adapter card (EGA) *or* equivalent of either;

Color display *or* monochrome display when used with a monochrome graphics display adapter;*

IBM PC-DOS versions 2.0 through 3.1

An 8087 or 80287 math coprocessor will significantly speed up calculations; however, it is not required.

REHAB should perform correctly on *any* fully IBM compatible system, but it has only been tested for correct operation on the following computers:

Kaypro
ATT 6300
Leading Edge, Model D
Epson Equity I
Tandy 1000

* REHAB can only be used with a monochrome display under the following circumstances: the display adapter must have a graphics capability and, in addition, must have the ability to emulate the IBM CGA. For example, the Paradise Modular Graphics Card works correctly. Also, certain computers, such as the ATT 6300, are equipped with monochrome display adapters which will work with REHAB.

Preparing REHAB For Use

Before REHAB can be used certain steps must be taken to prepare the system. For a diskette based system this preparation involves first adding several DOS files to the REHAB diskette (making the REHAB diskette capable of starting the computer) and second making a copy of this diskette. This copy will be your "working diskette" which you should use for all of your work with REHAB. For a hard disk based system this preparation entails creating a REHAB subdirectory and copying the entire REHAB diskette as well as one DOS file to this subdirectory. Thereafter, all work will be done from the hard disk. For both diskette and hard disk based systems, after these steps have been performed the original REHAB diskette should be put away for safekeeping. The following instructions detail the preparation procedure for single diskette, dual diskette, and hard disk systems.

Single Diskette Systems

Follow these instructions if your system has a single diskette drive:

1. Insert your DOS diskette in the disk drive.

2. Turn on the computer or if the computer is already on, perform a **system reset** by holding down the **CTRL** and **ALT** keys and then pressing the **DEL** key. DOS will be loaded and you will be prompted to enter the date and time. After doing so, the DOS prompt **A>** will appear.

3. Type **SYS B:**

   Complete this and all other commands with the **ENTER** key. When you are asked to insert the diskette for drive B, remove the DOS diskette and insert the original IRRIGATION REHAB diskette in the drive. Then press any key. Note that although there is only one *physical* diskette-drive, DOS considers there to be two *logical* diskette-drives in the system. You should think of the system as having *two* diskette drives (drive A and drive B). But, instead of A and B representing two physical drives as on a multiple diskette-drive system, The A and B represent diskettes. Depending on the memory configuration of your system you may be required to swap diskettes several times before the necessary DOS files are transferred. Just remember that for this operation the DOS diskette is diskette A, while the REHAB diskette is diskette B.

4. Copy the DOS file COMMAND.COM to the REHAB diskette by typing the command:

   COPY COMMAND.COM B:

   Perform all steps exactly as prompted. As before, the DOS diskette is diskette A while the REHAB diskette is diskette B.

5. Copy the DOS file GRAPHICS.COM to the REHAB diskette by typing the command:

   COPY GRAPHICS.COM B:

   Perform all steps exactly as prompted.

6. Make a copy of the REHAB diskette using the DOS DISKCOPY command. To do this, insert the DOS diskette in the drive and type:

   DISKCOPY

   You will be asked to insert the *source* diskette in drive A; this is the REHAB diskette. When asked to insert the *target* diskette in drive A, insert the diskette which you intend to be the REHAB working diskette. This diskette can be formatted or unformatted. If it is unformatted, DISKCOPY will format it for you while it is copying. The diskette copying process usually requires that you switch diskettes several times. Be sure to perform all steps exactly as prompted.

7. Label the working diskette appropriately and put the original diskette away for safekeeping.

Dual Diskette Systems

Follow these instructions if your system has two diskette-drives:

1. Insert your DOS diskette in drive A.

2. Turn on the computer or if the computer is already on, perform a **system reset** by holding down the **CTRL** and **ALT** keys and then pressing the **DEL** key. DOS will be loaded and you will be asked to enter the date and time. After doing so the DOS prompt **A>** will appear.

3. Insert the REHAB diskette in drive B and type

   SYS B:

   Complete this and all other commands with the **ENTER** key.

4. Copy the DOS file COMMAND.COM to the REHAB diskette by typing the command:

   COPY COMMAND.COM B:

   Perform all steps exactly as prompted.

5. Copy the DOS file GRAPHICS.COM to the REHAB diskette by typing the command:

   COPY GRAPHICS.COM B:

6. Make a copy of the REHAB diskette using the DOS DISKCOPY command. To do this, insert the DOS diskette in drive A and type:

   DISKCOPY A: B:

   Now, insert the original REHAB diskette in drive A and insert the diskette you intend to be the REHAB working diskette in drive B. The working diskette can be formatted or unformatted. If it is unformatted, DISKCOPY will format it for you while it is copying.

7. Label the working diskette appropriately and put the original diskette away for safekeeping.

Hard Disk Systems

Follow these instructions if your system has a single diskette drive and a hard disk:

1. Turn on the computer or if the computer is already on, perform a **system reset** by holding down the **CTRL** and **ALT** keys and then pressing the **DEL** key. DOS will be loaded and you may be asked to enter the date and time. After this, the DOS prompt (usually **C>**) will appear.

   Note: There should not be a diskette in the diskette drive during this step, or else the computer will attempt to start DOS from the diskette, which may not contain the DOS files.

2. Create a REHAB subdirectory by typing

   MKDIR \REHAB

   Complete this and all other commands with the **ENTER** key.

3. Access this subdirectory by typing

   CHDIR \REHAB

4. Insert the original IRRIGATION REHAB diskette in the diskette drive and type

   COPY A:*.*

   This will copy all of the REHAB files to the hard disk.

5. Insert your DOS diskette in the diskette drive and type

   COPY A:GRAPHICS.COM

6. At this point, the original REHAB diskette should be put away for safekeeping. All work will be done from the hard disk.

Chapter 2. Using REHAB

INTRODUCTION

Irrigation system rehabilitation should not be understood as an end in itself. Rather, it is one means for creating the conditions for improving and sustaining agricultural productivity and rural well-being over time. Crucial to achieving these goals is improving irrigation system operations and management by both the irrigation bureaucracy and farmer water users. How system rehabilitation is conceived and the way it is carried out will greatly affect those future prospects for improved water management.

Until recently, irrigation system rehabilitation was too often regarded simply as reconstruction or restoration. It was not understood as an activity quite different from the original creation of the system. However, no irrigation system can be fully or perfectly known at the time of its design and construction. It is also unlikely that the human-land-water environment in which an irrigation system operates will remain fixed through time. Thus, even correct initial design assumptions or operational considerations are unlikely to remain valid 25, 35, or 50 years later. The many hydrological, geographical, sociological, economic, agronomic, and other constraints - as well as possibilities - which exist in an established irrigation system can be more effectively appreciated by regarding it as an ever-changing socio-technical system.

Rehabilitating an existing irrigation system presents an opportunity to create a better "fit" between human and physical factors than could be achieved in even the best of initial system designs. The accumulated experience and wisdom from years of operation and use should be incorporated into every irrigation rehabilitation activity in an effort to come closer to establishing an "optimum" system. However, to capitalize fully on the opportunity thus presented, engineers, planners and policy-makers also need to have a conception of rehabilitation which differentiates such an undertaking from simply recreating an irrigation system as originally planned.

IRRIGATION REHAB has been developed to facilitate such a conceptual change by those involved in irrigation development. It has been designed to simulate many of the tasks and problems likely to be encountered in planning for and implementing the rehabilitation of an existing irrigation system, *not to original design standards and plans*, but rather to create a better "fit" between physical and human factors that *currently* exist in the irrigation environment. Game participants are challenged to anticipate and resolve - or provide a basis for resolving - as many problems as possible of the kind that may emerge in getting an irrigation rehabilitation project underway. In so doing, they should improve their skills in identifying knowledge needs, formulating effective designs and plans, and developing appropriate strategies for solving problems. They also should develop a better understanding of processes which are likely to affect the successful implementation of irrigation rehabilitation projects.

In developing REHAB we also have sought to create an activity useful for the various kinds of persons typically involved in both planning and implementing irrigation rehabilitation projects, e.g. irrigation engineers involved in either field operations or designs; government officials from district to central ministry levels; and other professionals such as consultants, development assistance project managers, and researchers. Our purpose is pedagogical, viz. to create a group

problem-identification and problem-solving learning experience for participants which helps them develop an interdisciplinary, problem-oriented approach to irrigation system rehabilitation.

Thus the "game" dimension has been consciously down-played, and there is no single correct answer or solution in REHAB, nor is there any winning or losing in the usual sense. Rather, this is a non-competitive activity in which individuals or groups of participants first seek to discover as many of the problems as possible that exist in a hypothetical irrigation system. Then each group or single player formulates solutions to the problems that have been identified or anticipated as part of the process of developing an appropriate rehabilitation plan for the system. Finally, players have an opportunity to respond to several typical farmer questions in a simultation of how their rehabilitation plan might be received in a meeting of farmers served by the system. All participants are "winners" to the degree that these tasks are successfully carried out, and increased understanding of the complex process of planning irrigation system rehabilitation is gained.

The environment simultated in REHAB is meant to be a composite of situations existing to a greater or lesser degree in many large and small gravity-flow, rice-focused irrigation systems elsewhere in the humid/sub-humid monsoon regions of Asia, but we have drawn rather freely upon field conditions encountered in the Gal Oya Left Bank system in Sri Lanka to create it. Although the layout of the distributary channel and associated command area used in REHAB is hypothetical, it does incorporate many of the conditions and problems likely to be encountered in rehabilitating such irrigation systems. To be sure, the *variety* of situations and problems created here typically would not be found in a single distributary channel system; however, we have choosen this approach in order to expose participants to the *range and complexity* of field conditions that may be encountered in irrigation rehabilitation projects.

The AB-99 Irrigation System: Background Information

The distributary channel (also called a D-channel), Any Branch 99 (AB-99), and its tertiary field channels (AB-99.1, 99.1.1, 99.1.1.1, 99.2, etc.) are located in the upper reaches of a large gravity-flow irrigation system constructed some 30 years ago. An outline map of the AB-99 channel system is shown in Figure 1. Water is supplied to this system from a major reservoir that stores runoff from a large catchment area, primarily during the monsoon rains. Since its construction, the reservoir has completely filled in two different years and on two other separate occasions water levels have dropped to near dead storage. In general, there is not enough runoff stored in an average rainfall year to provide assured irrigation during the dry season for the entire area *now commanded* by this large system. During the rainy season, some irrigation is provided to the whole system on a supplementary basis, to ensure a good rice crop.

In principle, water is to be distributed throughout the whole system, and for most of the first two decades of operation this generally occurred. However, for the past 10 years or so, farmers in the tail areas of the main system have received scarcely any water during the dry season. Farmers in the head-end command areas invariably draw as much water as they think they need for their rice crop, leaving those downstream to manage as best they can with the water that remains. Various efforts to get farmers to reduce their planted acreage in water-short years to make possible a more equitable distribution of water throughout the system have not been successful.

Overall, the general physical condition of the irrigation system, including the AB-99 sub-system, is now very poor. Rehabilitation is clearly necessary. Channel beds are typically higher than

designed because of accumulated silt; channel embankments often are eroded from their original profile, in part the result of human and animal traffic seeking access to water for non-irrigation purposes.

Many channel structures are severely deteriorated, and most channel offtakes cannot be used to regulate water flows because their gates are either broken or missing. Lack of water control leads to excess runoff into the drains, especially in head-end areas of the system. Drainage channels also are heavily silted, reflecting conditions of general neglect. Farmers complain about unpredictable and unreliable water supplies, blaming the Irrigation Department (ID) for failing to maintain the system properly, as well as other farmers who take more than their authorized share of water.

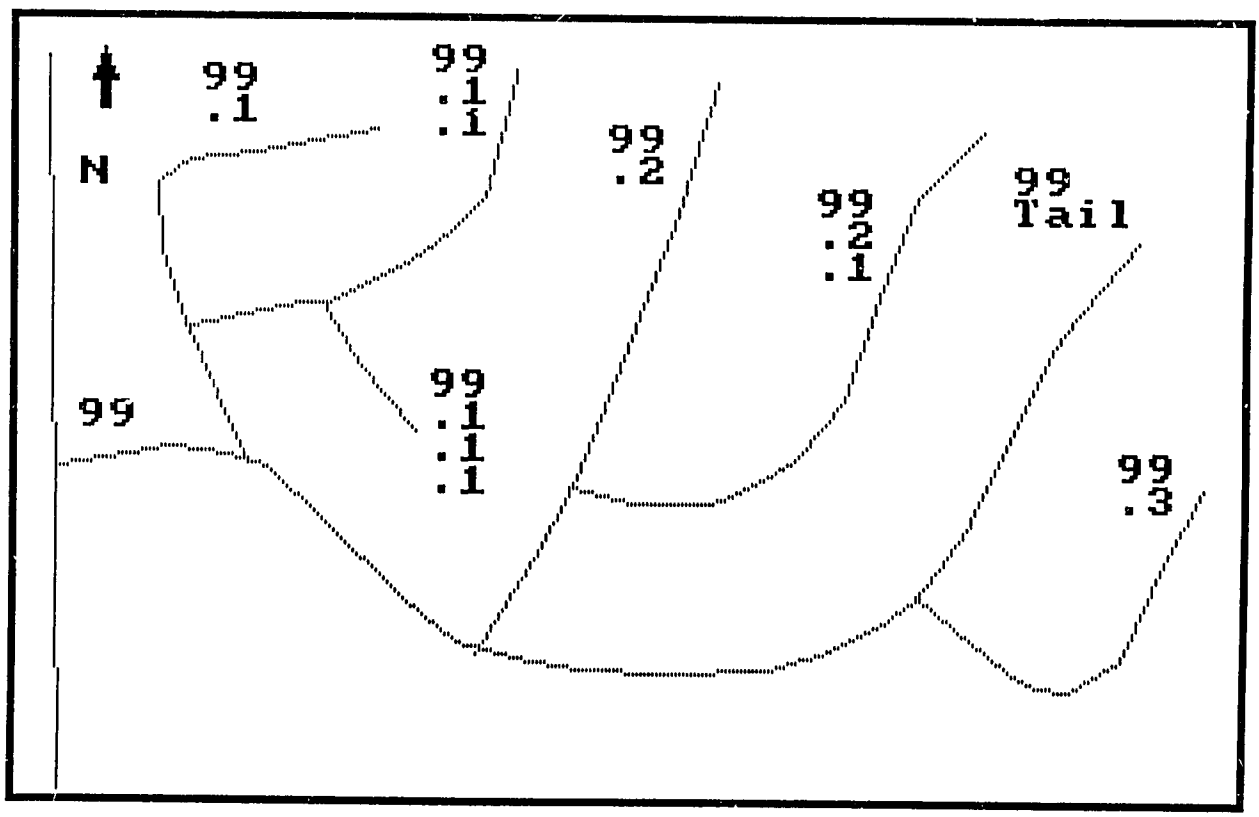

Figure 1. The Channel System Outline Map

The original farm families in the command area of AB-99 were settled in the area during the later stages of construction of the irrigation system three decades ago. Each family was granted a farm

comprising 1.5 hectares of irrigable rice land plus an additional piece of unirrigated land for a homestead - on which a standard house was provided - and a rain-fed garden which can contribute to overall family food production and consumption.

Individual holdings are terraced on the relatively gentle to moderate slopes in the area. A typical farm will have about 10 individually bunded paddies, with irrigation water flowing from the highest field to the lowest paddy in the farm before entering the drains which are a combination of naturally existing and constructed channels.

Rice is the predominant crop grown in both seasons. During the wet season, irrigation water is issued only to supplement a usually substantial rainfall; however, if the rains are inadequate or not timely, irrigation is crucial for a successful rice crop in this season. In the dry season, the rice crop is completely dependent upon the irrigation system to meet water requirements as rainfall typically is scanty and very erratic.

Originally, 46 farms were served by the AB-99 system and each farm was provided irrigation water through a standard 4" pipe set in the channel embankment at the proper elevation. In the designed layout of AB-99, land on both sides of irrigation channels was reserved exclusively for the ID to provide access to channels for operation, maintenance, and repair. These reservations are approximately 10 meters on either side of the D-channel and 5 meters wide along field channels; no crops were to be grown and no private structures were to be built in these areas. However, there has been some encroachment upon these reservations by farmers, some of whom are descendants of the original settlers, desperately seeking land for farms of their own.

Where lack of water control in the D-channel and field channels leads to excess runoff into the drains, some farmers also have encroached upon the drainage areas, creating fields and cultivating where water can be readily diverted by weirs (or anicuts), and thus is fairly ample. Cultivation in the drainage areas can disrupt the drainage system, sometimes causing problems for upstream farmers. However, when these squatters are descendents of original settlers, there is a general community reluctance to displace them. As a result of various kinds of encroachments activities, the present commanded area of AB-99 has been expanded beyond the original 69 hectares.

No formal provision was made in the original design of this irrigation system for an expansion of irrigable area beyond the initial commanded area. Government policy when the system was constructed required farmers settled in the scheme to pass on their 1.5 ha farms undivided to only one son or daughter. It continues to be illegal for farms to be subdivided among multiple heirs; nevertheless, many original farms have been *de facto* subdivided. Also, many farmers have mortgaged land as security for loans or leased portions of their farm to other cultivators as tenants. Consequently, some farmers' holdings are cultivated by tenants, while other farmers have become tenants on their own land or have lost control of their land to other operators when they could not repay their debts. In spite of these developments, Government continues to recognize only the original farmer or a properly designated heir as the cultivator with legal rights to water from the irrigation system.

Rehabilitation Objectives and Design Criteria

The rehabilitation of AB-99 - and the larger system of which it is a part - is intended to create conditions for a more equitable distribution of water and a more adequate and reliable water supply

throughout the system than is now possible. Rehabilitation also should facilitate more efficient water use through improved control of water, presently minimal within the system because gates are missing or inoperable on most secondary or tertiary channel structures.

Another objective is to secure farmer participation in and cooperation with the rehabilitation process. The desire here is to create a basis for an active farmer participation in system O & M at the distributary canal (AB-99) command level and below following the completion of system rehabilitation.

The Irrigation Department has adopted several design criteria for rehabilitating the irrigation system to meet these water management objectives based upon its operational policies and current engineering standards. These are:

1. Channels and control structures will be redesigned as necessary to permit continuous irrigation deliveries to the head of each field channel. Along a field channel, rotational irrigation will occur between pairs of farmers who will take water for a few hours once a week.

2. No farms will be served directly from distributary channels.

3. Field channel command areas should be 15-20 hectares, each served by field channels with a capacity of 30 L/sec, based upon a designed discharge of 1.5 lps/ha.

4. Each farm (approx. 1.5 hectares) will be served by only one pipe turnout. Where there has been an approved subdivision no smaller than 0.75 hectare, it also may be served by a pipe turnout.

5. Government reservation lands (rights-of-way) are to be reclaimed, where they have been encroached upon, to permit ID access for channel and drain maintenance as necessary.

The irrigation system has been long operated on an announced rotational schedule - alternating deliveries among branch canals for five days on (water flowing) and five days off (closed) - because of an overall scarcity of water and general lack of control capacity. For various reasons, however, this schedule of operation has not been adhered to very strictly, thus tending to reinforce competitive behavior among water users. After rehabilitation is completed, the ID plans to adopt a new system of continuous delivery; here a reduced but steady flow of water will be provided in all main and secondary channels (e.g. AB-99), and irrigation supplies are expected to be continuously available at the field channel turnout. Consequently, a system of rotational delivery among farms will be required since the flow in field channels will be insufficient for more than one or two farms to be irrigated simultaneously. As yet, farmers have not been consulted about this policy and most probably are not aware that such an operational change is being planned. (One immediate consequence of these plans, however, with implications for rehabilitation design, is that no farm should be allowed access to irrigation water from a branch or distributary channel.)

In the interests of design uniformity and greater system standardization, the ID desires that field channels be designed with a 30 L/sec (1 cusec) capacity, each serving a 15-20 hectare (40-50 acre) block of farms. This may not be readily accomplished because, given both prevailing topography and system layout, rotational blocks of this size are not always possible. Some adjustments also may be necessary because of significant soil differences, although the ID believes that after 30 years of irrigation, soils in the system are essentially the same for irrigation purposes.

Although original farms were to pass to a single inheritor undivided, this rule is in the process of being relaxed by Government, acknowledging that in fact many farms have been subdivided among several heirs of the original farmers, while others have been partially tenanted or mortgaged and then effectively lost. Some confusion continues to surround the subdivision issue, but the ID has been told it now can give a separate farm turnout to such holdings if they are at least 0.75 hectares and registered with the Land Department by eligible heirs of the original farmer. Smaller subdivisions cannot be registered nor can they be given separate access to water.

The ID desires to reclaim all reservation areas so as to permit more regular channel maintenance in the future. In the past, however, it generally did not enforce the rule against encroachment (squatting) on reserved rights-of-way along branch, distributary, and field channels, or on reservation lands in drainage areas. Thus, in some areas farms have been extended up to the channel bund. In other instances, essentially landless farmers (children of original settlers, recent in-migrants) are cultivating small holdings (sometimes micro-plots) of paddy and/or have constructed rude houses within these reserved areas, lacking alternative locations in which to establish themselves. The law in such situations is somewhat ambiguous - occupation and use of a location for some time without challenge creates a presumptive right to continue occupation and use - and in any event it is difficult to enforce through the courts. Moreover, political pressure in support of land-hungry farmers has resulted in the Land Department agreeing to register new holdings up to 0.75 hectares where the ID will waive its right to the reserved land. There is understandably much pressure upon the ID to accept such claims.

The situation in some of the drainage areas further complicates land tenure matters. At certain times of the year, irrigation water is perceived as "going to waste" in drainage areas because of the lack of up-stream control. In many instances, entrepreneurs (e.g. merchants, government employees) have been able to divert this water with anicuts so as to cultivate new areas not previously registered or authorized. Their activities usually are defended on the grounds that this drainage water otherwise would pass unused to the sea; however, because these persons also are often politically well-connected, their control and operation of holdings above the ceiling of 1.5 hectares commonly has not been challenged. The ID now has been told not to provide any water to farms larger than 1.5 hectares; instead, such cases are to be referred to the Land Department where the land is to be reallocated in 0.75 hectare holdings to eligible claimants (e.g. children of original farmers).

Finally, it should be noted that the ID expects considerable work will need to be done on channel reconstruction because the plan to change to continuous flow operations after rehabilitation means that more control will have to be maintained over volumes of flow throughout the system. Thus, channel bunds will need to be reshaped or restored, and more cross-regulators will have to be provided to maintain sufficient head in long channel reaches. Heavy machinery will be used in D-channel reconstruction, but a good deal of hand labor will be required on field (tertiary) channels. To reduce project costs, no budget allocation was made to pay reconstruction work at the tertiary channel level; instead, it has been assumed that farmers will participate in the project by freely contributing their labor here. However, the farmers were not previously consulted about this policy even though it is clear that if tertiary rehabilitation is not done effectively, much of the benefit of the ID's investment in rehabilitating the primary and secondary system will be lost.

Phases of Play

REHAB can be used by one or more teams of individuals or in a "stand-alone mode" by a single individual. Both types of play are described in this section. As suggested in the introduction, group play using interdisciplinary teams is an effective means of bringing different perspectives into the identification and problem-solving process associated with rehabilitation of an irrigation system. On the other hand, the advantage of stand-alone play is that participants can proceed at their own pace without being distracted by group process.

The operational objective in REHAB is for participants to formulate a plan - within budget/time constraints - for rehabilitating a hypothetical secondary channel command area (called AB-99) that will:

1. Resolve irrigation /water supply problems existing within the command area; and

2. Facilitate improved efficiency and equity in distribution of scarce water resources at all levels of the irrigation system.

The proposed rehabilitation plan should also produce:

3. Fewer problems in implementation because potential difficulties and resistances will have been identified and anticipated;

4. More favorable prospects for securing farmer cooperation with and participation in the project; and

5. Increased opportunities for farmer acceptance of responsibility for operating and maintaining their part of the system after project completion.

In REHAB the rehabilitation process proceeds through six sequential phases. They are: System Introduction, Information Acquisition, Preliminary Design, Farmer Meeting, Final Design, and Evaluation. These phases are detailed below.

1. System Introduction

Users of REHAB should first read the extensive system background information provided (beginning on page 12) as well as the discussion of rehabilitation objectives and design criteria (beginning on page 14), in order to become familiar with the AB-99 irrigation system and the community which it serves. Next, using the Environment Description Module software, the participants are able to further develop their understanding of the system and the community. Simply reading about AB-99 is not sufficient since users may be unfamiliar with irrigation systems and the types of communities which they serve. What is required is a more visually illustrative presentation which will provide the REHAB participant with a depth of understanding approaching that which would be obtained by *actually visiting the irrigation system and spending time in the community.* The software is particularly effective here, since its graphical orientation helps the user to form the appropriate mental images. Use of the Environment Description Module is detailed in Chapter 3.

2. Information Acquisition

After reviewing all of the information provided up to this point, participants use the Information Acquisition Module to gain the additional information they need to develop their rehabilitation plan. While the operation of this software module is detailed in Chapter 3 of this manual, it is worthwhile to make a few comments at this time.

Available information is broken down by category and by source. The use of information categories is helpful, insofar as these categories provide a logical framework within which to think about the system. The following information categories are used:

a) Structures and Channels
b) Soils and Topography
c) Settlement Infrastructure
d) Land Tenure

Information is also classified according to source, i.e. the means by which the information is to be obtained. There are three sources of information in REHAB:

a) Farmer - Information is obtained from the farmer by informal consultation or "walking the channel" with farmers. This source is normally quick and inexpensive, but information, though often more abundant, is sometimes not readily quantifiable. Information obtained using farmers as the source may also be less reliable than information acquired using other methods.

b) Reconnaissance - Information is acquired by systematic observation and rapid appraisal of the field level situation; not as costly as a detailed survey (see below) but information is generally less exact and less abundant. On the other hand, information obtained by reconnaissance may be more exact - albeit more costly - than information gathered from farmers.

c) Survey - Detailed surveys yield the most precise information but often entail a considerable expenditure of both time and money since technical data collection can only be done by trained professional staff whose numbers are limited. In many cases - e.g. determining the locations of the primary settlement areas - such precision is unnecessary and the information is best obtained from the farmers or a reconnaissance. At other times - for example, when trying to determine accurately the topography of the system - a detailed survey is called for.

Finally, the amount of information a team or individual user can obtain is restricted by budget constraints built into the Information Acquisition Module. These constraints are intended to simulate "real world" conditions where resources (finances, skilled personnel, time, etc.) are often scarce or limited. Thus, each team or individual can spend no more than 125 units in the course of acquiring information. Note that these "units" do not correspond to any particular monetary system, but only serve to measure the relative worth of information.

3. Preliminary Design

Here, REHAB participants develop their preliminary plans for rehabilitating the AB-99 system; information gathered in all previous phases should be used here. Users organized into teams should develop a single team plan through group discussion and synthesis. Since this is a preliminary design subject to further revision, users may want to prepare this plan in rough, outline form. In general, this will entail:

a) Listing both technical and non-technical system problems which have been identified in phases 1 and 2, and

b) Suggesting some tentative solutions to these problems, if necessary using maps and other printed materials obtained from phase 2.

Although it is not encouraged, a preliminary rehabilitation plan may propose to deviate from prescribed objectives and design criteria; in each instance, a sound justification must be provided for doing so.

4. Farmer Meeting

A simulated meeting occurs with AB-99 farmers to consider the proposed rehabilitation plan. The primary intent of this phase is to allow the farmers to express their views concerning the system rehabilitation, so that where possible the farmer's concerns can be accounted for in the final design. What actually occurs, is that the Farmer Meeting Module displays a number of statements drawn from a large set. These statements are called **Farmer Viewpoints** and express the concerns of one or several farmers (though not always those of the majority of water users). An additional function of this phase is to provide REHAB participants with less technically oriented information which cannot be obtained using the Information Acquisition Module.

In lieu of or in addition to this simulated farmer meeting, individuals familiar with the AB-99 system can act as farmers, expressing their concerns about the proposed rehabilitation plan. The advantage of this approach is that participants can question the farmers as well as vice versa. In particular, questions of a social or political nature are best resolved by these surrogate farmers who can be asked such questions directly instead of having to make inferences based on the software generated viewpoints.

5. Final Design

This is an opportunity for each team or individual to revise its preliminary rehabilitation plan as a consequence of the Farmer Meeting. These final designs should incorporate maps and diagrams where appropriate. Note that the computer need not be used for this phase.

6. Evaluation

In this phase, each final rehabilitation plan is formally presented for group discussion and critical analysis. The justification for any deviation from stated rehabilitation objectives or design criteria also should be reviewed carefully.

One possible way to evaluate the likely success of each design is to consider how many of the main problems in the AB-99 system were identified and effectively dealt with by the rehabilitation plan. However, the objective of this evaluation phase is not to differentiate a winner among the various rehabilitation designs, but rather to provide REHAB participants with feedback concerning the creativity and thoroughness of their rehabilitation proposals.

If REHAB is to be used by one or more teams of individuals, then it is useful to have a "gamemaster" who possesses sufficient knowledge of REHAB to allow him/her to guide the teams through the various phases of play, enforce time/budget constraints, resolve contested issues, and so forth. If, on the other hand, REHAB is to be used in a "standalone" mode by a single individual, then it is suggested that a slightly different approach be taken with regard to the above phases. Such standalone play in essence follows these phases except that the evaluation phase per se is eliminated. Instead, the participant might, for example, be required to hand in a final design as part of his/her course work. Standalone use is often more realistic in situations where it is difficult to coordinate the necessary equipment and individuals. If REHAB is to be played in teams it is desirable not to attempt to go through all of the phases in a single session, but instead group the phases in a logistically feasible manner (the entire process will certainly require more than three hours). Phases three and five can be done on the participants own time since the computer need not be accessed. Finally, these phases of play are "suggested" and should not be considered immutable. It was our intention to make REHAB quite flexible in its possible uses, so by all means use your imagination!

Chapter 3. Software Operating Instructions

REHAB Start-Up Procedure

If you have not performed the step-by-step procedure "Preparing REHAB For Use" in Chapter 1, do so now. These steps must be followed in order that REHAB work properly. Having done so, you are ready to start-up REHAB as follows:

Important: If you have purchased the RAC and intend to use the automatic slide access capability of REHAB, then before proceeding you should follow the instructions in Appendix A of *this manual*. This appendix contains step-by-step instructions for configuring REHAB for use with the RAC.

Single and Dual Diskette Systems

1. Insert your working copy of IRRIGATION REHAB in drive A.
2. Turn on the computer or if the computer is already on, perform a **system reset** by holding down the CTRL and ALT keys and then pressing the DEL key. DOS will be loaded and you will be prompted to enter the date and time. After doing so, the DOS prompt A> will appear.
3. Continue with step 3 below.

Hard Disk Systems

1. Turn on the computer or if the computer is already on, perform a **system reset** by holding down the CTRL and ALT keys and then pressing the DEL key. Wait for the DOS prompt (usually C>) to appear.
2. Access the REHAB subdirectory by typing

   CHDIR \REHAB

3. Start the program by typing

   REHAB

4. After a few seconds the introductory logo will run and then the REHAB **root menu** will appear (Figure 2). Ordinarily, the logo will only run the first time REHAB is executed after the computer is turned on; if you exit REHAB and then restart the program the logo will not be executed. To run the logo again without turning off the computer you must start the program by typing

   REHAB LOGO

   This is one of the REHAB start-up options. Refer to Appendix B for a detailed discussion of these options.

5. As with most REHAB menus, commands are issued by typing the brightly highlighted letter in the desired menu item. For example, for the root menu, pressing **E** starts the Environment Description Module, Pressing **I** starts the Information Acquisition Module, pressing **F** starts the Farmer Meeting Module, and pressing **Q** causes the program to terminate (the program can also be terminated at any point in any of the modules, by holding down the **CTRL** key and typing either **C** or **BREAK**). Note that the highlighted command letters can be typed in either lower case or upper case; REHAB recognizes both.

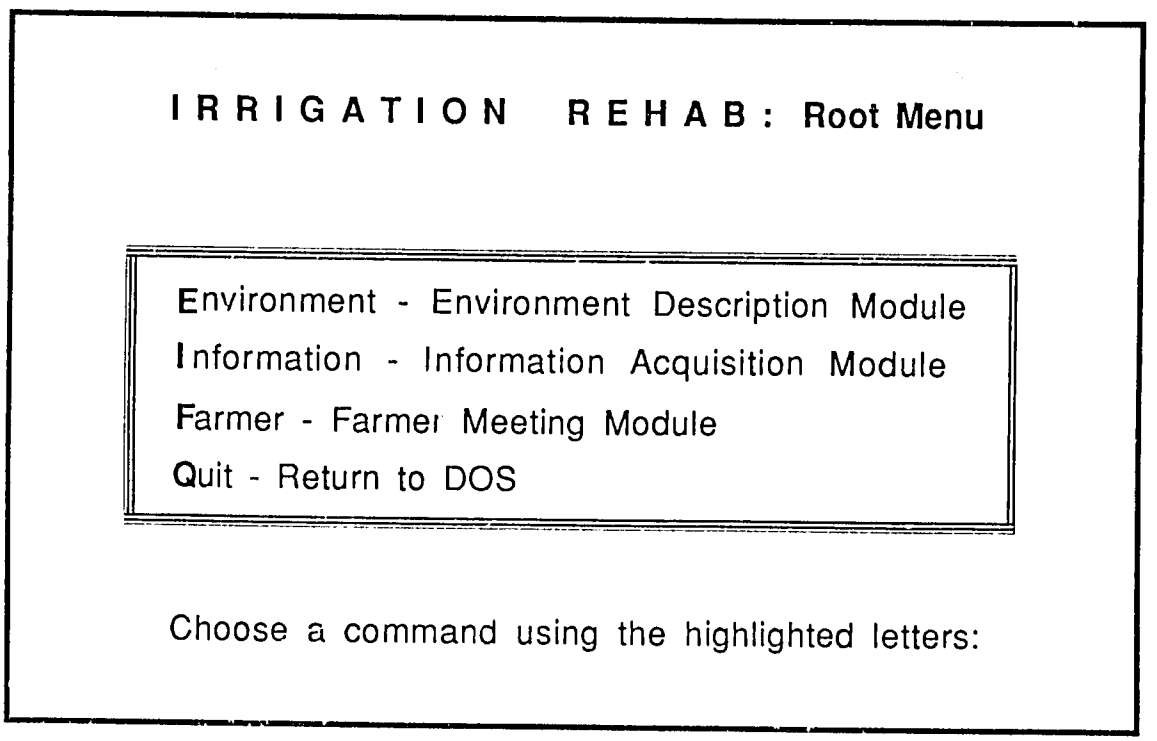

Figure 2. REHAB Root Menu

Environment Description Module

The purpose of this module is to acquaint you with the basic aspects of the AB-99 irrigation system and the community which surrounds it. Using textual material in conjunction with maps and other visual aids, you are given a "tour" of the system. Furthermore, if the Relay Adapter Card (RAC) is installed in your computer it becomes possible for the computer to automatically access the REHAB slide set, which is meant to accompany the maps and text. The background information presented in this module is chosen so as to encourage you to explore the system further using the Information Acquisition Module. In the course of this exploration process many of the system "problems" not revealed in the Environment Description Module can be discovered.

Terms and Concepts

It is necessary to define certain terms and concepts before preceeding to discuss the menu commands in detail.

Frames

The operation of this module is quite straightforward - it involves displaying a series of information packets or **frames** in a predetermined sequence. There are two types of frames: **graphics frames** consist of maps, text, and visual aids such as circles and arrows (which appear on the maps as in Figure 3). Since only a limited amount of text can be included in a graphics frame (roughly 70 words), **text frames** are used where a large amount of textual material must be conveyed and maps are not required (Figure 4). Frames of both types reference slides in the REHAB slide set.

Menus

There are two types of menus which occur in this module: the **module menu** is the first menu to appear when the module begins (Figure 5). The **frame menu** appears at the bottom of every frame (bottom of Figure 4). The commands which constitute these menus are discussed below.

Slide Indicator

Displayed in the lower left corner of each frame is the number of a slide which accompanies that frame; this is the **slide indicator**. Note that in many cases more than one slide will accompany each frame; the slide indicator will change appropriately to reflect this fact.

The Module Menu Commands

The following commands are accessed from the module menu:

Begin

This command will start the frame sequence beginning with frame #1.

Continue

Continue resumes the frame sequence at the last frame which was accessed, i.e. the frame which was being viewed when you left the frame menu in order to access the module menu.

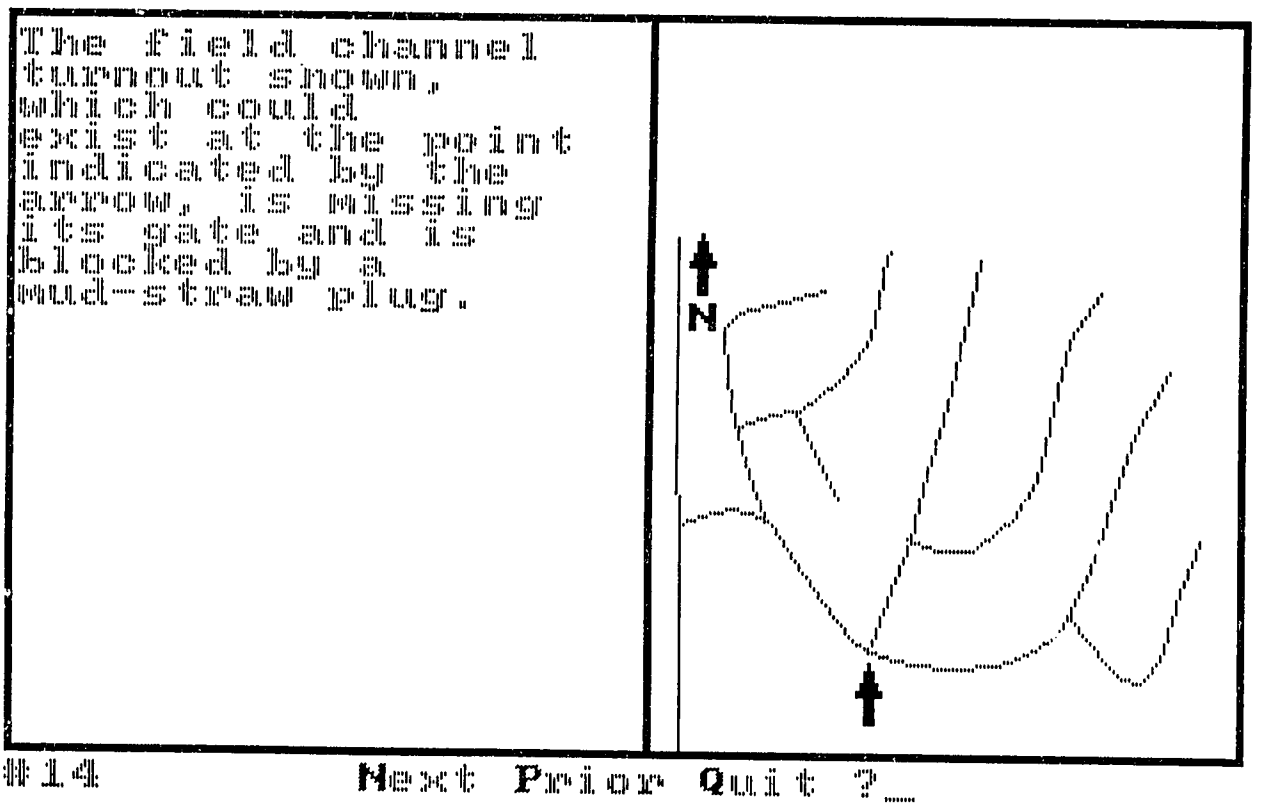

Figure 3. Environment Description Module Graphics Frame

Any

This command allows you to access any frame in the sequence by simply specifying the number of the frame which is desired. The frame sequence continues as though you had started at that frame. In this way you can skip to parts of the frame sequence which are of particular interest.

Quit

This Quit command returns you to the *REHAB root menu* .

The Frame Menu Commands

The following commands are accessed from the frame menu:

Next

This command accesses the next frame in the sequence or, if the current frame refers to additional slides then Next changes the slide indicator accordingly, *without* moving to the next frame.

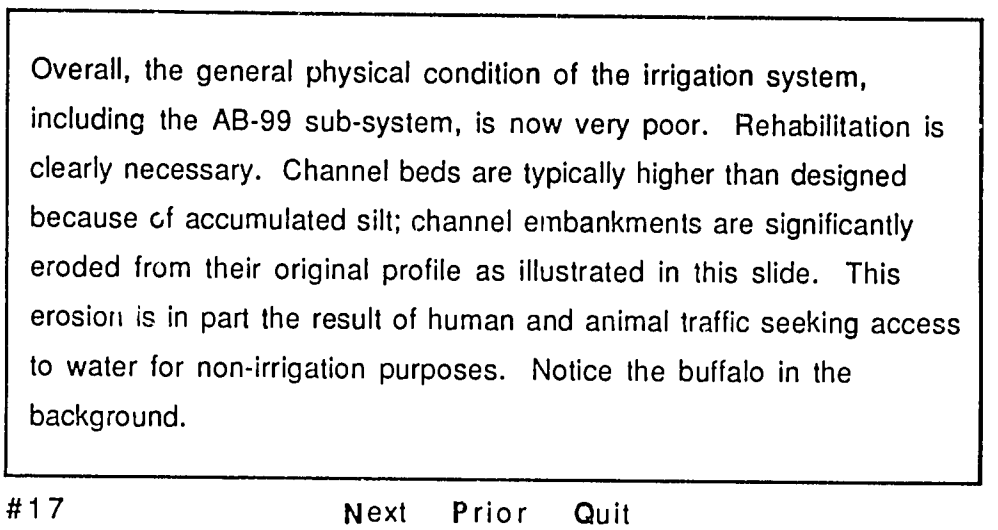

Figure 4. Environment Description Module Text Frame

Prior

This command accesses the prior frame in the sequence or, if the current frame has referenced multiple slides then Prior causes the slide indicator to reference the prior slide, *without* moving to the prior frame.

Up Arrow/Down Arrow

The up and down arrow keys (located on the numeric key pad on the right hand side of the keyboard) are used to focus the projector. The **Up Arrow** moves the lens in one direction while the **Down Arrow** moves it in the opposite direction. Note that this command only applies - and

in fact will only appear on the frame menu - if the RAC is installed, REHAB is properly configured for automatic slide access, and the projector being used has a remote focusing capability. Appendix A contains step-by-step instructions for setting up REHAB for automatic slide access using the RAC.

Quit

This Quit command returns you to the *module menu* so one could, for example, use Any to access a particular frame. Continue will cause the frame sequence to resume, beginning with the frame from which Quit was issued.

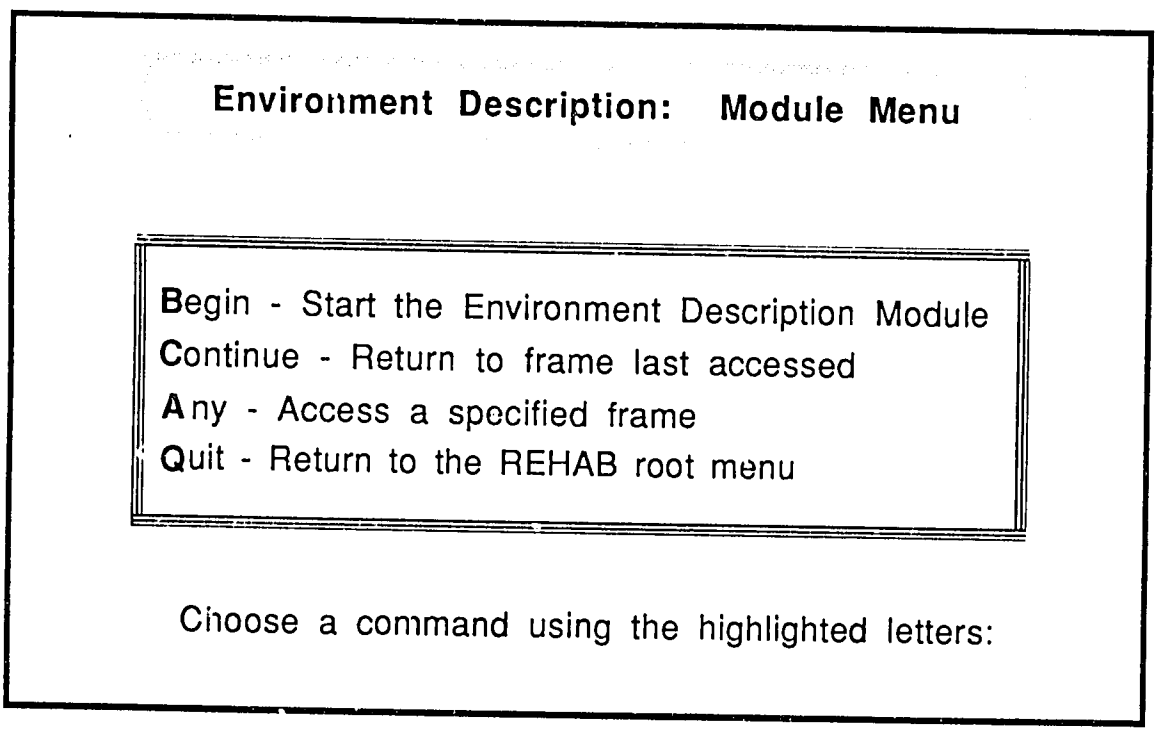

Figure 5. Environment Description Module Menu

Information Acquisition Module

After using the Environment Description Module you should have a basic understanding of the irrigation system and the community it serves. The Information Acquisition Module allows you to build upon that understanding by discovering aspects of the system not revealed in the first module. It is up to you to choose the source and type of information so as to discern the various system "problems" which have necessitated rehabilitation.

Terms and Concepts

Before proceeding to describe the various menu commands it is necessary to define a number of terms and concepts which are employed throughout the discussion which follows.

Information Units and the Index

Most information about the AB-99 irrigation system is contained in a series of small data packets called **Information Units** (IUs). Each IU consists of textual information, maps, and graphical aids such as circles and arrows used to point out certain areas on the maps. In addition, access to these IUs is facilitated by the use of an **index**; for each IU there is a corresponding index entry consisting of a one line description of that IU. The index is organized in the following manner: first the index entries are grouped by **category**, for example, information pertaining to soils and topography; second, within each of these categories entries are grouped according to **source**, i.e. the means by which the information may be obtained. These sources of information include the **farmers** themselves, a **reconnaissance**, and a **survey**. The topic of source and category is discussed in greater detail on page 31. Portions of the index appear in the index area of the screen (see discussion of the screen areas below) and provide the means by which to select the IUs you will access.

Screen Areas

As shown in Figures 6 and 7, there are three major areas of the screen. The **status area** is delineated by the large box in the lower right of the screen and contains a number of lines which define the status of the module. Towards the top of the screen is a horizontal rectangle which defines the **menu area**. All of the menus appear in this area as well as the command prompt which always appears on the top line of the menu area. The **index area** is defined by the large box in the lower left of the screen and is used to display index entries and associated parameters such as cost.

Modes of Operation

This module operates in two modes. In the **selection mode** the selection menu appears in the menu area and the index is displayed in the index area seven entries at a time with the associated costs appearing to the right of each entry. These seven entries all come from the category and source indicated in the status area. By using the cursor movement keys one can view additional entries from that category and source. The category and source from which the displayed entries are taken can be changed using the appropriate menu commands. To select an entry for potential display, move the red rectangular window over the desired entry using the up and down arrow

keys and then press the space bar. A triangular mark will appear to the left of the selected entry, indicating your choice; this is called **marking** an entry. Up to 14 entries from various categories and sources may be marked in this manner at any one time. Note that no information is actually displayed at this point; the marking process simply defines a set of selections. Some or all of the IUs corresponding to these selections can be displayed when you enter the **display mode**. In the display mode, all of the index entries which were marked while in the selection mode are grouped together in the index area together with one of the three letters **F**, **R**, or **S**, used to indicate the source for that selection.

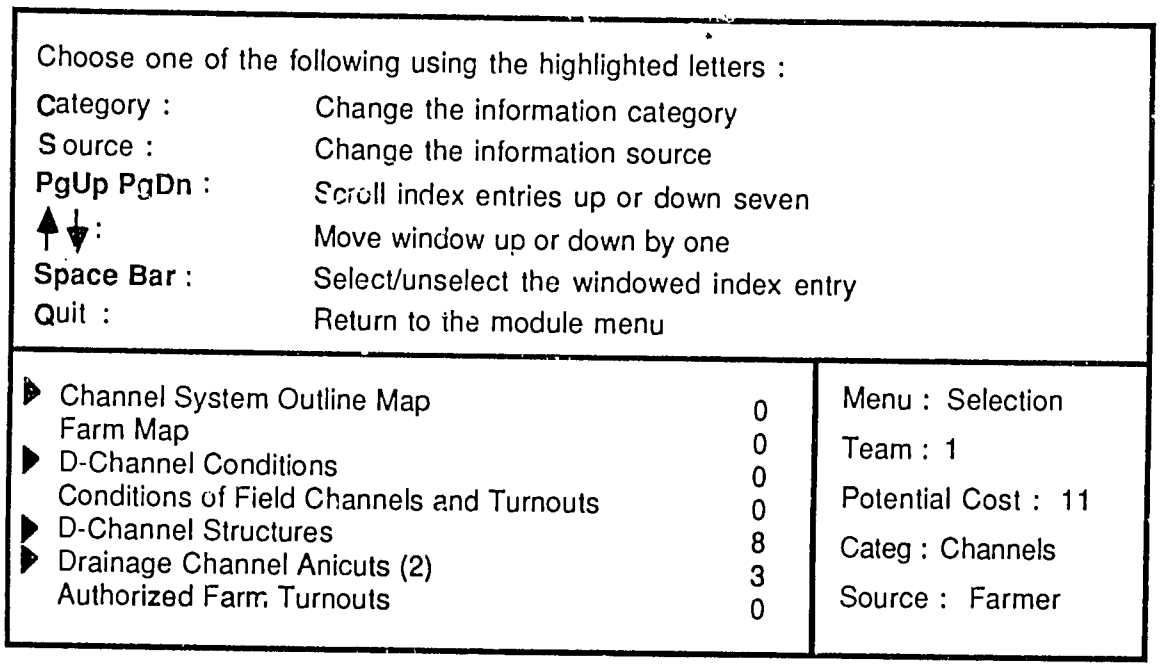

Figure 6. Information Acquisition Module Selection Mode Screen

The display menu appears in the menu area and the status area is modified to reflect the mode change. At this point you can access the IUs corresponding to any or all of the selections which appear in the index area. Large maps, small maps with accompanying text, and composite maps can be displayed using the appropriate commands. Note that in this mode entries can be marked just as they were in the selection mode, though in the display mode the purpose of marking is to specify the IUs which will be accessed in the process of constructing the composite map. The details of the information display process are discussed in the section on display menu commands which begins on page 33.

Teams

As discussed in Chapter 2 of this manual, REHAB can be used by individuals or by groups of individuals organized in **teams**; up to four teams can access this module. Actually, only one team can access the module at any one time (the so-called **active team**) but another team can quickly take control by changing the active team using the Team command (see page 30). It is important to realize that when the active team is changed all relevant information concerning the status of the originally active team is retained internally, so that when the original team resumes its use of the module, it will appear as though its progress was never interrupted. When the module is being used by a single individual all of this is irrelevant and the active team is usually set to one (the default).

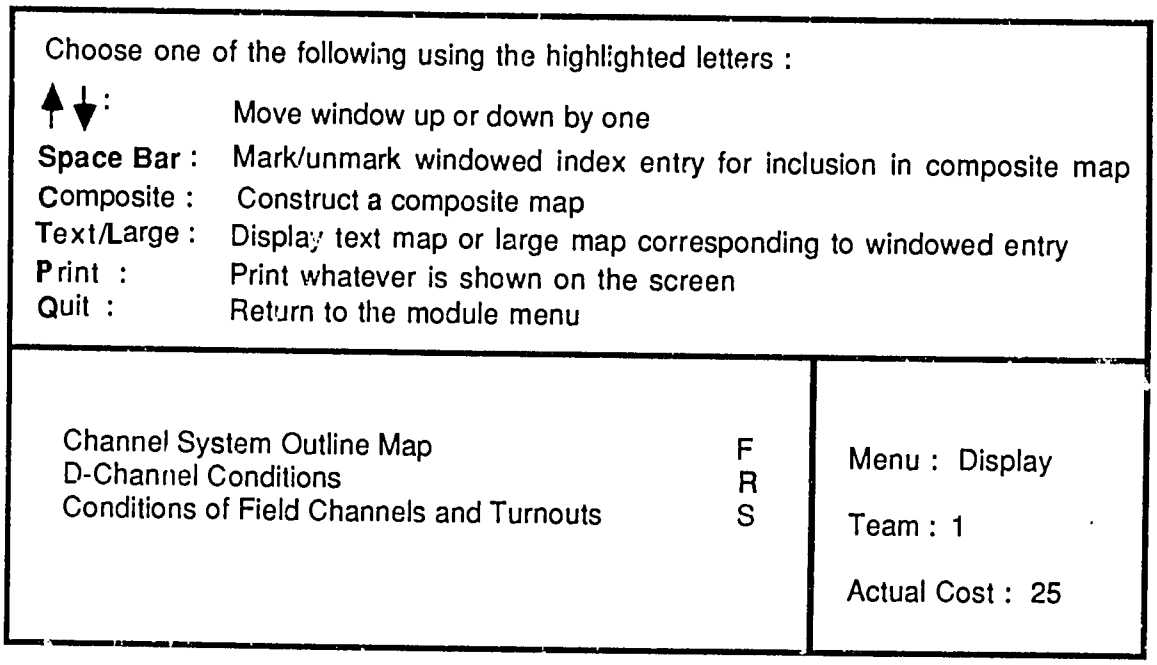

Figure 7. Information Acquisition Module Display Mode Screen

Maps

There are several points which should be understood with regard to the REHAB maps. The same maps may appear in many IUs. Also, maps included in an IU may be of two types: **conditional** and **unconditional**. Unconditional maps are displayed whenever the IU containing them is

accessed. However, a conditional map is shown only if you have already displayed an IU which contains the *same map* marked as *unconditional*. Thus a map which would not ordinarily be displayed when an IU is accessed will be included as a further visual aid *if* that map has been displayed - and hence paid for - through the accessing of another IU. Note that text information and graphical aids that are part of an IU are always unconditional; they are always displayed when a text map is requested.

Module Menu Commands

At this point it is appropriate to discuss the various menu commands in detail. Let us begin with the commands in the module menu, which is the first menu to appear when the module begins.

Choose

This command causes the module to enter the selection mode. The information selection menu will replace the module menu and seven index entries are written in the index area of the screen. A detailed description of the commands in the information selection menu is found below.

Display

This command causes the module to enter the display mode. The display menu will replace the module menu and the information which has been selected in the information selection mode is grouped in the index area. It is from this point in the module that information is actually displayed. A detailed description of the commands in the information display menu is found below.

Team

This command allows you to select which of four teams will be the active team, i.e. the team which can select, display, retrieve, etc. information. All selections, costs, and all other associated parameters are managed separately for each team and retained internally. Therefore, it is possible to switch from one active team to another and yet allow the originally active team to resume control without having to redo any of its work. Note that information in the status area applies only to the active team.

Save/Retrieve

Save stores the active team's selections on the disk. *Previously saved selections are overwritten and thus lost.* It is *not* necessary to save a team's selections before changing the active team; they are saved internally until the module terminates, i.e. you return to the root menu or leave REHAB altogether. On the other hand, it *is* necessary to Save if a team wishes to retain a set of selections even after the module has terminated. Note that all marked IUs are saved to the disk, regardless of whether they have actually been displayed.

Saved selections can be recalled at any time using Retrieve,which first Unselects (see the discussion of this command below) - unmarking any entries which were marked while in the selection mode - and then marks those entries which correspond to the ones being retrieved.

Unselect

This unselects all of the selections of the active team; all marked entries are unmarked to reflect this fact. Unselect does *not* erase the diskette file containing selections previously stored using Save.

Quit

This command returns you to the REHAB root menu.

Selection Menu Commands

Note that the selection menu is accessed by selecting Choose from the module menu. The selection menu consists of the following commands:

Category

The available information is grouped in four major categories which are listed in the menu area of the screen when this command is invoked. After you select a category, the index area is filled with the first seven index entries in that category and from whatever source has been selected using the Source command. By grouping the index in categories it is easier for you to decide on a set of selections.

Source

Information within the abovementioned categories is available from three different sources: the farmer, a reconnaissance, and a survey. Note that not every index entry can be obtained from all three sources. After selecting one of these sources the index area will be filled with seven new entries from the chosen category and source.

PgUp/PgDn

These keys scroll the entries in the index area, so that a new set of seven entries appears (unless not that many new entries exist!). This is the quickest way to inspect a set of index entries from a given category and source.

Up Arrow/Down Arrow

These keys move the **window** up or down by one. The window is the red-colored rectangle which covers a single index entry at a time and determines which entry can be marked or unmarked.

Space Bar

Pressing the space bar marks the index entry in the window as indicated by the triangular mark which appears to the left of the entry. If the windowed entry has already been marked then this action unmarks the windowed entry and the triangular mark is removed. When the display mode is entered the index entries marked in this manner will be grouped together in the index area so that the IUs corresponding to these entries can be accessed.

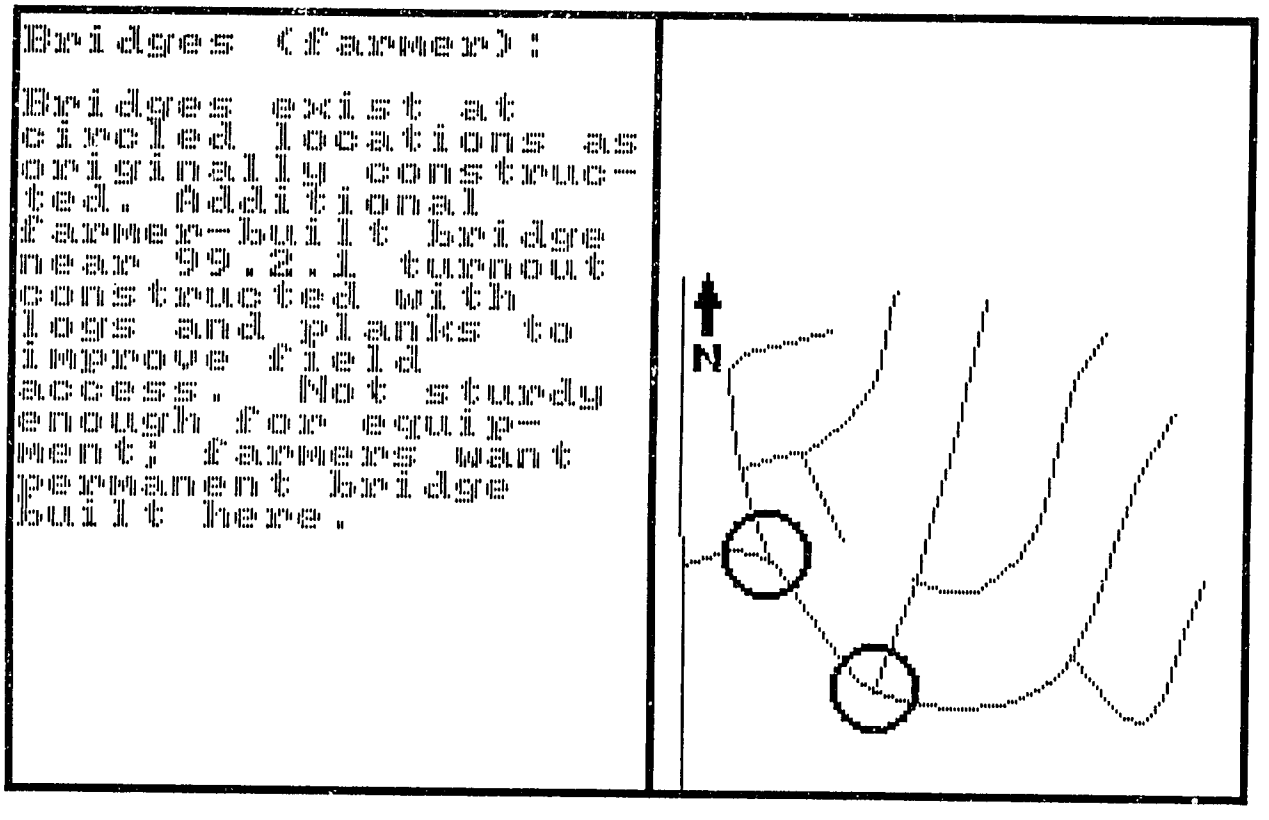

Figure 8. A Text Map

Quit

This command returns you to the module menu.

Display Menu Commands

The following commands are accessed from the display menu:

Up Arrow/Down Arrow

These keys move the window up or down by one. The windowed index entry can be marked/unmarked and the IU corresponding to this entry can be accessed.

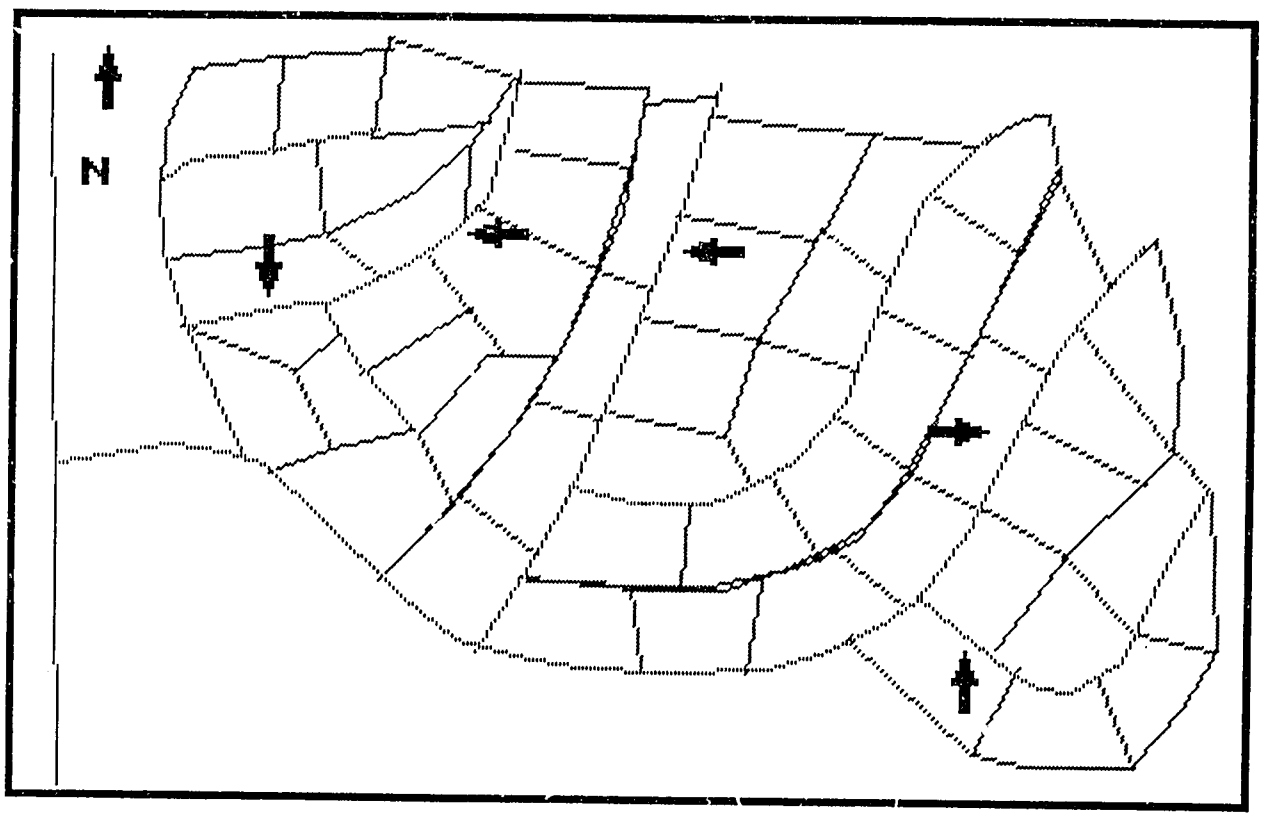

Figure 9. A Large Map

Space Bar

Pressing the space bar writes a triangular mark to the left of the windowed index entry. If the windowed entry has already been marked then this action removes the mark. The purpose of

marking entries in this manner is to permit you to determine which maps will be included in the composite map. See page 36 for a detailed discussion of the composite map.

Composite

This command constructs a composite map based on the set of maps contained in the IUs corresponding to the marked entries. Once the composite map is drawn, pressing any key returns the user to the display menu. The composite map is constructed by inspecting the IUs corresponding to the marked index entries and superimposing on the screen any unconditional maps which appear in those IUs. Conditional maps which have already been seen will also be included. In general, the more marked entries the more costly the composite map. An example of a composite map is shown in Figure 10. For more information, see "The Cost Assessment Protocol For the Composite Map" on page 36.

Text/Large

Both commands access the IU corresponding to the windowed entry. **Text** displays a split graphics screen with the applicable maps drawn on the right and the text on the left (the so-called **text map**). **Large** displays the same maps without text and using the entire screen. Once a large or text map is drawn, pressing any key returns the user to the display menu. Examples of a text map and a large map are shown in Figures 8 and 9. The cost assessment protocol for text maps and large maps is described below.

Print

This command has the same effect as pressing the **PRTSC** key on the keyboard; using this command, any text, maps, lists, etc. being displayed will be printed as they appear on the screen. In order for this to work you must be in the display mode, but it is *not* necessary for the display menu to be present (e.g. a text map could be on the screen). Note that with the current version of the hardcopy routines you must wait for the printer to stop before continuing. For a graphics screen this can take up to three minutes.

Quit

This command returns you to the module menu.

The Cost Assessment Protocol

In order to provide some indication of the relative time and difficulty involved in obtaining various pieces of information, each IU is assigned a "value" (these values denote a relative cost and have no actual monetary significance) which appears to the right of each index entry while in the selection mode.

In the selection mode the status area includes a line which tells you the **potential** cost of all the index entries which have been marked. This value is simply the sum of the values of those entries

which are marked but not paid for; that is, the additional charge which would be assessed if each of the marked entries was actually displayed. It is important to realize that you are *not* charged for selecting an entry (by marking it while in the selection mode), but *are* charged once the IU corresponding to the marked entry is actually displayed. Furthermore, once charged for an IU accessed using the Text or Large commands you are never again charged for the same IU *even if the module or REHAB itself terminates and is restarted.* This is so because a cumulative account of all IUs which have been accessed by each team is stored on the disk; the net effect is that a team cannot be charged twice for accessing the same IU.

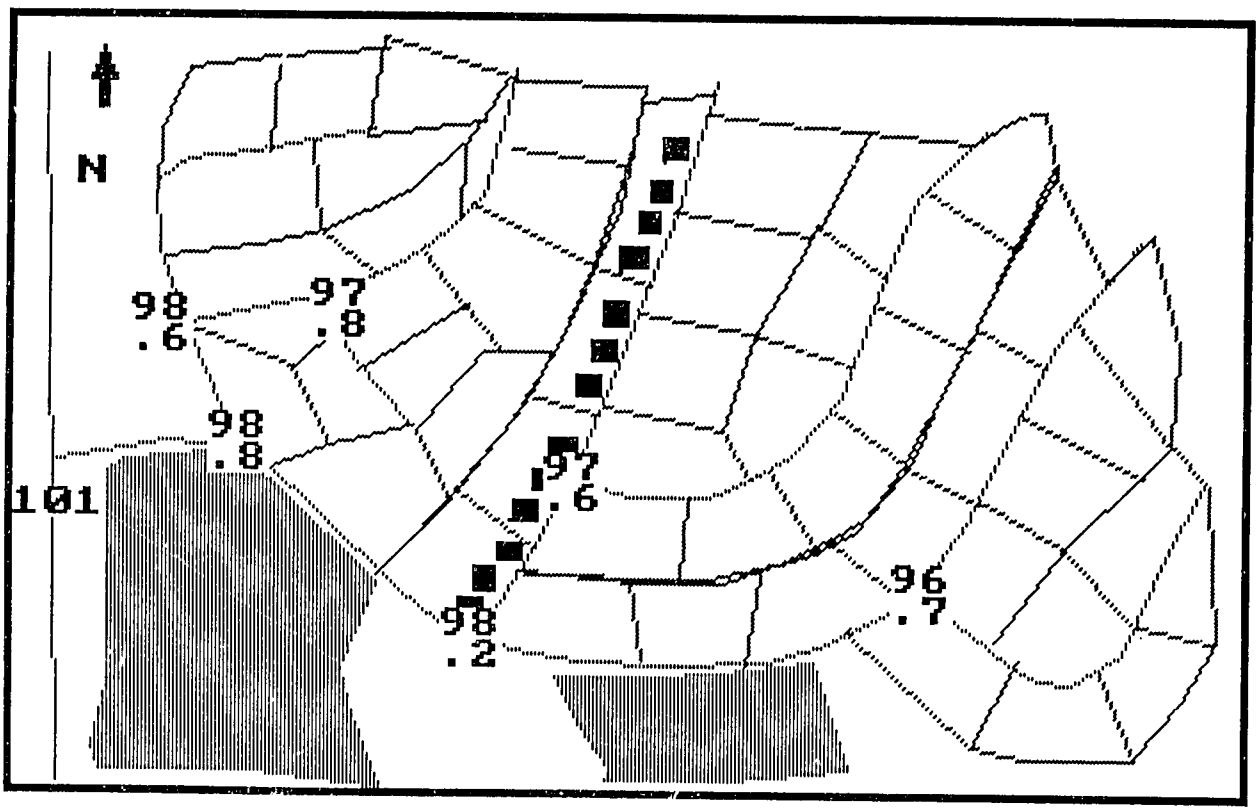

Figure 10. A Composite Map

The **actual cost** which has been assessed based on the IUs actually displayed appears in the status area of the screen while in the display mode. Using the Text or Large commands while in the information display mode will simply add the value of the windowed index entry to this actual cost, but only if it has not already been paid for.

Each team or individual is allowed to spend up to 125 units. After 100 units have been spent, the module issues a warning whenever the user attempts to display information which would increase the participants actual cost. If the user attempts to display information which would cause the actual cost to exceed 125 units, the module will prevent access to this information and display a message.

The Cost Assessment Protocol For the Composite Map

The cost of a composite map is calculated by summing the values of every selected IU which fulfills this condition: at least one of the maps in that IU is an unconditional map which has not been seen previously. The appearance in this IU of a channel system outline map (Figure 1) or farm map (Figure 11) is not considered sufficient to fulfill this condition because both are so basic that their inclusion in the composite map provides too little additional information to warrant charging you for the IU. It is important to note that once you are charged for an IU by virtue of its having met the above condition, then as would be expected, subsequent access using Text, Large, or Composite is free of charge.

Cost Clearing

The only exception to these cost assessment protocols is that it is possible to clear all parameters pertaining to a team's accumulated actual cost using a "hidden" command. Note the following:

1. This command can only be accessed from the module menu.
2. The command is a **Z** (for Zero) followed by a 1, 2, 3 or 4; e.g. **Z3** clears the costs for team #3.
3. If **ZA** (Zero All) is entered, then the costs for all teams are cleared.
4. This command does not appear on any of the menus, thus it is a hidden command.
5. The effects are irreversible!

In general, this command should only be used when an entirely new REHAB session is being started and you are therefore justified in clearing all of the parameters.

The On-Line Help System

Help files are provided as a convenient supplement to this documentation. Though the help command does not appear on any of the menus, in fact, help may be obtained from any point in the module except when the screen is in the graphics mode (when maps are being displayed). Help can be obtained in one of two ways:

1) Press **H** followed by the highlighted letter of a command which appears in the menu currently being displayed. This will give you immediate information concerning that command. With this method help may only be obtained for commands appearing in the menus. To return from the help text press any key.

2) Press **HH**, which will display a list of all topics for which help is available. To access any of these topics enter the highlighted letter or press the **ENTER** key to go back to where you left off. Note that some topics are not commands per se (e.g. the discussion of the cost assessment protocol), and can therefore only be accessed using this method. To return from the help text press any key.

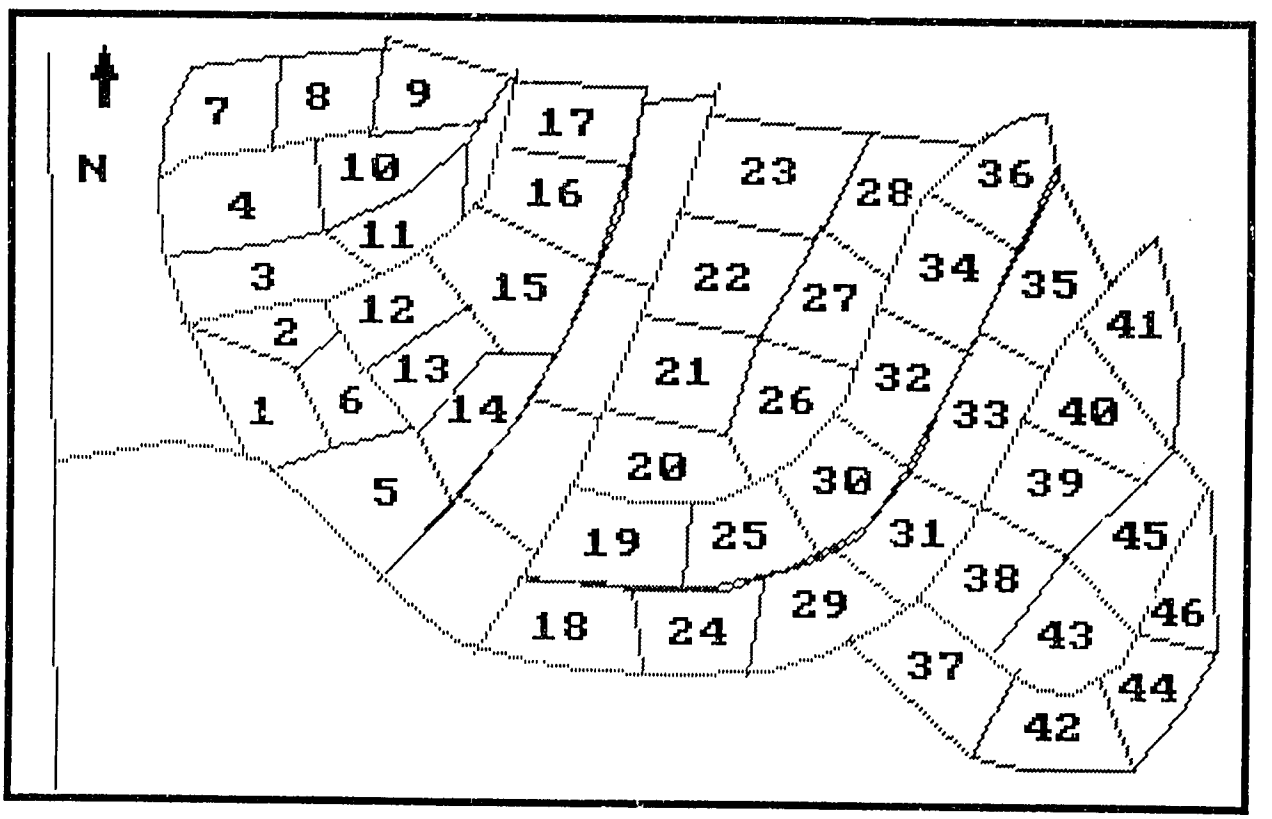

Figure 11. The Farm Map

Error Trapping

In most cases, a user error will not cause the module to terminate; instead, a blinking error message will be displayed in the status area of the screen. The following conditions will invoke these error trapping routines:

1. **Nothing Selected** - An attempt has been made to go into the display mode when nothing has been selected.

2. **Too Many Selections** - A maximum of 14 index entries can be selected at any one time. In order to be able to select the entry which caused the error you must unmark some other entry and then mark the desired entry. Another approach is to select and display a set of entries, Save that set, Unselect, then select and display another set of entries.

3. **Nothing To Save** - An attempt has been made to save a set of selections when no entries have been marked.

4. **Nothing To Retrieve** - An attempt has been made to retrieve a set of selections when no selections were previously saved.

5. **No Marked Entries** - An attempt was made to construct a composite map when no index entries have been marked for inclusion.

6. **Fatal Disk Error** - A non-recoverable disk error has occurred and the module must terminate; ordinarily, this should never occur.

7. **Nothing To Unselect** - An attempt has been made to unselect when there are no marked entries.

Farmer Meeting Module

As discussed in Chapter 2, "Phases Of Play", the purpose of this module is to present you with some number of **viewpoints**; each viewpoint is a paragraph of text which expresses a complaint, concern, inquiry, etc. of a farmer concerning the proposed rehabilitation of AB-99.

When the module begins, the module heading will be displayed and the following prompt will appear

Are you playing as a member of a team (Y/N)?

Enter a **Y** if REHAB is being played in teams or an **N** if it is being used in a standalone mode (pressing the **ENTER** key will have the same effect as pressing **N**). If you answer yes to this prompt then a second prompt will appear

Which team (1-4):

Enter a number between one and four and press **ENTER**. After these two prompts are displayed the screen is cleared and the main section of the module begins.

The first time that this module is used you are presented with a random selection of between 4 and 10 viewpoints which are choosen from a larger set. On subsequent use of this module, users from the *same team* are presented with the *same set* of viewpoints. Even if you are playing in a standalone mode you will still be presented with the same set of viewpoints each time you use this module. The point of this is to ensure that users have access to a strictly limited number of viewpoints and that users from the same team are presented with the same set. The only way to overide this restriction is to use a "hidden" command; note the following:

1. This command is accessed from the menu which appears at the bottom of the screen (bottom of Figure 12).
2. This command is executed by entering a **Z**.
3. This command will cause a new set of viewpoints to be choosen, and this new set will be the one which is presented on subsequent use of the module.
4. This command does not appear on the menu - thus it is a hidden command.
5. The effects are irreversible, i.e. the original set of viewpoints cannot be retrieved!

In general, this overide should only be used when an entirely new REHAB session is being started and you therefore desire a fresh set of viewpoints.

During the main part of the module (after the two initial prompts) the randomly chosen set of viewpoints is displayed one at a time, on command (see Figure 12). The viewpoints are displayed in the large middle section of the screen and are double spaced if there is sufficient room. The command menu appears at the bottom of the screen and provides the means by which you control the accessing and printing of the viewpoints. The menu commands are discussed in detail below.

In addition to the command menu the bottom of the screen has two status areas - at the far left and the far right. The two numbers in the status area at the far right tell you how many viewpoints are in your set and which viewpoint from that set is currently on the screen. For example, if this status area looks as follows

2 of 7

then there are a total of seven viewpoints in your set and the second one from that set is currently showing.

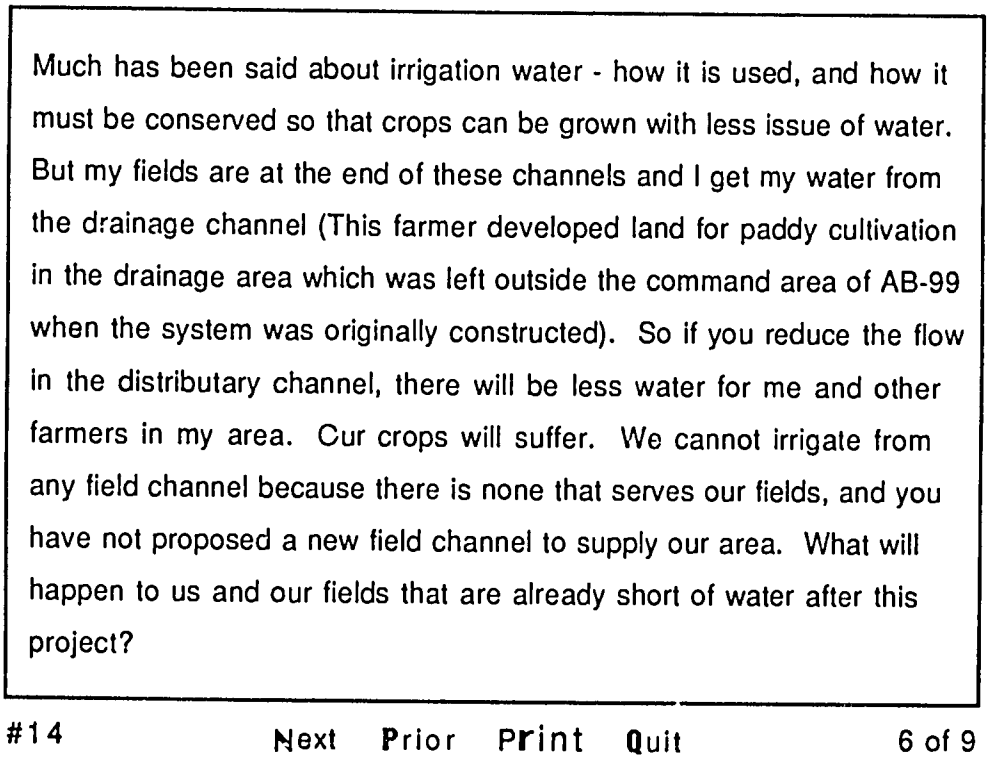

Figure 12. Farmer Meeting Module Screen

The number in the far left status area is simply the position of the currently displayed viewpoint in the complete sequence of viewpoints contained in the viewpoint file on the diskette. This number is primarily for reference purposes.

The Menu Commands

There are four commands, all of which are issued by pressing the highlighted letter in the command:

Next

This command causes the next viewpoint in the set to be displayed in place of the one which is currently showing. Note that if the last viewpoint in the set is showing then Next causes the first viewpoint to be displayed; thus, using Next, you can continuously cycle forwards through the set.

Prior

This command causes the displayed viewpoint to be replaced by the prior one. Note that if the first viewpoint in the set is showing then Prior causes the last viewpoint to be displayed; thus, using Prior you can continuously cycle backwards through the set.

Print

This command prints the viewpoint which is currently showing. Printing a viewpoint in this manner takes about 20 seconds depending on the printer which is attached. Note that you must wait for the printer to stop before continuing.

Quit

This command exits the Farmer Meeting Module and returns you to the root menu (Figure 2).

Appendix A. Using REHAB With The Relay Adapter Card

One of the more innovative features of IRRIGATION REHAB is its ability to automatically access slides when used in conjunction with the Relay Adapter Card (RAC). Many of the social and technical aspects of irrigation systems and their associated communities cannot be adequately conveyed using maps and textual information alone. In many such cases the use of slides is essential if one is to form the appropriate mental images; thus, a special slide set is included with REHAB. In addition, an optional plug-in adapter card is available which has the ability to control most commercially available slide projectors (the card can be configured to control any slide projector which has a remote control capability - that is, most of the projectors produced in the last twenty years) and software has been written which can randomly access any slide and even allows you to focus the projector from the keyboard (this is only possible when the projector has a remote focusing capability). The slide access process is completely automated so that, for example, you are freed from having to locate the particular slide meant to accompany a map or text. Note that the RAC and a companion set of software utilities can be purchased seperately from REHAB. For detailed information on the RAC and these utilities refer to the User's Manual which came with the card.

Note: In version 1.0 of REHAB only the Environment Description Module has the ability to access the REHAB slide set automatically. Subsequent versions of REHAB will most likely incorporate this ability into the Information Acquisition Module, so that slides could accompany the information provided by that module.

If you have purchased the RAC then you should complete the following steps in order to configure REHAB properly for use with the card:

1. If you have not already done so, install the RAC in your computer as described in the section of the RAC User's Manual, "Installing the Relay Adapter Card".

2. If you have not already done so, follow the step-by-step procedure in the section of the RAC User's Manual, "Preparing the RAC Utilities Diskette For Use".

3. Use Table 2 in the RAC User's Manual to determine the features of the slide projector you plan to use with REHAB, and determine which of these features can *actually be used*, again using Table 2. Make a note of these features.

4. Read the short section, "PROJECTR in Detail" in the RAC User's Manual in order to familiarize yourself with the operation of the PROJECTR program. This program performs all of the necessary functions (and more!) for getting your slide projector to work with REHAB.

5. The PROJECTR program is on the RAC Utilities diskette included with the RAC. At this point, you should start the PROJECTR program as follows:

Single and Dual Diskette Systems

a) Insert the RAC Utilities diskette in drive A.

b) Type **PROJECTR**. When the logo finishes executing the following message will appear

Perform a comprehensive configuration (Y/N)?

Type **Y** in response.

Hard Disk Systems

a) Go into the RAC Utilities subdirectory you created during the RAC Utilities preparation procedure (step 2 above) by typing

CHDIR \RAC

b) Start the program by typing **PROJECTR**. When the logo finishes executing the following message will appear

Perform a comprehensive configuration (Y/N)?

Type **Y** in response.

6. As described in the operating instructions for PROJECTR, this comprehensive configuration process entails answering a series of yes/no questions starting with

Do you wish to allow the projector to be accessed (Y/N)?

Answer all of these questions based on the features you determined were available in step 3. Incidentally, it is not necessary for slides to be in the slide tray during the configuration process.

7. After you have answered these questions the program will proceed to adjust the various parameters which enable the RAC to access slides correctly. At various points in this process you will be asked

WHICH SLIDE IS CURRENTLY BEING ACCESSED:

Determine the number on the slide tray which corresponds to the tray slot which is being accessed. Type in this number and press **ENTER**.

8. When the comprehensive configuration is complete you will be returned to DOS, and a small file will have been created on the RAC Utilities diskette called CONFIG.PRJ. This file contains all of the parameters required by REHAB to access slides correctly. CONFIG.PRJ must be on the same disk and in the same subdirectory as the REHAB files,

otherwise, REHAB will not be able to read the parameters contained in CONFIG.PRJ and will assume that you do not wish to access slides; the menus and operation of REHAB will be changed accordingly. Therefore, you must copy the file CONFIG.PRJ as follows:

Single Diskette Systems

a) Insert the RAC Utilities diskette in the diskette drive.

b) Type **COPY CONFIG.PRJ B:**

c) When prompted, insert the REHAB diskette in the diskette drive.

Dual Diskette Systems

a) Insert the RAC Utilties diskette in drive A.

b) Insert the REHAB diskette in drive B.

c) Type **COPY CONFIG.PRJ B:**

Hard Disk Systems

a) Type **COPY CONFIG.PRJ \REHAB**

9. At this point, you should load the REHAB slide set into the slide tray. The slides are numbered and must be loaded into the corresponding slots in the slide tray; otherwise, REHAB will not access the correct slides.

10. REHAB is now properly configured for use with the RAC. The REHAB slide set will be accessed automatically!

Important: This comprehensive configuration process must be repeated each time you change projectors, *even if you change to a projector with the same model number as the one you have been using.*

Appendix B. REHAB Start-Up Options

It is possible to control certain general characteristics of REHAB by including the appropriate options when you start the program. One start-up option has already been mentioned in the REHAB Start-Up Procedure on page 21; by typing **REHAB LOGO** when you restart the program, REHAB will execute the logo even though the computer has not been turned off. Following is a summary of the start-up options:

REHAB

Starting the program without using any options can have two possible effects: If the computer was turned on immediately prior to start-up then the default condition is in effect; that is, 1) the logo is executed (if your display adapter has a graphics capability) and 2) the program operates in the fast mode (see below). On the other hand, if the program is being restarted without having turned the computer off, then 1) the logo is *not* executed and 2) the program will operate in whatever display mode was in effect the last time the program was started.

REHAB LOGO

In this case, the logo will execute regardless of whether the computer has been turned off or not. As with all of the REHAB start-up options, the option (in this case, logo) can be typed in either lower case or upper case letters. Furthermore, spaces or other extraneous characters are permitted. The only requirement is that their be *at least* one space between the word **REHAB** and the option. Thus, all of the following are valid uses of the logo option and have the same effect:

REHAB logo
rehab LoGo
ReHAb xyzLOGOabc
ReHaB junk and lOgO more of it

REHAB NOLOGO

This option is used to prevent the logo from running when the program is started immediately after the computer has been turned on.

REHAB SLOW

This causes the program to enter the slow (flicker-free) mode. If REHAB is exited and subsequently restarted without turning off the computer, the program will continue to operate in the slow mode *unless* the program is restarted using the fast option (see below).

REHAB FAST

This causes the program to enter the fast mode. If REHAB is exited and subsequently restarted without turning off the computer, the program will continue to operate in the fast mode *unless* the program is restarted using the slow option.

The fast/slow start-up options control the display writing speed of REHAB; the program operates in both a **fast mode** and a **slow mode**. Why is it necessary to provide the ability to slow down the display writing speed when everyone agrees that snappy display writing makes a program more pleasant to use? This option must be included because certain types of display adapters (the plug-in cards which control the display) will **flicker** when high-speed display writing techniques are used. Flicker is a regrettable phenomenon which is characterized by small white specks called **snow** which appear on the screen whenever extensive changes are made to the image displayed on the screen. Specifically, the IBM Color Graphics Adapter exhibits flicker, while the Enhanced Graphics Adapter does not. Other, compatible display adapters may or may not flicker. While many users find the snow to be tolerable (particularly if it has never been pointed out to them!) others do not. Therefore, REHAB has been provided with the ability to operate in a flicker-free mode; unfortunately, eliminating the snow causes the display writing to be significantly slower.

To determine the most satisfactory display writing mode the user might want to try both of them and decide for him/herself. If your display adapter does not exhibit flicker then of course you should always use REHAB in the fast (default) mode.

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