SYSTEM REQUIREMENTS AND EXTERNAL DESIGN

for the

CACEN INFORMATION SYSTEM

Technical Assistance to CACEN
Contract #511-0582-C-00-4216-00
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by

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I. EXECUTIVE SUMMARY: CONCLUSIONS AND RECOMMENDATIONS

A. CACEN

1. The rapid changes in the financial and economic environment of Bolivia -- in combination with the greater transactions volumes that can be expected as a result of the new decrees, the increased number of account types and prospective infusions of capital -- impose significant new risks and program requirements on the Bolivian Savings and Loan system. It is important that CACEN improve its information system capabilities to better carry out its supervisory and programming responsibilities.

2. I do not believe that it is feasible to attempt to serve the computer needs of the Mutual La Primera, Mutual La Paz and CACEN with the same equipment. The only system that would currently be capable of meeting the needs of all three of the institutions is too expensive for the financial capabilities of the institutions.

3. CACEN should take immediate steps to develop an information system that is capable of supporting its managerial and operational responsibilities.

4. The information system for CACEN should be developed in accordance with the long-range architecture described in Parts III and IV of this report. The initial systems and subsystems should be implemented in stages, as follows:

    a. Planning System
        * Regulations Subsystem
        * Savings and Loan Program Subsystem
        * Planning and Forecasting Subsystem

    b. Operations System
        * Inventory Subsystem
        * Project Management Subsystem

    c. Accounting System
        * Loans Receivable Subsystem
        * Loans Payable Subsystem
        * Basic Accounting Subsystem

    d. Insurance System
        * Insurance Inventory Subsystem
        * Insurance Accounting Subsystem

5. Of the computer equipment available in Bolivia, the information system for CACEN should be installed on a Motorola 68000-based "SuperMicro" Computer, with an eventual capacity of 10 terminals, 1.5-2 megabytes of main memory, cartridge tape backup and 40-100 megabytes of hard disk storage. The initial configuration should have a minimum of 5 terminals, 1 megabyte of main memory, cartridge tape backup, 45-50 megabytes of hard disk storage and one letter quality printer. The existing dot matrix printers should be connected via microbuffers.

6. All things being equal, UNIX should be the operating system for the computer installation. It has become the de facto standard operating system in microcomputers of this size, and while there may be advantages to proprietary operating systems, there is generally a greater advantage in following standards that are widely used in other installations. there may, however, be sufficient justification for use of a different operating system.

7. Minimum package software requirements for the system are: (a) a relational data base management system capable of handling several hundred variables efficiently, a spreadsheet program and a word processor. Graphics is desirable, but not essential. Most applications, with the possible exception of accounting, can be easily developed from this software base.

8. Custom software interfaces will have to be developed for each application. Specialized programs and application packages should be developed by a local software company. Initial reports and data base applications should also be developed by a local software company, but only in the process of training CACEN staff to extend those capabilities in the future without further assistance.

9. All application programs and source codes should be the property of CACEN.

10. Of the three Motorola 68000-based microcomputers available in Bolivia, one (NEC) is of Japanese manufacture and not eligible for A.I.D. financing. Of the remaining two (NCR Tower and Pertec 3200), I strongly recommend sole-source selection of the Pertec 3200 for the following reasons:

    * Number of installations in country. The Pertec is installed in 7 institutions, with pending orders for 3 additional units. The NCR Tower is installed in 1 institution with no current orders.

    * Repairs. The Pertec distributor maintains one spare unit for each three installed, and has a spare parts inventory beyond that. The NCR Tower distributor had no additional units in country, and no plans to import additional units, other than a demonstrator model, without purchase commitments.

    * Past experience with vendor support. The Mutual La Promotora has been very satisfied with vendor support from the Pertec vendor. Mutual Guapay and Mutual El Progreso have not been satisfied with vendor support from NCR.

* Vendor stability. NCR is abandoning Bolivia, leaving future support to a local distributorship, which has not yet been legalized. The Pertec vendor appears stable.

* Compatibility with other installations in the system. The Pertec would be compatible with one unit that is now installed. The NCR Tower would represent a new line of equipment in the system. Other mutuals in the system that are contemplating acquiring or changing systems should be encouraged to purchase the Pertec system, leading to further compatibility. There is no Spanish-language savings and loan package available for the NCR Tower.

* Cost. The proposed first-phase Pertec hardware configuration for CACEN would cost between $4,000 and $6,000 less than the equivalent NCR Tower configuration.

For these reasons the Pertec selection could be justified for sole-source selection under A.I.D. procurement regulations.

11. Before installing any system CACEN needs to take preliminary steps to revise and formally publish new charts of accounts for the associations (mutuals) and CACEN itself. Furthermore, CACEN needs to carefully review the contents of this report, and make any additions, modifications or deletions (as necessary) to reflect current views.

12. CACEN needs to name one person to be responsible for managing the system installation. This person would be the principal contact for the local vendor, and would be in charge of assuring the development of the system along the lines specified in this report. In addition, CACEN needs a permanent system administrator. This does not have to be a full time position, but there clearly needs to be at least one person knowledgeable about and responsible for all aspects of the system. Finally, CACEN may need to employ one or more data entry clerks if date entry cannot be automated, and if data entry volumes require it.

13. The new system will be a complex system, requiring trained personnel in several areas. At a minimum, the following training is necessary:

* Systems Administration. At least two people need to be trained in operating the system (e.g., turning it on and off, backing up files, establishing user codes and permissions, establishing security, creating and deleting files, etc.) This can (and should be) provided initially by the vendor. If UNIX is the operating system this initial training could be followed by specific advanced UNIX training of one or two weeks in Puerto Rico or the U.S.

* Data Base Management. At least two people should be thoroughly trained in the data base management system that is used. This should be provided by the vendor. Additional training for advanced data base techniques might be scheduled for one person through participant training.

* Advanced Spreadsheet Techniques. In addition to learning how to use the spreadsheet package selected for the system, at least one person should receive additional training in designing and using advanced spreadsheet techniques for that package. This could be a one-week training course in Puerto Rico or the United States, followed by a mandatory one-week period in La Paz training the rest of the staff that use spreadsheets.

* Word Processing. At least two secretaries and one professional need to receive at least a one-week intensive introduction to the word processing system. Learning beyond that can be achieved "on-the-job."

B. MUTUAL LA PRIMERA

1. Of the three systems available for the Mutual La Primera, I strongly recommend that they first explore the alternative of installing a Partec 3200 system using the program developed for the Mutual La Promotora. Only if this turns out to not be feasible should they continue to explore the other two alternatives.

C. GENERAL

1. CACEN should negotiate with SEINCO, S.R.L. to develop and maintain a single savings and loan package for the system. Any mutual that wants to automate should be encouraged to purchase this system, and any association that wants to exchange its equipment for this system should be encouraged to do so. The long-range goal of the system should be to have all mutuals on a single system.

2. CACEN should arrange a round-table discussion on data processing for the associations, involving the general managers of each association, to discuss data processing issues and experiences and establish a long-range data processing strategy for the system as a whole.

II. INTRODUCTION

Several important changes have occurred in the Bolivian savings and loan system that both increase the need for and the potential demands on automated information system support to the movement. Among these are the continued high rate of inflation in the country, the new requirements for calculating interest monthly, and the shift in the portfolio from long-term mortgage-secured real estate lending to short-term non-mortgage-backed home improvement and consumer lending, with the resulting larger number of loans and more rapid turnover in funds. Rapid changes and an increasing transaction velocity greatly increase the amount of risk inherent in the operations of the associations. The major benefit of automated support is that it can help monitor potential problem areas with up-to-date information and help the savings and loan system identify and react quickly to potential problems.

The need for computer systems to support CACEN operations has also increased during the past several months. In the near future CACEN will be implementing a loan portfolio of as much as US$30 million, with programs in water and sanitation, rural housing, savings mobilization, short-term credit and new housing programs. Monitoring those programs in the unstable economic and financial environment that Bolivia finds itself in today will be a major operation. Adequate information system support is essential for CACEN to perform this role effectively.

An information system review that was conducted in February 1985 identified five major systems that would constitute a comprehensive, integrated information system for CACEN:

1. Planning System: the data and programs necessary to analyze the status, trends, market position, competitiveness and liquidity of of the savings and loan system, and to use this analysis to forecast and plan future strategies and programs.

2. Accounting and Administrative System: the data and programs for maintaining the accounting, fixed asset inventory, check writing, loans and collections of CACEN.

3. Insurance System: to integrate the now separate processes of issuing policies and accounting for the insurance program.

4. Personnel Management System: to support all aspects of the personnel system, including personnel data, time card control, vacation, sick leave and other benefits, and payroll.

5. Project Management System: to track major projects, such as the water and sanitation and rural housing development program. It would include an inventory control program.

At the time of the earlier report it was recommended that the system be implemented in the order listed above, with the project management system to be developed only if the projects were approved, and the personnel system deferred until the other priority areas have been developed. Now that the water and sanitation program has been approved by USAID/Bolivia and the GOB, the project management assumes a higher priority, and should be the second or third system developed.

III. OVERVIEW

A. System Architecture

The long-range information system architecture for CACEN consists of five major systems:

Planning System
Operations System
Accounting and Administrative System
Insurance System
Personnel System

While these systems correspond to the major functional responsibilities of CACEN, they are organized along information lines rather than the organizational structure of CACEN. As a result, they are designed to support the long range functions of CACEN rather than any particular organizational structure, and should be able to survive any internal reorganizations.

Each of the major systems is made up of subsystems, which organize the data and applications along more narrowly defined functional lines. The major subsystems identified for each system are:

Planning System
- Regulatory Subsystem
- Planning and Forecasting Subsystem
- Savings and Loan Program Subsystem

Operations System
- Project Management Subsystem
- Inventory Subsystem

Accounting System
- Basic Accounting Subsystem
- Fixed Assets Subsystem
- Loans Subsystem (Receivables and Payables)
- Check Writing Subsystem
- Supplies Inventory Subsystem

Insurance System
- Policy Inventory Subsystem
- Insurance Accounting Subsystem

Personnel System
- (Subsystems not Developed Because of Low Priority)

B. Basic System Design

Since CACEN works with a limited number of associations, and since all departments in CACEN deal with those same clients from different perspectives, the uses of data and information are highly interrelated. As examples:

* The accounting system depends on data generated by the insurance and operations departments.

* The savings subsystem depends on data generated by the regulatory subsystem.

* The planning system requires data generated by the accounting system, especially in terms of the monthly CACEN budgets and status of loans payable and loans receivable.

* The accounting system depends on data generated by the insurance and operations departments.

* The savings subsystem depends on data generated by the regulatory subsystem.

What these indicate is that date have multiple uses in CACEN, and the system must be designed to allow that multiple use without having to reenter or copy data from one file or diskette to another. Shared data must be available to all users at all times. As a result, the CACEN information system should be designed as an integrated data base, with a shared processor, a centrally administered data base system, and multiple user terminals sharing data and files.

C. Essential System Components

The CACEN information system requires a central, shared processor computer system capable of performing at acceptable response rates with 10 to 12 user terminals. It must have a powerful (but easily maintained) operating system, adequate provisions for security, backup and recovery, and capabilities for networking and remote communications. It should also admit standard TTY terminals and support parallel interface printers, either directly or through a microbuffer.

Minimum software requirements for the CACEN system include a powerful data base or data file management program, spreadsheet program, word processing (with Spanish font and spelling checker), and monochrome graphics. Most,

if not all, of the applications envisioned for CACEN can be developed with this software base.

Additional, specialized application program packages in accounting, inventory management and project management are desirable but not essential. These applications can be developed locally.

D. Operating System Considerations

All other things being equal, UNIX should be selected as the operating system for the CACEN information. UNIX has become the de facto standard operating system for computers of this size. What other operating systems gain in terms of speed and performance is usually offset by the absence of generalized software and the increased risk of single vendor support.

UNIX does have some distinct disadvantages, however, and in the context of the Bolivian environment these may outweigh the other advantages to using UNIX as an operating system. UNIX requires a large disk storage capability for the operating system itself -- some 9 megabytes of hard disk storage are used by the operating system alone. UNIX also requires a large share of main memory, which slows processing speeds. Perhaps more important is that UNIX I/O drivers (according to the U.S. Pertec representative) are very slow and limiting, resulting in significant degradation in response time with as few as four to six terminals on the system. This could be a major factor in the CACEN system.

Proprietary operating systems generally offer improved performance at the expense of flexibility and standardization. One of the major benefits of the Pertec OS/3200 is that it allows word processing and spreadsheet applications to be downloaded into intelligent terminals, thus freeing the main processor for other applications. Since word processing is a notorious drain on CPU resources, this capability can significantly enhance system performance. UNIX lacks this capability.

I am not in a position at this time to provide a definite recommendation on the operating system for the CACEN information system. Evaluating the alternatives and the implications of each for the CACEN system will require additional research and extensive conversations with the Pertec vendor. This would best be accomplished by CACEN staff.

Some basic comparisons of software available under the Pertec OS/3200 and UNIX operating systems can be seen in the table on the following page. I have included literature on some of these software products; the local Pertec representantive should be able to provide additional information and assist in evaluating the alternatives.

Software	OS/3200	UNIX
Data Base Management	IDOL	UNIFY INGRES
Word Processing	WORDSTAR PALENTIR (Both have Spanish)	CRYSTAL WRITER HANDLE (Neither has Spanish)
Spreadsheet	Included (?)	HANDLE
Graphics	Included (?)	Available

E. A Staged Approach to Building the Information System

Although this report attempts to lay out the entire architecture for those elements that have been analyzed, it must be noted that an entire system cannot be developed and implemented at one time. It is important to begin with one system, develop that, and then proceed with a second system, and so on. With this in mind, the proposed order of system development is as follows:

1. Planning System
   * Regulatory Subsystem
   * Savings and Loan Program Subsystem
   * Planning and Forecasting Subsystem

2. Operations System
   * Inventory Subsystem
   * Project Management Subsystem

3. Accounting System
   * Loans Receivable Subsystem
   * Loans Payable Subsystem
   * Basic Accounting Subsystem

4. Insurance System
   * Insurance Inventory Subsystem
   * Insurance Accounting Subsystem

Only when these systems and subsystems are in place should CACEN attempt to develop the remaining system and subsystems.

IV. SYSTEM AND SUBSYSTEM DESCRIPTIONS

This section provides a description of the logical (or external) design of each of each of the major systems and subsystems, showing the various programs, outputs and reports required to support each subsystem. It does not attempt to present the internal system design because that depends on the particular computer system and software that are selected.

A. The Planning System.

The Planning System is the major system for CACEN, as all of the regulatory and developmental work of CACEN depend directly on data from the Planning System. As a result, this is the system that should be developed first.

1. Characteristics of the Planning System.

The Planning System should be developed as a single, integrated data base and set of applications. It should be designed so that all data needed to support any of the planning, forecasting, cash flow modeling, reporting, analysis and other research are entered and stored only once on the system. Any application using data for any of the above purposes should be designed to draw that data from the data base, so that only current, accurate and consistent data will be used for all purposes. Specific applications will need to use subsets and altered subsets of the data -- consisting of specific fields or specific records -- and must be able to quickly and easily create those subsets. The actual physical data base can be designed in any rational fashion, as long as it meets these criteria.

2. Major Subsystems

The planning system consists of three major subsystems: (a) the regulatory subsystem, which analyses monthly and other data on the associations (mutuals) to monitor growth, performance, and compliance with government regulations; (b) the planning and forecasting subsystem, which uses the data on the associations, plus other macroeconomic data, to forecast trends, interest rates, cash flows, liquidity requirements, and external capital needs; and (c) the savings and loan subsystem, which monitors savings and loan growth in the system, market share and market trends, and the results of specific savings and loan incentive programs.

3. Basic Software

The Planning System requires a modern, integrated data base management, spreadsheet and report generation program. A graphics program might also be included. The term "integrated" should not be misconstrued; the program does not have to be supplied by a single vendor or package, but it may very well be. What is important is that the data base management system be capable of producing temporary files that can be utilized directly by spreadsheet and other applications. Other required characteristics of the data base management program include:

* capable of handling a large number of records quickly and efficiently (up to 100,000 records in the case of the insurance system);

* multi-tasking, that is, it must allow different users to simultaneously perform different applications on the same file, or access different files for different applications;

* capable of handling a large number of fields for a given record (although the monthly planning data can be divided among files, it would best be designed as a single data base with between xxx600 and 700 fields);

* protection against unauthorized alteration of the data base;

* capable of organizing the large volume of data efficiently and effectively, either through relational files or other techniques. (Many applications may require data to be assembled from multiple physical files.);

* allow users to quickly and easily develop query, search, select, reporting and temporary file creation applications.

The spreadsheet program must be capable of using data files created by the data base management system (or other application program) or original data input by the user. It should be capable of adding spreadsheets to produce consolidated totals from a series of individual spreadsheets.

The report generator program should permit users to easily create new report programs and store those for later use.

4. Access to Planning System Data

Many users will have need to access Planning System data. It is important that use of the data is facilitated by the system, but that the integrity of the data is ensured by appropriate programming techniques. Entry and editing (or modification) of data base items should be restricted to a limited number of users and application programs, and should be protected by adequate security mechanisms. There is no need to restrict use of the data to any authorized user of the system. Any legitimate user should be able to access, extract subsets of and create new temporary files from data in

the Planning System, but none of these uses should permit alteration of the data base itself.

5. Security

As outlined above, security for this system needs to protect against accidental (or deliberate) destruction or erroneous modification of the data base. Programs which serve to enter or edit data should be restricted to a limited subset of users and have adequate protection against errors. Application programs should prohibit any modification of the data base.

6. Backup

This system will have large volumes of stored data. Backup on floppy disks or cassette tapes or other appropriate medium should be a standard operating procedure. Backups should be made each month, after the new month's data has been entered. The system should probably use a three or four tape (or floppy) backup system to prevent accidental overwrite of the most recent backup copy.

7. Programming Requirements

Programming requirements for the planning system can be divided into three major categories: input and editing, intermediate, and output generation.

a. Input and Editing Programs. There must be a data entry and editing program for each data set. Entry and editing programs should be restricted to certain users or protected by password. Data validation may be incorporated into the entry programs, but this will generally slow down data entry. Entry programs should be screen oriented, user friendly systems, with complete help instructions and error recognition and correction facilities.

b. Intermediate Programs. Intermediate programs are those which work on the data to produce intermediate outputs which are then used for other applications.

Data Validation. There should be programs to test the validity of all data in the system. Basic comparisons of ratios, acceptable ranges and values, plus checks on addition and partial sums should be used to validate the data after it is entered.

Select, Sort and Merge. The system must have powerful select, sort and merge programs which allow users to extract data subsets and create temporary data files to use in particular report preparation and analyses. These programs must be capable of selecting individual data fields from several files and merging them into a file. These programs should be sufficiently flexible and easy to use that

individual users can perform the required steps easily. At the same time, procedures which are used repeatedly, such as for regular reports, should be specifically programmed and made available to the users via menus.

Data Reorganization. Many applications required the data in a form in which it is not stored in the data base. The user, either through established, menu driven programs, or on an ad hoc basis, must be able to organize data extracted from the data base in whatever form is most appropriate for further use. Unfortunately, the one language that is best suited for that purpose, APL, is probably not practical because of the absence of knowledgeable programmers in Bolivia.

c. Output Programs. These are the report generating programs that will produce tables, charts, spreadsheets and the like. As in the case of the intermediate programs, there will be a need for both ad hoc, user created applications and repetitive, standard reports. Both will have to make use of the intermediate programs. Repetitive, standard reports should be programmed and made available to the user via a menu driven screen. Output will either be in the form of printed reports or temporary data files.

In almost all cases these programs will have to be written, either by someone within CACEN or by the system vendor or other software supplier. With a good data base management system the basic building blocks for these programs should be readily available and easy to use. Programming will consist of developing a series of stored applications that automate the use of the building blocks.

8. Coding Considerations

The data base management system should be dictionary driven, or have an automated set of field descriptions through which the data base can be easily accessed. Every field will have to be given a name. These should be very short, beginning with an alphabetic character. For example, assets may be named A1 through A59, liabilities L1 through L48, etc. Considerable thought should be given to the naming convention, as once established it will be very difficult to change. The particular convention will depend on the particular hardware and software system selected, and must be addressed during internal design..

9. Regularly Scheduled Outputs

As mentioned earlier, there are three subsystems in the planning system: the monitoring and regulatory subsystem, the planning and forecasting subsystem, and the savings and loan subsystem. Each has very different reporting requirements. the regulatory subsystem will generally produce repetitive, standard reports from data on the associations. These reports

should be pre-programmed and menu-driven so that the user can produce any report merely be selecting the appropriate report. The planning and forecasting system needs to extract data from the data base to use in spreadsheet applications, both repeated spreadsheets and special ad hoc applications. These spreadsheets will have to be designed by CACEN staff. The savings and loan subsystem will produce standardized reports on a regular basis using subsets of the data base. On occasion this subsystem will use spreadsheet programs to further analyze that data.

Specific outputs that the planning system must produce are as follows:

Regulatory Subsystem

A. Monthly Consolidated Balance Sheets. This duplicates a report that is being produced now, with no changes. In addition, however, the user should have the ability to produce comparative balance sheets for a single association (or for the system as a whole) over a period of several months, in both nominal and real (adjusted for inflation) terms, and should be able to specify balance sheets with only the major asset and liability categories. Data should be shown in millions of pesos.

B. Monthly Consolidated Normalized Balance Sheets. The report would be laid out similar to Item A above, except that instead of having actual amounts, each asset and liability item is shown as a percentage of total assets, for each association and for the system as a whole. Again, the user should have the ability to produce this table with only the major categories of assets and liabilities.

C. Absolute and Percent Changes in Balance Sheets. This would report changes in balance sheet items in both absolute and relative amounts between any two or more periods. The user must have the ability to specify which months and how many months to specify, within limits of printed paper width, and whether or not to print the entire balance sheet or only the major categories. In addition, the system must be capable of producing reports in nominal or real (adjusted for inflation) amounts.

D. Monthly Consolidated Financial Statements. As in the case of the balance sheets, this duplicates a report already being prepared. As in the case of the balance sheets, the user should be able to produce a table showing the financial statements of a single association (or a consolidated statement for the system as a whole) over several months, in both real and nominal terms, and should be able to display the entire detailed income/expense statements or only the major categories. CACEN may wish to combine the report that shows only the major categories with the major budget categories to form a single report.

E. Monthly Normalized Consolidated Financial Statements. The same as Item D above, except that data are displayed as a percentage of total income.

F. Changes in Financial Statement Data. The same as Item C above, except that it contains income/expense rather than balance sheet data.

G. Selected Growth Statistics. This will produce a summary report of key indicators showing growth over a user specified time frame. Preliminary categories would be total assets, total savings, total loans outstanding, total income, total expenses, new margin. Others can be added as desired.

The user must have, at the moment of creating the report, the option of producing the report for a selected set of associations, all associations, or only the consolidated statement for the system as a whole. It must also have the capability of producing absolute amount of change, in both nominal and real terms, and the percentage change in both nominal and real terms.

H. Ratio Analysis. This should be a set of three reports. The first would produce a set of standard ratios profitability, operating, efficiency, liquidity, debt, reserve for the associations for the current month. The second should show changes in ratios between any two given time periods, selected by the user at the time of initiating the report. The third should allow the user to print out the ratios for a given association, or for the system as a whole, over a period of months selected by the user.

I. Operating Spread Analysis. As in the case of the other ratios, these reports should allow the user to show the spreads of all associations, and the consolidated for the system as a whole for the current month. It should also allow the user to display changes in the operating spreads of a single association (or the system as a whole) over any selected time frame.

J. Delinquency Analysis. The major delinquency report should display the distribution of delinquency for the individual associations and for the system as a whole. A secondary report should calculated the loss exposure of each association and indicate the effect of exposed risk on the value of the asset portfolio.

K. Portfolio Analysis. This report would compare the maturities and earnings rates on the asset and liability portfolios of the associations. At the present time all loans are short term; in the future the system will have to be able to compare maturities over a longer time frame.

L. Movement of Savings Accounts and Savings Balances. This duplicates forms that are now being kept manually. For each association it would show the number of accounts opened, closed, net number of openings and closing, and active each month, and the amounts of deposits, withdrawals, net increase or decrease and total balance.

M. Loan Activity Report. This report would show, for each association and for the system as a whole, (a) the number of requests for loans received and the amounts of loans requested during the month, (b)

Number and amounts for loans paid off during the month, (c) the amount received for amortization of still active loans, (d) the net increase or decrease in loans outstanding, and the amount of loans outstanding at the end of the month.

Planning and Forecasting Subsystem

It is assumed that all reports generated by this subsystem will be developed and generated by the staff of the Planning Department, using spreadsheet and graphics programs.

Savings and Loan Subsystem.

This subsystem requires 12 reports on a regular basis:

A. Share of Savings Market. This report shows a month to month comparison of savings deposits in the associations to savings deposits in banks. The user must be able to specify, at the time of initiating the report, which months he/she wishes to see data for. Columns in the report consist of (1) date, (2) amount of savings in banks, (3) percent of total savings in banks, (4) amount of savings in associations, (5) percent of total savings in associations, and (6) total savings in both banks and associations. Calculating data for this table requires summing the savings categories in the associations' monthly balance sheet data set and summing the savings data in the banks' monthly data set.

B. Share of Savings Market, by Department. The column layout would be the same as for report A, except that the first column would contain the names of the departments. Data would consist of savings data for the month specified by the user at the time of initiating the report.

C. Share of Savings Market, by Department and Month. this report would have the same column layout as report A, above. It would be for only one department, and would show the change in market share over time in that department. The user should have the option of having the program print several or all departments, one after the other.

D. Share of Savings Market, by Type of Savings. This report would have the same column layout as report A. The body of the report would be subdivided by the months selected by the user. For each month there would be a listing of the deposit types, with data in the numeric columns to show amounts and percentage share of market for banks and the associations.

E. Share of Loan Market. Same as report A above, except loan data instead of savings data.

F. Share of Loan Market, by Department. Same as report B above, except with loan data instead of savings data.

G. Share of Loan Market, by Department and Month. Same as report C above, except with loan data instead of savings data.

H. Distribution of Savings in Savings and Loan System. This table would show the total amount of savings deposits in each association and the percentage this represented of savings and loan system totals for selected months. The number of months would be limited by the print width of the printer.

I. Distribution of Loans in Savings and Loan System. This table would show the total amount of loans outstanding in each association and the percentage this represented of savings and loan system totals for selected months. The number of months would be limited by the print width of the printer.

J. Growth in Savings in Savings and Loan System. This report would show the growth (in amount and percentage terms) in savings in each of the associations and for the system as a whole. The user should be able to specify (a) a certain type or certain subset of savings types, or all savings balances, (b) nominal or real balances, (c) growth index or percent changes from period to period, and (d) the months to be reported in the table.

K. Growth in Loans in the Savings and Loan System. This report would be identical to report J, except that it would contain data on loans rather than savings. Also, it would probably not be necessary to separate out individual loan types.

L. Listing of Indices. The system should be capable of printing out the indices used in the system, identified by month.

B. The Operations System

In the February report it was noted that the Operations Department was responsible for four major projects: (1) water and sanitation, (2) rural development, (3) savings and loan project, and (4) control of disbursements and collections. Integrated information systems do not necessarily follow organizational lines, however. In designing the data base structure the accounting data for the rural development, disbursements and collections projects naturally fall within the context of the accounting system, and were included in the descriptions of that system. Data for the savings and loan promotion project are primarily generated in the planning system, so that aspect was covered in the planning system. This does not imply or recommend changes in organizational structure or responsibilities; it merely organizes the data structures in a rational fashion. An information system designed in this manner can support the existing organizational structure and responsibilities of CACEN.

The operations information system consists of two major subsystems: (a) a project management or monitoring system and (b) an inventory control system for the water and sanitation projects.

1. The Project Management Subsystem

Project management systems can be very complex, detailed programs, tracking the status and cost of every substep down to the most minute detail. On the other hand, they can be very simple listings of scheduled dates and quantities. The objective is to find a system that corresponds to the management interests and responsibilities of

CACEN does not have the direct implementation responsibility for any of the projects that the operations system may be trying to monitor. In all cases CACEN acts as an intermediate lending institution, lending funds to the local association, which then either on-lends the funds or implements the project. The day-to-day management of the projects is not the responsibility or the concern of CACEN. The concerns of CACEN are:

* Are the projects being implemented on schedule?

* Are the projects being implemented within budget?

* Are there any major cost or scheduling problems that may jeopardize CACEN's investment in the project?

The nature of these questions indicates that CACEN does not need an extremely detailed project management system to monitor project status. CACEN needs to monitor projected and actual start and finish dates, projected and actual costs, and some indication of the interim status of the projects, but this does not have to be a highly detailed commercial project management application.

The project management subsystem can be developed as a series of simple spreadsheets or data base management data sets. While the actual layout would depend on whether or not the project had intermediate components that could be tracked separately, the simplest form could be laid out as follows:

Item	Original Estimate (Total)	Actual Status	Percent Completed	Variance from Plans (No/%)	Current Estimate to Complete	Variance From Plans (No/%)
Start Date						
Completion Date						
Total Calendar days						
Cost to Construct						
Quantity to be Built						

If a project has intermediate steps, such as a water project might -- e.g., main artery constructed, primary lines completed, secondary lines completed, houses hooked up -- each of these may take a row of the matrix or spreadsheet, with the data listed above stretched out items above can be measured in terms of meters completed, the latter item in terms of number of hookups completed.

A slightly more complicated version can have intermediate benchmark targets and reports of variance. This could be laid out on a three-month schedule, as are the reporting requirements for A.I.D.

If the system is designed to use a data base application the variances would not be entered into the data base as fields, but would be calculated by the report program. In a spreadsheet program they would have to be established as separate columns in the spreadsheet.

Program Requirements

The major programming requirements of this subsystem are that it must be able to make date calculations (e.g., 1/8/85 - 14/7/85 = 16 days), and it must be able to calculate variances in absolute and percentage terms.

Reports

All reporting from the subsystem will highlight variances between planned and actual status. In the simplest case above, the spreadsheet would itself be the report. More complicated phased projects (or projects with interim benchmark targets) would report the same data in a series of smaller, specific reports.

2. The Inventory Subsystem

The inventory subsystem is designed to keep track of the quantities and current value of materials destined for the water projects. There could be as many as 10 major water and sanitation projects under the program, with approximately 3000 distinct items that will be purchased and warehoused in one of as many as seven separate warehouses. Most of the items for the projects will be purchased one time, at one price, and be exhausted when the project is finished. There will be no reordering of these items unless a mistake was made in planning. Items for home hookups will be subject to reorder. The items will be kept in inventory at their U.S. dollar price, and valued at time they are released to the projects at the current exchange rate. The inventory subsystem must keep track of the items, the quantity of each item, where they are stored, the amount that has been used, the amount remaining, the historical price of each item, the date and value at which they were released from the system, and provide a current pricing based on a revaluation of the prices of

Except for the exchange rate calculation this is a standard inventory program with multiple warehouses. If at all possible, this should be purchased as a package program.

Program Requirements

The major program requirement of the system, other than standard database select, sort, merge and print capabilities, is that it be capable of updating current market value of the products in inventory, based on either a CPI Index or the Peso/Dollar exchange rate. The historical base for each item will be contained in the data base, the current rate will either come from the planning system or be input from the keyboard by the user. The user may wish to calculate and print current prices without updating the data base.

The system must have an easy-to-use data entry and editing program. Reports should be preprogrammed, with the user selecting appropriate output via a menu screen.

Security

The ability to change inventory entries should be limited to a small group of users and should be password protected.

Required Outputs

Outputs from the system consist of (a) ad hoc scans of subsets of the data base, (b) current price quotes on items to be removed from inventory, (c) inventory lists for conducting audits of inventory at the warehouses, and (d) current estimates of the value of the inventory.

A and B. Ad Hoc Scans. the project manager may wish to know the answer to questions such as:

* How much of item X is in inventory in warehouse Y? Or in any warehouse in the system?

* What price should be used for item X today?

These should be menu-driven queries, with the user able to select from a set of predefined questions and from a set of predefined options or parameters.

C. Inventory Lists. The user should be able to request a list of the items that are supposed to be in warehouse X, for the purpose of auditing the warehouse stock. These should be sorted by class of item.

D. Inventory Valuations. The user should be able to update the book value of items in the inventory and print out (either detailed or subtotals) the current valuation of items in the the warehouses.

E. Preparation of inventory Billing for each Project. As the value of the items used is included in the amount of the loan to each association, this system needs to prepare a statement each month of the value of items used, at the exchange rate as of the date of use.

I do not believe that some of the other standard inventory and order entry system capabilities, (such as rate of depletion, economic ordering quantity calculations, and order point calculations) are needed in the CACEN system.

Additional Considerations

1. There must be strict reporting procedures from the warehouses to the data base system for this system to work properly. CACEN will need to develop a set of transaction forms to control the entry and exit of items from the warehouses. These will serve as source documents for entering the inventory data on the system.

2. By adding a field for "Estimated Quantity Needed to Complete the Project," the system can verify that the current stock is sufficient to meet the needs of completing the project. This, however, requires close coordination between the field project manager and the data base, and accurate reporting. There would have to be a special form for submitting information on a regular basis.

C. CACEN Accounting and Administrative System

The CACEN accounting and administrative system consists of six basic subsystems: (1) basic accounting subsystem, (2) fixed assets subsystem, (3) loans subsystem, comprising loans receivable and loans payable, (4) check

writing subsystem, (5) inventory subsystem to cover the purchasing and warehousing of office supplies., and (6) insurance accounting subsystem to account for and clear insurance policies. Not all of these are equally important. First priority should be given to (a) the basic accounting subsystem, (b) the loans receivable subsystem, (c) the loans payable subsystem, and (d) the insurance subsystem. The fixed assets program should be implemented during the third phase of system development, and the other two can be postponed until the basic system is working properly.

1. The Basic Accounting Program

The accounting program needed by CACEN is a standard business oriented accounting program. The only special requirements are that CACEN needs to be able to keep accounting records by source of funds (a Funds Accounting capability) and it needs to be able to do "sub-ledger", or project, accounting. If at all possible this program should be purchased as a package, because there are no unique or unusual features of the accounting needs of the system. If it is not possible to locate a suitable package, in Spanish, then a reputable firm that has demonstrated an ability to program accounting programs should be selected to develop this application for CACEN.

The "catalogo de cuentas" for CACEN currently has 324 line items, but it has not been officially adopted by CACEN. This must be reviewed and approved before computerization starts.

Basic specifications for the accounting system include:

* Must be able to add and delete chart of account line items easily.

* Must be able to dump final balance sheet and income/expense data to the CACEN file in the planning system.

* Must be able to interface with the insurance system, to enter new policies and clear inactive ones.

* Must have funds accounting, so that accounts can be separated out by source of funding.

* Must have project accounting, through sub-ledger accounts or other mechanism, so that accounts can be kept on specific projects -- such as the three planned water projects, the three major insurance programs (by association), and specific rural housing development projects.

. Backup

Transactions for the accounting system need to be backed up at the end of each transaction run. Major accounting files need to be backed up monthly and yearly.

Security and Access

Entry and editing of accounting transactions needs to be a secure operations, limited to a few user codes and password protected. Programs to edit and enter data should be restricted to certain user codes. Review of accounting data -- account status and other -- needs to be available online to the gerencia, president and planning department. These programs should not, however, allow modification of the accounting data.

Output Requirements

The CACEN accounting system requires four types of standard outputs:

1. Standard Accounting Reports. Monthly balance sheet and financial statements, showing monthly and yearly budgets, totals and variances. Monthly trial balances, standard general ledger listings, accounts receivable and accounts payable reports should be a standard component of the basic accounting system.

2. Project Accounting Reports. Each project (the different types of insurance, the various water and sanitation projects and others) should have separate monthly statements.

3. Required Donor Agency Reports. Since many projects implemented by CACEN involve funding provided by external sources, CACEN must be capable of providing financial reports as required by the external agencies.

4. Automated Posting of Monthly Accounting Data to the Planning System. The system should automatically post trial balance and final monthly data to the required file in the planning system.

Estimated Transaction Volumes

The system currently has about 250 transactions per month, but should be planned for 750 to 100 transactions per month.

2. Fixed Assets Program

A fixed asset program is usually a module of an accounting system. If the accounting program purchased or developed for CACEN does not include a fixed assets module, a simplified tracking system can be developed using the data base management system.

Program Requirements

The fixed asset programs have several requirements:

* They must be able to search for items that meet certain specifications, extract those from the data base and present them in a list. For example, the user must be able to get a listing of all fixed assets in the President's Office, or a listing of all chairs owned by CACEN, sorted by department and type.

* There must be easy to use, menu driven input, editing and report programs.

* It should be possible to update the current book value or replacement cost automatically or manually.

* It must have select, sort (with multiple keys) and merge capabilities.

* It must be able to calculate depreciation and book value and post those directly to the accounting subsystem. If it cannot do that, it should at least print out the values in a report so that they may be entered manually.

Backup

Fixed asset records will not change frequently. Backup, therefore, should follow a regular backup schedule.

Security

Only the accounting department should be able to modify fixed asset inventory data. Other departments may have access to the report programs, however.

Output Requirements

Outputs from the fixed asset subsystem consist of (a) screen or printed formated responses to ad hoc inquiries, (b) regular inventory reports of fixed asset items, by department or by class of items, (c) automatic calculation of depreciation and current book value of fixed assets and automatic calculation of current replacement value of fixed assets, (d) listings and a summary report of current book value of fixed assets and listings and a summary report of current replacement value of fixed assets, and (e) direct posting of current book value of assets, current year depreciation and cumulative depreciation to the accounting subsystem. There should be a single master report menu which allows the user to select the type of report he/she wishes to produce. Reports a, b, and d require merging the identification and data files. Report d requires data from the planning system macroeconomic indicator file.

a. Ad Hoc Inquiries. The user should be able to ask "WHERE IS ID# 0123457" and receive a response on the screen (or printed out) of "LARGE WOODEN TABLE IN CONFERENCE ROOM." Another possibility would be "WHAT IS CURRENT BOOK AND REPLACEMENT VALUE OF CLASS# 15?" with the response of "COMPUTER EQUIPMENT: BOOK VALUE = $B12,540,000; REPLACEMENT VALUE = $B70,000,000." These should be parameter driven menu screens, with the user selecting the question he wants to ask from a menu, and then selecting the appropriate limiting parameters.

Questions might be:

WHERE IS
WHERE ARE
HOW MANY
WHAT IS VALUE OF

Limiting parameters would include:

GENERAL CLASS
SPECIFIC CLASS
ID #
BOOK VALUE
REPLACEMENT VALUE
ON SCREEN OR PRINTED?

b. Regular Inventory Reports. These reports will allow the user to scan or print reports on various aspects of the fixed asset inventory file. It should have a general menu which allows the user to first select the type of report desired, and then select the options required.

Report Types

Full Listing, Sorted by Class of Items
Full Listing, Sorted by Subclass of Items
Full Listing, Sorted by Class and Year of Purchase
Full Listing, Sorted by Department and Class of Item
Partial Listing, of One or More Classes of Items
Partial Listing, of One or more Subclasses of Items
Partial Listing, of One or More Departments, by Class or Sub-Class

Options

CLASS(ES)
SUBCLASS(ES)
DEPARTMENT(S)
FIELDS TO BE PRINTED, OR DEFAULT?

The system would be set up to have a default report layout, with the user able to specify an alternative column layout.

c. Automatic Calculation of Book and Replacement Values. The system should have the ability to recalculate the "Current Book Value" and "Current Replacement Value" columns. For recalculating book value it would take the original purchase price and multiply that by the reciprocal of the number of years of useful life to obtain an intermediate calculation of the amount of depreciation to be applied this period. It would compare that intermediate product with the current book value and take the lesser of the two for the actual amount of depreciation in the period. That amount would then be subtracted from the current book value column, and the results would replace those in the current book value column. The value of any number in this column cannot be less than zero. For calculating current replacement value the system would take the original purchase price and multiply it times the current official exchange rate divided by the official exchange rate at the time of purchase. (Note: this is the method used to revalue assets for the savings and loan system at this time. However, if items are imported it may be more accurate to use the parallel rate. This program should be under the exclusive control of the accountant's office.

d. Listings and Reports on Book and Replacement Value. These reports would follow the identical structure of the reports in item B above, except that the report would contain data on the values of items in the fixed assets inventory. The user should be able to select between book value, replacement value or both, as the fields to be printed. The program should also have the option of printing a detailed listing or only subtotals and totals. In complete listings all categories would have subtotals.

e. Automatic Posting to the General Ledger. The calculations in C above should have the ability to post current period depreciation directly to the general ledger. This program should be under the exclusive control of the accountant's office.

3. Loans Subsystem

This subsystem consists of two separate programs. One is the loans receivable program that handles the accounting for loans owed by associations to CACEN. The second is a loans payable program that keeps the accounting for loans that CACEN owes other institutions.

a. The Loans Receivable Program

The loans receivable program is a typical loans program, although on a smaller scale. The number of transactions will be limited by the fact that the loans will only be made to 12 institutions. A package developed for the associations should be capable of serving the needs of CACEN. If that is not feasible, the next best alternative would be to purchase an existing

loans package and modifying it to meet CACEN's needs. Only as a last resort should a package be developed in house.

The planning and control of disbursements to the associations is the responsibility of the Sub Gerencia of Operations. Documentation authorizing disbursements originates in that office, although actual data input would be performed by the accounting department. Also, reports and outputs of the program are used primarily by the Sub Gerencia of Operations.

The program must be capable of handling multiple disbursements, and disbursements with discounts of funds owed on previous loans. It must be able to create a record of scheduled payments due that can be used in spreadsheet applications by Operations and Planning.

b. The Loans Payable Program

This program must account for all monies owed by CACEN to other (Bolivian or International) organizations. It must keep a schedule of interest and principle payments due and be able to produce a record that can be used in spreadsheet applications by the Planning and Operations departments. At any time the user should be able to get a printout of the past payment history of a single loan, a schedule of future payments dues on a given loan, or a schedule of payments due on the entire portfolio.

Both programs must be capable of handling loans in both dollars and pesos.

4. Check Writing Subsystem

At the present time the volume of checks written by CACEN is relatively low, and can be handled manually. Development of the check-writing program should be delayed until phase three of the project.

5. Supply Inventory Subsystem

It is possible that the inventory system developed for the Operations System will be able to handle the requirements of this application as well. However, the cost and effort involved in maintaining this subsystem, for the relatively low value of the individual items may make the system unfeasible.

6. Insurance Accounting Subsystem

This subsystem is described under the Insurance System, below.

D. Insurance System

The insurance system is one of the major volume activities of CACEN. Every loan issued by a savings and loan association in Bolivia must be insured by CACEN. With the shift to short term loans that has occurred in the past 6 months, the volume of insurance activity will increase substantially during the next few years.

There are three major insurance programs at this time: (1) FHA insurance, which protects the association's investment in a property in the event of default by the borrower, (2) Mortgage Death and Disability insurance, which pays off the mortgage in the event of the death or disability of the borrower, and (3) Death and Disability insurance for non-mortgage loans, which pays off the loan in the event of the death or permanent disability of the borrower. A fourth program (life savings insurance) is not currently being offered by the associations, and needs to be restudied. It should not be computerized at this time.

Of the three major insurance programs, the volume of business in the first two categories has dropped off considerably due to the absence of mortgage lending during the recent inflationary period. The volume of business in the third area, however, is rising rapidly, and could easily reach 100,000 policies per year with the new funds that are to be made available to the associations. This is the program that should be implemented first.

1. The Major Subsystems

Insurance Inventory Subsystem

There are two major subsystems in the insurance system. The first is essentially an inventory system for registering and controlling the policies. Using this subsystem the insurance department of CACEN registers new policies, cancels expired policies, verifies the validity of policies prior to authorizing payouts and claims, and prepares regular reports required by CACEN and the insurance standards of the Government of Bolivia.

Insurance Accounting Subsystem

This subsystem must interface directly with the insurance system. It purpose is to account for the funds, income and expenditures of each of the three major insurance programs, and report on the profitability and solvency of each. It must also provide information to the insurance system to clear policies, and should verify that the amounts received are those that should have been received for each program.

In the case of the FHA insurance programs payments are received semi- annually from the associations. It is not clear if these payments have to be posted to individual policies. In the mortgage death and disability insurance program, payments are received monthly, and are based on the outstanding value of the mortgage loan portfolio. No attempt is made to post these payments to individual policies. The death and disability policies on other loans are collected once, at the beginning of the loan. Since the payment varies according to the period of the loan, and the insurance is only valid for the period of the loan, these have to be posted to individual policies.

This is a straightforward project accounting program although it must conform with insurance accounting requirements of the Government of Bolivia.

2. Programming Considerations

Special Requirements

a. The insurance system needs to check the number of premium payments received with the recorded number of new loans granted and loans active submitted in the regular monthly reports to the Planning Department, in order to verify that payments for all insurance policies were received.

b. The insurance system needs to be able to calculate payments due in order to verify that all payments have been received.

c. The insurance system needs to check active (non-canceled) policies against premiums paid and maturity date to report discrepancies.

d. Instead of receiving individual "Comprobantes de Deposito", the system should be able to check the global sum of the deposits with the amount due.

Security

Insurance inventory data should only be entered on edited by the insurance department. Only the accounting department should be able to make entries or edit payments data. While there are no particular security issues with using the data for reports, for practical purposes only the insurance and accounting departments require access to the report generation programs.

Backups

Because of the high transaction volume level, backup for this system will be critical. Transactions should be backed up daily. The data base should be backed up once a week. A major backup should also be performed once each month.

System Outputs

The major output of this system is the accurate maintenance of data on insurance policies, so that at all times the system correctly identifies the valid policies and accounts for the income, expenses and funds of the system.

The system must be able to identify lapses in payments and prepare a listing for verifying policy status with the associations. It should be capable of reconciling payments received with amounts due.

Beyond that, the Director of Insurance must prepare regular reports required by the insurance regulators, and regular statistical reports on new policies, expired policies, claims and profitability. These reports should concentrate on the growth and health of the funds, liquidity of the funds:actuarial adequacy) and profitability of the program, broken down by association and type of insurance. It should be able to calculate exposed risks, changes in types and amount of claims as a percentage of the insured portfolio of each association. Many of the reports in the current annual report should naturally be a product of the Planning System.

Relationships with Other Systems.

The insurance inventory subsystem is closely related to and depends heavily on the insurance accounting subsystem. All transactions recording the expiration of policies, payment of premiums and issuance of new policies comes from data input by the insurance accounting subsystem.

Other Considerations.

1. This system will have to be carefully analyzed at the time of implementation to insure compliance with Bolivian insurance laws.

2. While data collected for the insurance system are appropriate for a manual system, it may be necessary to redesign both the date that are to be collected and stored and the data collection forms that transfer that data to the system for this to work well as an automated system. In particular, and automated system will require various numbering systems to accurately locate and update records. In the schema above I have recommended using the Carnet number for the borrower and co-signers, as well as including the loan number and policy number on all records.

V. FILE ESTIMATES A') STRUCTURES

Each of the major systems of the CACEN information system is based on a set of data files. Although the physical structure of the overall data base will depend on the computer system and data base management system selected by CACEN, the basic file and data base requirements can be described as a series of independent but integrated files.

A. Planning System File Requirements

The Planning System data base consist of six major data sets: (a) an identification data set, (b) a monthly balance sheet and financial statistics data set, (c) a weekly statistical data set, (d) CACEN accounts data set, (e) macroeconomic indicator data set, and (f) a competitor data set.

1. Identification Data Set. This is a small file containing the names, addresses and identification numbers for CACEN, the 12 savings and loan associations and other entities that are participating directly in CACEN programs. The latter might include the Water and Sanitation Cooperative in Guayaramarin that is receiving an AID loan through CACEN. This is the only place in the entire data base that this information will appear. There would be, at a maximum, two hundred records in the file. Data classes and approximate field lengths for the file are:

* ID Number	3 digits	(000 = CACEN, etc.)
* Location Code	2 digits	(01 = La Paz, etc.)
* Name	25 chars	Name of the Institution
* Address	75 chars	Address of the Institution
* President's Name	25 chars	Name of Principal Officer
	131 chars	Probable Record Size

2. Monthly Data Set. These could be developed as either a single large file with a record for each association each month, or as a series of separate files containing sections of the data received each month from the associations. The description here breaks the data set into separate files, and is based on the data collection forms currently in use by CACEN. In some instances these are out of date, and should be revised before the computer system is developed, and suggested revisions are contained in Appendix A. They are adequate, however, for preliminary file size estimates. At the present time 12 digits are needed to hold data in the data fields of these files. Programmers must plan on at least 15 significant digits, unless some other action is taken (such as revaluation of the

currency or a decision to round off data) which reduces the necessary field size.

Monthly Balance Sheets
(Source Document: Monthly CACEN Report)

	Fields	Digits
* ID Number	1	3
* Date of Data	1	6
* Period (Month) Code	1	3
* Assets	59	885
* Liabilities	48	720
* New Fields	10	150
	120	1,767

Monthly Income and Expense Statements
(Source Document: Monthly CACEN Report)

	Fields	Digits
* ID Number	1	3
* Date of Data	1	6
* Period Code	1	3
* Income	20	300
* Expenses	12	180
* Net margin	1	15
* New fields	10	150
	46	657

Monthly "Request-For-Loan" Data
(Source Document: Monthly CACEN Report)

	Fields	Digits
* ID Number	1	3
* Date of Data	1	6
* Period Code	1	3
* Number Fields	4	20
* Amount Fields	4	60
	11	92

Monthly "Analysis of Loan Activity" Data
(Source Document: Monthly CACEN Report)

This file leaves room for all current fields, plus allows for the addition of new fields to cover new loan types. Although certain current fields are

inactive, the system must plan for a future in which they might become active again. It is suggested that the data collection form be modified.

	Fields	Digits
* ID Number	1	3
* Date of Data	1	6
* Period Code	1	3
* Number Fields	33	198
* Amount Fields	31	465
* New Fields	5	105
	72	780

Monthly Loan Payment/Cancellation Summary.
(Source Document: Monthly CACEN Report)

This file contains data on the number of loans that have been paid off and the amounts paid, for each of the different types of loan. It would have room for 10 different loan categories, although more could be added. It is suggested that the data collection form be modified.

	Fields	Digits
* ID Number	1	3
* Date of Data	1	6
* Period Code	1	3
* Number fields	10	60
* Amount fields	10	150
* Total Active Loans	2	21
	25	243

Monthly Delinquency Reports
(Source Document: Monthly CACEN Report)

I am assuming that detailed information contained in Anexos III-IX are not necessary for CACEN activities, and should not be entered into the computer system. However, if delinquency data on individual loan programs is needed, this file would have to be duplicated for each program for which data was wanted. This form should be modified to provide additional data on longer term delinquency, with categories for (a) current to less than 3 months delinquent, (b) 4-6 months delinquent, (c) 7-9 months delinquent, (d) 10-12 months delinquent, (e) 13-18 months delinquent, and (f) more than 18 months delinquent. The field description below reflects this proposed modification.

Distribution of Loan Portfolio	Number of Loans	Amount of Payments Due	Balance of Loans Due
Current to Less Than 3 Months Delinquent	_____	xxxxxxxxx	_____
4-6 Months Delinquent	_____	_____	_____
7-9 Months Delinquent	_____	_____	_____
10-12 Months Delinquent	_____	_____	_____
13-18 Months Delinquent	_____	_____	_____
More than 18 Months	_____	_____	_____
Totals	_____	_____	_____

The corresponding file estimates for this distribution are:

	Fields	Digits
* ID Number	1	3
* Date of Data	1	6
* Period Code	1	3
* Number fields	7	70
* Amount fields	14	210
	24	292

In the forms currently used by CACEN to collect monthly data from the Mutuales, data from Anexo XI does not need to be entered into the computer because this form is a direct calculation from data already stored in other parts of the data base.

Increase and Decrease of Savings Accounts File
(Source Document: Monthly CACEN Report)

	Fields	Digits
* ID Number	1	3
* Date of Data	1	6
* Period Code	1	3
* Number Fields	6	36
* Amount Fields	8	120
	17	168

Savings Activity File
(Source Document: Monthly CACEN Report)

The two forms contained in Anexo XII and XIII of the current CACEN monthly reporting forms can be combined and simplified to reduce the amount of work and data involved. At the present time they are used both for reporting historical trends and for recording the current month's data. With the new system it will only be necessary to collect current month data with this form. Also, the column entitled "Acumulados" is a duplication of data in the balance sheet. CACEN should consider laying out the new form as follows:

Type of Account	Withdrawals/ Increases		Deposits/Increases		Net Change	
	No.	Amount	No.	Amount	Number	Amount
Ahorros Libres						
Mon. Nac.	xxxxxx	_____	xxxxxxx	_____	xxxxxx	_____
Mon. Nac. C. Man.	xxxxxx	_____	xxxxxxx	_____	xxxxxx	_____
Mon. Ext.	xxxxxx	_____	xxxxxxx	_____	xxxxxx	_____
Depositos Pl. Fija						
Mon. Nac.	_____	_____	_____	_____	_____	_____
Mon. Nac. C. Man.	_____	_____	_____	_____	_____	_____
Mon. Ext.	_____	_____	_____	_____	_____	_____
Garantias						
Mon. Nac.	_____	_____	_____	_____	_____	_____
Mon. Nac. C. Man.	_____	_____	_____	_____	_____	_____
Mon. Ext.	_____	_____	_____	_____	_____	_____

The number of types of accounts may be increased; that would have to be determined by CACEN during a review of this document. The record layout would be as follows:

	Fields	Digits
* ID Number	1	3
* Date of Data	1	6
* Period Code	1	3
* Number Fields	27	162
* Amount Fields	27	405
	39	579

Liquid Assets File
(Source Document: Monthly CACEN Report)

This file can be eliminated because all of the data contained in it is calculated from other portions of the data base.

Portfolio Analysis File
(Source Document: Monthly CACEN Report)

The current data forms used by CACEN do not provide data for portfolio, liquidity, and spread analysis. To capture this the forms would have to provide both asset and liability portfolio data, distributed by maturity and interest rate. The major concern is short term portfolio analysis, the matching of assets and liabilities during the next twelve months, with special emphasis on the first three months. The data would have to be recorded in multiple tables, one for each type of asset and liability account (National currency without maintenance of value, National currency with maintenance of value, and Foreign currency) Thus, there would be a total of 6 tables, each structured as follows:

		Maturity								
Interest Rate	Current	Less Than 30 days	31-60 days	61-90 days	91-120 days	120-180 days	181-270 days	271-360 days	More than 360 days	Totals

This file would not contain a space for every possibility, as this structure would yield a large number of data fields containing zeros. I suggest structuring the data base to allow initially for ten possible interest rates during each period. Each entry would have two values (the interest rate and the amount deposited or on loan at that rate for each maturity. The application program would create a spreadsheet table from the data. This would yield 300 fields each for assets and liabilities for each association each month:

	Fields	Digits
* ID Number	1	3
* Date of Data	1	6
* Period Code	1	3
* Asset Interest Rates	6	30
* Asset Amounts	294	4,410
* Liab. Interest Rates	6	30
* Liab. Amounts	294	4,410
	603	8,892

3. Other Monthly Data Sets. The planning system also requires monthly data from other sources -- particularly macroeconomic and national monetary data and data on competitors (primarily banks).

Monthly CACEN Data Series. This data set would contain monthly data on CACEN'S balance sheet and income/expense statement. Under the current chart of accounts, this file would have 324 fields of 15 digits each, plus a month identifier field, for a total of 4863 digits per record.

Monthly Macroeconomic and Monetary Data Set. This data set would include monthly data on key macroeconomic indicators. Each month would add a new field (column) to the data set. The data could either be laid out in a horizontal or vertical format, and it may be preferable to have the most recent month in the first row or column. In horizontal format it would be structured as follows:

Indicator	Months			
	7/85	6/85	5/85	etc.
Inflation Index (Canasta Familiar)				
Official Exchange Rate				
Parallel Exchange Rate				
Bank Interest Rate/Loans				
Bank Interest Rate/Savings				
S&L Interest Rate/Loans				
S&L Interest Rate/Savings				
M1 Money Supply				
Quasi Money Supply				
Medio Circulante				
Monetary Emmissions				

Assuming that 10 years of data would eventually be stored in the system, and that earlier periods would be dropped off once the ten years had been exceeded, the file would require 120 fields of an average of 10 digits each for each indicator. There would have to be one separate record to keep track of the months in the file. With the indicators listed above there would be a total of 1440 fields of 10 digits each, or a total of 14,400 digits for the file size.

Competitor Statistics. Statistics on competitors are needed for both the individual departments and the country as a whole. Data on the departments tend to be delayed, necessitating preliminary estimates that are later replaced by actual data. The data consist of account balances for various asset and liability categories, particularly Passbook Savings, Fixed Deposits, Other Savings, Savings in Foreign Currencies and Total Loans Outstanding. Assuming these are the appropriate categories, the file would be logically structured as follows:

	Departmentos					
	La Paz . . .					
	Savings					
Month	Passbook Savings	National Currency	National Currency	Foreign Currency	Other Savings	Total Loans Outstanding

Since data on the departments are not readily available, the data entry program should have the capability of calculating and entering estimated totals for the departments from consolidated total information as soon as that is available, with a provision for editing the departmental totals at a late date.

With 9 Departments and the totals, and with 6 data categories to be collected for each department each month, the data file would consist of a month identifier, 9 repeating sets of 6 fields each, and 6 fields for the totals each month. With 15 digits per field the total record length for each month would be 900.

4. Weekly Data Series. The weekly data series consist of 19 data items for each of the twelve associations. With fields for totals, each weekly record would consist of a period identifier and 13 repeating sets of 19 fields, there would be a total (with 15 digits per field) of 3705 digits per weekly record.

5. Minimum File Size Considerations

Assuming that data would be kept on file for five years. the minimum file size required for the planning system data base is 11,924,140 bytes. It would be possible to reduce this somewhat be combining the separate monthly data files for the associations into a single file. It can be reduced significantly by reducing the number of significant digits to be carried on the system.

		Approximate File Size in Bytes
ID File		26,200
Monthly Data Files on Associations		
Balance Sheets	1767 x 13 x 60	1,378,260
Income/Expense	657 x 13 x 60	512,460
Request for Loans	92 x 13 x 60	71,760
Loan Activity	780 x 13 x 60	608,400
Loan Payment	243 x 13 x 60	189,540
Delinquency	292 x 13 x 60	227,760
Savings Accounts	168 x 13 x 60	131,040
Savings Activity	579 x 13 x 60	451,620
Liquid Assets	87 x 13 x 60	67,860
Portfolio Analysis	8892 x 13 x 60	6,935,760
Subtotal		10,574,460
CACEN Accounts	4863 x 60	291,780
Macro and Monetary		14,400
Competitor Statistics	900 x 60	54,000
Weekly Data Series	3705 x 60	963,300
Grand Total		11,924,140

B. Operations System Files

1. Project Management System

This can be developed as a series of simple spreadsheets or data base management data sets. The actual layout would depend on whether or not the project had intermediate components that could be tracked separately. The simplest form could be laid out as follows:

Item	Original Estimate (Total)	Actual Status	Percent Completed	Variance from Plans (No/%)	Current Estimate to Complete	Variance From Plans (No/%)
Start Date						
Completion						

Date						
Total Calendar days						
Cost to Construct						
Quantity to be Built						

If a project has intermediate steps, such as a water project might -- e.g., main artery constructed, primary lines completed, secondary lines completed, houses hooked up -- each of these may take a row of the matrix or spread sheet, with the data listed above stretched out items above can be measured in terms of meters completed, the latter item in terms of number of hookups completed.

A slightly more complicated version can have intermediate benchmark targets and reports of variance. This could be laid out on a three-month schedule, as are the reporting requirements for A.I.D.

If the system is designed to use a data base application the variances would not be entered into the data base as fields, but would be calculated by the report program. In a spreadsheet program they would have to be established as separate columns in the spreadsheet.

In the above model, using a data base application, each project or substep of a project would require approximately 30 data fields of an average of 10 digits each per month. Assuming a total of 20 moderately complex projects with 10 substeps each, each project would require approximately 3000 bytes of data storage per month. This means an average of 60,000 bytes per month for the system as a whole, or 3,600,000 bytes of storage for five years of projects.

2. Inventory System

If an inventory management package is not purchased for this project, it can be developed as a data base program. Three files are necessary to run the system: an identification file, a master file, and a transaction file.

The Identification File. This file would hold the narrative descriptions of the coded items in the inventory data file, specifically items (1) names of projects, (2) names and locations of warehouses, (4) units of measurement, and (17) transaction type, such as transfer to other warehouse, use in project, loss, etc.

The Master File. The fields of the master file should be laid out as follows:

1.	Record Number	6 digits
2.	Project Number	5 digits
3.	Warehouse Number	1 digit
4.	Part ID Number	10 digits
5.	Unit of Measurement	2 digit code
6.	Quantity	10 digits
7.	Date Purchased/Received	6 digits
8.	Original Unit Price or Value	15 digits
9.	Exchange Rate on Date Purchased or Received	10 digits
10.	Quantity of Items Remaining	10 digits
11.	Value of Current Inventory	15 digits
12.	Description, Field 1	40 chars
13.	Description, Field 2	40 chars
	Probable Record Length	160 chars

Note that identical items with different purchase prices will have to be stored as separate records in the file.

Transaction file. There must be a transaction record each time an item is added to or withdrawn from inventory. This record would be laid out as follows:

1.	Transaction Number	6 digits
2.	Document Number	10 digits
3.	Project Number	5 digits
4.	Warehouse Number	2 digits
5.	Record Number of Inventory Item	6 digits
6.	Date Removed from Inventory	6 digits
7.	Quantity Removed	10 digits
8.	Exchange Rate on Date Removed	10 digits
9.	Unit Value of Items Used	15 digits
10.	Total Value of Items Used	15 digits
11.	Transaction Type	1 digit
		86 digits

Transaction and Number-of-Records Estimates

It is estimated that each item in the inventory will have an average of one initial entry and 10 withdrawal transactions during the life of the project. This yields an estimated 33,000 records over the life of the project.

Minimum File Size

With 33,000 records and 86 bytes per record, the estimated file size of the transaction file for this system is 2,838,000 bytes. The estimated file size for the master file is 800,000 bytes, and the identification file will require another 10,000 bytes. Thus, the total estimated data base size for this subsystem is 3,648,000 bytes, of which 2,838,000 can be stored off-line.

C. CACEN Accounting and Administrative System Files

1. Basic Accounting Files

The "catalogo de cuentas" for CACEN currently has 324 line items, but it has not been officially adopted by CACEN. This must be reviewed and approved before computerization starts. The items are divided as follows:

Rubro	No. de Items	Commentario
Activos		
Activo Disponible	11	
Cartera		
Moneda Extranjera	13	) Need subledgers for each
Moneda Nacional	13	) of the mutuales
Activo Exigible		
Int. por Cobrar (M.E.)	13	) Need subledgers for each
Int. por Cobrar (M.N.)	13	) of the mutuales
Cuentas por Cobrar	13	)
Prim. Seg. por Cobrar	13	
Inversiones	18	At present, but could be higher
Activos Fijos	5	
Activos Diferidos	9	
Total de Activos	1	
Pasivos		
Exigible a Corto Plazo	1	
Cuentas por Pagar	6	
Intereses por Pagar	17	At present, but could be higher
Fondo de liquidez	13	Need subledgers for each mutual
Largo Plazo	1	
Exigible	16	At present, but could be higher
No Exigibles	5	At present
Pasivo Diferido	5	
Total de Pasivos	1	
Capital/Valor Neto	16	
Cuenta de Cuadre	1	

Total de Pasivos/Reservas	1	
Ingresos		
Ingresos Financieros	1	
Creditos (Mon. Ext.)	3	At present
Creditos (Mon. Nac.)	6	At present
Int. Dep. Bancarios	4	
Comisiones	3	
Ingresos No Financieros	7	
Total de Ingresos	1	
Egresos		
Costo Financiero	1	
Int. S. Mon. Ext.	3	
Int. S. Mon. Nac.	5	
Comisiones Pagados	3	
Costos Administrativas	1	
Costos del Directorio	6	
Rem. de Personal	8	
Auditoria	5	
Supervision Tecnica	3	
Administracion Contable	3	
Seguros	7	
Seminarios	4	
Reuniones Locales	2	
Vinculaciones	4	
Promocion/Publicidad	3	
Programa Comunal	2	
Desarollo Rural	4	
Transporte Local	2	
Gastos Generales	21	
Total de Gastos	1	
Estado Neto	1	
	324	Items

Each of the accounts requiring subledgers, requires a subledger for each association.

Estimated Transaction Volumes

The system currently has about 250 transactions per month, but should be planned for 750. Estimated major file size of 1,000,000 bytes, with ancillary files.

2. Fixed Assets Files

The fixed assets program would need two files: (a) an identification file containing ID codes and descriptions of items in the file, and (b) a file of data on each item.

Identification File. While this may, in fact, be several files, it would contain the complete listing of codes used in the fixed asset system and the general description for those codes. rather than entering the descriptions in the data file, only the codes would appear there, and any report programs would match back to the ID file to get the narrative descriptions. As an example:

```
Departments
   0 = General
   1 = President's Office
   2 = General Manager's Office
       etc.
General Classes of Assets
   101 = Desks
   102 = Chairs
   103 = Tables
       etc.
Specific Classes of Items
   103.01 = Leather desk chairs
   103.02 = Reclining Office Chairs with Arms
   103.03 = Secretarial Chair
       etc.
```

The exact coding and file layout would depend on the system selected. In the example above there is some redundancy in the coding. This should be avoided if possible.

The Data File. This would be a standard flat file, laid out in fields, as follows:

1.	General Asset Class	3 digits
2.	Specific Asset Class	5 digits
3.	ID Number (if any)	10 digits
4.	Department Location	2 digits
5.	Date Purchased	6 digits
6.	Purchase Price	15 digits
7.	Type of Asset	1 digit
8.	No. Years of Useful Life	2 digits
9.	Depreciation Schedule	1 digits
11.	Current Book Value	15 digits
12.	Current Replacement Value	15 digits
13.	Narrative Description	60 chars
		151 chars

Estimated File Size

There are approximately 500 items that need to be included in the file. At 151 characters per record, the total file size would be approximately 75,500 bytes.

D. The Insurance System

1. Inventory Files

The inventory subsystem, which can be developed using standard data base software, consists of four separate file structures: (a) the master current policy file, (b) the historical file of policies that are no longer current, and (c) a master claims file to record the details of claims against the funds, and (d) a transaction file to record all changes to the master files.

The Current Policy File. This file contains the records of all policies that are currently in force in the system. The file layout would be approximately as follows:

* ID Number of Borrower	10
* Name of Borrower	50
* Sex of Borrower	1
* Age of Borrower on Date of Loan	2
* Policy ID number	10
* Loan ID Number	10
* Mutual Number (01=La Primera, 02=La Paz, etc.)	2
* Type of Policy (1=FHA, 2=DH, 3=DP)	1
* Date of Policy	6
* Original Amount of Policy/Loan	15
* Current Amount of Policy/Loan	15
* Loan Period (#,units -- days, months years)	4
* Maturity Date of Policy	6
* ID Number(s) of Co Signer(s)	10
* Monthly Premium	10
* Collection period (1=once, 2=monthly, etc.)	1
* Total Premium due CACEN	15
* Premium Period	10
* 5% Commission	10
* 25% Commission	10
* Amount Deposited in CACEN Account	15
* Date of Most Recent Premium Payment	6
* Policy Status (Active/Canceled)	1
* Objective of Loan	2
* Fields to verify existence of	
a. Solicitud del Prestamo	1
b. Certificado de Salud	1
c. Documento Privado Reconocido	1
	225

This file could have as many as 100,000 active records at any one time, which would require 22,500,000 of on-line disk storage.

The Historical Policy File. As loans are paid off and policies expire, inactive policies would be transferred to an "inactive" file for permanent storage. This file would have the identical layout of the current file; the active/inactive field would be coded for inactive. This file would maintain two or three years of data "on line", as part of the current policy file, with a complete tape backup for permanent storage.

The Claims File. This file maintains a detailed record of all claims paid by the system, including the dates, amounts and reasons for the claim, references to needed documentation and amounts paid out. The filed layout would be approximately as follows:

* ID Number of Borrower	10
* Name of Borrower	50
* Mutual Number	2
* Case Number	10
* Policy ID Number	10
* Loan ID Number	10
* Policy Date	6
* Original Loan Amount	15
* Age of Borrower on Date of Policy	2
* Loan Period (#,units)	4
* Date of Claim	6
* Reason for Claim	2
* Age on Date of Claim	2
* Amount of Claim	15
* Verification of Existence of Documents 43, 44 and 45	3
* Disposition of Claim	1
* Amount Paid	15
* Date Paid	6
* Comments	50
	219

This is expected to be a relatively small file, especially with the shift to short-term loans. Estimating a maximum of 500 records during a two-year period, this file will require 109,500 bytes

The Transactions File

Transactions should be backed up daily, and maintained on an off-line file.

E. File Summary

On-line file storage requirements for the CACEN information system are quite large, as can be seen below:

Planning System	11,924,000
Operations System	4,410,000
Accounting System	1,500,000
Insurance System	22,610,000
	40,444,000

Not all of these fiel requirements will be present during the first year or two of the system, but the system must be designed to eventually handle this volume of on-line files and the implications for entry, editing and access programs. The insurance programs will not be added until the second year, and it is likely that volumes will grow slowly over the next two to three years. There are other ways to economize on file storage requirements as well.

Because of the large file sizes, and the planned number of users and programs, the operating system and its ability to handle the volume and load requirements becomes very important. CACEN should spend time with the vendor to discuss fully the options available and benefits of each.

VI. EQUIPMENT AND VENDOR OPTIONS

The equipment and vendor options available to CACEN are limited by the small size of the market for computer equipment in Bolivia. Most brands available in the United States are not represented in Bolivia. This significantly limits the alternatives.

The criteria for considering different vendors were determined by the nature of the information system needs of CACEN and the data processing requirements of the two associations in La Paz. For the two associations a system would have to meet the following criteria:

* Existing savings and loan package, in Spanish;
* Adequate capacity to process 90,000 to 100,000 accounts;
* Local representative or distributor with good reputation for service;
* Cost less than $75,000 for basic hardware;
* Complete confidentiality of files in a shared processing environment;
* Spreadsheet program for budgeting;
* Word processing in Spanish;
* If possible the system should represent equipment and programs already in use in the system.

For CACEN the basic system requirements are as follows:

* Capacity for 10 to 16 terminals;
* Hard disk storage of up to 100 megabytes;
* Shared file, true multi-user system;
* Standard operating system with wide variety of available software;
* Good multi user-relational data base management system;
* Good multi user-spreadsheet program;
* Good multi-user Word Processing program, in Spanish;
* Local representative or distributor with good service reputation;
* Availability of parts and service;
* Length of time to implement system.

These criteria clearly exclude the possibility of developing a system based on individual standalone microcomputers. The vendors considered in this review were NCR (8250 and Tower), IBM (System 36 and PC AT), WANG (VS 15) and Pertec (3200). These were the only brands and models available in Bolivia that had the possibility of meeting the above criteria, either for the combined system or a separate system for CACEN.

A. Possibilities for a Joint System

Two major systems an IBM 36 and an NCR 8250 were considered for a system that would possibly meet the needs of both associations and CACEN. A third alternative, WANG, was not reviewed in depth because of the absence of banking applications and installations in Boliva. A comparison of the IBM and NCR alternatives can be seen in the following table.

COMPARISON OF MAINFRAME EQUIPMENT OPTIONS

Criteria	IBM 36	NCR 8250
Cost	$150-250,000	$35-40,000
Maintenance	Excellent	Uncertain with Change in NCR status in Bolivia
Customer Support	Excellent	Have had troubles in past, uncertain with change
Training and Education	Excellent	Limited, uncertain with change
Technical Feasibility for Two Mutuals		
Communications	OK	OK
Confidentiality	OK	Questionable, files would be common, with code to separate clients
Capacity	OK	OK
Peripherals	OK	OK
Processing Speed	OK	OK
Number of Terminals	60	60
Existing Program	No	Yes

Programs Needed by CACEN

Spreadsheet	Available	No
Data Base	Uses internal inverted fields with field names. Requires programming expertise.	No
Word processing	Available, with powerful dictionary in Spanish and English	No
Graphics	Yes	No

Summary. The IBM 36 has the capacity of meeting all of the requirements of CACEN and the two Mutuales in La Paz. However, it is an extremely expensive option, and probably beyond the reach of the system at this time. The NCR could serve the needs of the two associations, but there are legitimate questions of service, support and maintenance. Both systems actually recommend attaching PCs to the main system to do the activities of word processing, graphics and spreadsheet.

Based on the above considerations, I do not recommend that CACEN and the two associations attempt to meet their combined needs with a single computer installation.

B. Alternatives for the CACEN System

1. Motorola 68000 Based Super-Micro Computers

At the present time there are three different brands of computers imported into Bolivia that use this processor base. One is the NCR Tower, which is currently imported by the NCR representative. The second is Pertec, imported by the company SEINCO, S.R.L. of Cochabamba. The third is NEC, imported by LatinData. The NEC is of Japanese manufacture, and is not eligible for A.I.D. funding. A comparison of the Pertec and NCR Tower appear in the following table.

Comparison of Pertec and NCR Tower Options

Criteria	Pertec (Model 3221)	NCR Tower (Model XP)
Main Memory	256K to 1.5M	256K to 2M
Clock Speed	10mhz	10mhz
Hard Disk		
Standard	53 Mbtyes	46 Mbytes
Maximum	340 Mbytes	600 Mbytes
Terminals	16	16
Cartridge Tape	48 Mbytes	44 Mbytes
Floppy Disk	None	1.2 Mbytes
Operating Systems	UNIX Pertec	UNIX
Battery Backup	None	Yes
Cost:		
1 Mbyte Memory 40-50 Mbyte disk 44-48 cartridge tape	$10,143	$17,000
Operating System	$400-$1000	Included
Terminals	$830-$1100	$1,000
Letter Quality Printer	2,500	2,500
Basic System (5 terminals)	$17,193-$19,143	$24,500
Software:		
Spreadsheet	Included with Pertec OS Extra with UNIX	Extra
Data Base Management	Included with both	Extra
Wordprocessing	Available in Spanish	?
Graphics	Included with Pertec OS	Extra
	Other Considerations	
Number of Installations	?	1
Number of Pending Orders	3	0
Past experience with Vendor	Excellent	Have had problems

Vendor stability	OK	NCR is withdrawing from Bolivia. Uncertain with new company.
Spare parts	Good	None
Compatibility with other equipment in system	1 in Cochabamba	None
Ability to use existing equipment	Yes	Yes

2. The WANG Option

The only computer offered by WANG/Bolivia that would meet the requirements of CACEN is the VS-15, the smallest in WANG's minicomputer series. This computer can handle up to 16 users, with 512K to 2 Mbytes of main memory and 76-147 Mbytes of hard disk storage. The base price for this unit, with 2 terminals, 1.0 Mbytes of memory and 76 Mbytes of hard disk storage is $20,000. Extra terminals cost $2,250 each. A 14 Mbyte cartridge tape backup costs $4,500. The minimum hardware configuration required by CACEN would cost $31,250, FOB the factory.

Only WANG terminals and WANG peripherals can be used with the system, although apparently standard parallel printers can be attached to individual terminals (not to the system itself.

Software for the WANG tends to be expensive. The spreadsheet program costs about $2,000, as does the WANG word processing system. Package software is very expensive -- from $15,000 to $40,000 per package with $25,000 the apparent average price of most business applications.

There are no readily available accounting or other packages in Spanish, so all of these would have to be written locally.

The cost of the WANG VS-15 system, the fact that there are no other WANG computers in the savings and loan system, and the lack of needed software modules lead to the conclusion that this is not a viable option for CACEN.

3. IBM PC-AT Option

Another option to meet the data processing requirements of CACEN in a phased approach would be to develop information system clusters using the IBM PC-AT. This is a multiuser system that has ample hard disk storage capabilities, but only permits three terminals to share a central processor. This means that the units would have to be located in specific work areas: those areas could share data and files easily, but would have more difficulty sharing data and files with other clusters.

While this is a potentially feasible option, there are some major drawbacks that should be considered:

1. It decentralizes the administration of the system. More people will have to be responsible for data entry, data validation, backup and security. There is a question as to whether there are sufficient people in CACEN who would be willing and able to take on these functions.

2. The programs developed for the IBM PC tend to be small, personal programs rather than office-wide integrated systems. There are severe limits on the numbers of fields that the spreadsheet and data base management programs can handle, the number of files that can be open at one time, etc.

3. The architecture of the IBM system is considerably slower than the architecture of the Motorola 68000 based computer systems. In addition to the internal processor capabilities (16 versus 32), there is also the difference in address bits (16 versus 24), clock speed (6 mhz versus 8 to 10 mhz) and direct memory addressability (64K versus 16 Mbytes). What all of this means is that the Motorola 68000 based machines are much faster and more powerful than any possible IBM configuration. They can handle up to 35 terminals, 1 billion bytes of hard disk storage and (at present) up to 8 Mbytes of main memory. The expandability of such a system would suffice the needs of CACEN into the foreseeable future. Most important, the size and structure of files is not limited by the processor chip. Whereas in IBM PC systems all arrays have to be less than 64K, the Motorola 68000 based computers can have arrays of up to 16 megabytes in size. This means that the type of data base structure we are trying to put together for CACEN can be developed easier, more directly, and with more options.

4. The fragmented data file and storage characteristics of the Local Area Network (LAN) approach is inconsistent with a centrally managed and integrated information system.

5. There have been reports that IBM has thus far not been able to develop an effective LAN, that there are problems with the Xenix operating system, and that much of the software designed for the PC XT and PC will not operate under the Xenix operating system. These should be investigated.

On the other hand, the advantages of the IBM PC, in terms of software availability, general familiarity with the product, and support are factors which do encourage a look at this option.

OPTION 1

CONFIGURATION FOR CACEN

(Assuming a Motorola 68000 Based Computer)

	First Stage	Second Stage	Third Stage
Processor:	68010, 10 mhz		
RAM Memory	1 Mbyte		2 Mbyte
Hard Disk	40-50 Mbyte		80-100 Mbyte
Cartridge Tape Backup	40 Mbyte		
Serial Ports	8		16
Parallel Ports (*)	1	2	
Terminals			
President's Office			
General Manager		1	
Planning	2		
Accounting		1	
Auditing		1	
Operations	1	1	
Insurance		1	
Word Processing	1	1	
Total Number of Terminals	4	3	3
Printers			
High Speed Dot Matrix (**)	2		
Letter Quality	1	1	
Line Printer			1

Software
- System: Unix (Unisoft) System V, Pertec OS/3200
- Data Base, etc.: UNIFY, IDOL, INGRES
- Spreadsheet: Handle, Multiplan, SuperCalc
- Word Processing: Handle, Crystalwriter, Wordstar, Palentir

(*) Parallel interface may be accomplished by use of microbuffer.
(**) Current Epson Printers may be used in the short run.

OPTION 2

CONFIGURATION FOR CACEN

(Assuming IBM PC-AT Local Area Network)

FIRST STAGE
-- One unit to serve Planning and Operations
1 IBM PC-AT, with Xenix Operating System and 512K of main memory
3 Terminals
   2 for Planning
   1 for Operations and Word Processing
1 Hard Disk -- 40 Mbyte
1 Floppy Backup (a cassette drive unit would be preferable)
1 Dot matrix printer (would use existing printer)
1 Letter quality printer

Software:
   Xenix Operating System
   Lotus 1 2 3, or Framework
   Data base management
   STSC's APL

SECOND STAGE
-- One unit to serve Accounting and Insurance

1 IBM PC-AT, with Xenix Operating System and 512K of main memory
3 Terminals
   1 for Accounting
   1 for Insurance
   1 for Word Processing
1 Hard Disk -- 40 Mbyte
1 Floppy Backup (a cassette drive unit would be preferable)
2 Dot matrix printers (one for draft letter printing, one for check writing)
1 Letter quality printer

Software:
   Xenix Operating System
   Lotus 1 2 3, or Framework
   Data base management
   Integrated Accounting Package

THIRD STAGE
-- An additional IBM PC-AT with three terminals to give access to the General Manager and President, and one extra word processing station. An alternative would be to have 2 or three

individual IBM PC's added to the system. This stage would also have one additional dot matrix and one additional letter quality printer.

VIII. STAFFING AND TRAINING

A. Staffing

The CACEN information system will not require specialized staff to operate and support. It is intended that individual users will be able to run their own reports and, to an extent, create new ones.

However, because it is a centralized and integrated system, there is a need for someone to be responsible for the system. We can call this person the "system administrator." At least two people should know how to perform these functions in case of the absence of one of them.

The system administrator is responsible for turning the machine on and off, creating and deleting users, maintenance of user passwords and security systems, file maintenance and backup, and helping others gain access to and use their applications. This is a person who fully understands the system.

This does not need to be a full time position, but the assignment of responsibility, and the training of the person(s) to carry out those responsibilities needs to be clear and unambiguous.

This is the only specialized staff requirement for the system. Other users will need to be trained in (and in some cases encouraged to use) their respective applications. Depending on data entry volumes it may eventually be necessary to employ data entry clerks.

B. Training

The system being developed for CACEN will be a fairly complicated system requiring a skilled user base. The idea behind the system is that the vendor will provide initial installation and program development, but that CACEN staff will have the ability to maintain the system and add new applications with little on going external assistance. This implies a fairly extensive training effort for the CACEN staff involved in the system.

The exact training schedule will depend on the type of system selected, the software selected and the extent of vendor support for training. However, given the system descriptions developed so far, it is apparent that certain general types of training will be required.

System Administration. The new system will require that personnel of CACEN

know how to administer a fairly complex system. In particular, they will need to know:

* Setting the system up and connecting peripherals
* Turning the machine on and shutting it down
* Backup
* Security
* Basic communications
* Establishing new users
* Setting and correcting passwords
* File maintenance
* Printing
* Managing directories

At least two people should be able to perform these functions. Depending on the operating system, this training could take from two to three weeks. It should be provided by the system vendor. If UNIX is the operating system it may be possible to arrange participant training for advanced UNIX applications once the basic training is completed.

Data Base System. Most of the applications developed will the system's data base management program. Staff will need to be trained in all aspects of the particular data base management system, including:

* The data base programming language
* Creating files
* Adding and deleting fields
* Linking data sets
* Sort, search, and select operations
* Creating subfiles from data extracted from the data base
* Creating reports and stored report programs

The same two people who are trained in system administration should also received training in this area. These two people would form an in-house resource base that can help other users. In addition, however, anyone working with an application that depends on data base management should receive basic training in the system.

Spreadsheet Programs. Spreadsheet programs are usually learned by reading and doing. However, initial training in the spreadsheet program should be provided by the vendor to all personnel of CACEN who are required to create and use spreadsheets in their work. In addition, specialized training in advanced spreadsheet techniques might be arranged as participant training in Puerto Rico or other A.I.D. approved site for one or two persons.

Graphics. This will probably have to be an in-house training exercise provided by the vendor, or learned by the staff from the package manuals.

Word Processing. It is unlikely that local training will be available for word processing in the particular package selected for CACEN. If the vendor does not know the word processing package, someone is going to have to sit down and work it out from the manuals. At least two secretaries and as

many professionals as can be encouraged to do so should learn the word processing system.

IX. IMPLEMENTATION SCHEDULE

There are numerous steps to be completed before CACEN will have even the skeleton of an integrated information system. This will be a long process, probably requiring more than a year to fully implement the proposed system. It is important to recognize this up front, to avoid frustrations later. The following schedule does not attempt to give time estimates, as these are too variable in the Bolivian environment. It does attempt to detail the various steps and activities that will have to take place to develop the system.

Activity	Institution Responsible
1. Determine most appropriate procurement mechanism and requirements	USAID
2. Select a system. Even if sole source procurement is used CACEN will need to verify the performance of the equipment and vendor by interviewing other installations. If competitive bidding, or short-listed competitive bidding, is used CACEN will need to develop the proposal criteria, prepare the requests for proposal, solicit bids, evaluate responses, and select a vendor, hardware and software.	CACEN
3. Appoint a project manager for the system installation. Eduardo Frias should have overall responsibility for the installation, but a project manger to oversee the daily operations is necessary.	CACEN
4. Redesign and simplify the forms used to collect data from the associations. This must be done before anything is programmed.	CACEN
5. Revise and approve new charts of accounts for CACEN and the Mutuals. This must be completed before the internal design phase.	CACEN

6.	Review system and subsystem descriptions in this report to verify accuracy and completeness. Make any needed modifications.	CACEN
7.	Develop the internal data base design, data entry and editing programs for the planning and operations system.	Vendor Proj. Man. Consultant CACEN staff
8.	Insert trial data and test/refine the entry and storage programs.	Vendor CACEN Staff
9.	Begin data entry of historical data.	CACEN Staff
10.	Develop intermediate programs and standardized reports.	Vendor
11.	Completely test all aspects of the program before accepting program as complete and satisfactory.	Vendor Consultant CACEN Staff
12.	Train staff in systems and applications. (Note: this can begin earlier and proceed throughout the installation phase.)	Vendor CACEN Staff
13.	Repeat steps 7 through 12 for each subsequent system.	

I recommend purchasing a book by Philip Metzger on "Managing a Programming Project."

X. SELECTION CRITERIA

In addition to the points listed earlier, selecting a computer system for CACEN involves a three major considerations:

1. Local Vendor Stability and Support. This is the most important single selection criteria. Whatever system CACEN ultimately selects it must be supported by a reliable vendor.

2. Power and Capabilities of the System. THE CACEN information system is a large system. The computer must be capable of effectively supporting 10 to 12 user terminals with word processing, data base management and spreadsheet applications with little degradation in response time. This may require a proprietary operating system to accomplish. In addition, the CACEN system will need in excess of 50 megabytes of on-line, hard disk storage, and must be able to support up to 6 printers. The computer selected for CACEN should have the capability of expanding to support this configuration.

3. Cost. Cost is a limiting factor rather than a selection criterion. CACEN should spend as much on the system as it can afford, because an underconfigured system will not support the business operations of the institution.

XI. GENERAL RECOMMENDATIONS

Numbering Standards

CACEN and the Mutuals need to adopt numbering standards which will be used by all applications to reference the data base. Among the standards that must be adopted are:

1. ID number for individual borrowers and savers. This should be the carnet number. It should appear on all loan and savings documentation and all insurance policies. This will be the reference number for each individual in the system.

2. A standard numbering system for CACEN, the Mutuals and other institutions:

   000 = CACEN
   001 = La Primera
   002 = La Paz
   .
   .
   .
   012 = La Frontera

   111 = USAID
   112 = I.D.B.

   201 = Cooperativa de Aguas de Guayaramarin
   etc.

3. A standard number to reference CACEN departments (e.g., 01=President's Office, 02=Gerencia General, 03=Asesoria Legal, etc.)

4. A standard numbering system for programs (Water and Sanitation, Guayaramarin; Rural Housing, Chuquisaca; etc.)

Form Standards

Every form used officially in the savings and loan system should have a form number and a date.

Pre-Printed Forms

The use of pre printed or automated standard forms should be mandatory throughout the system. The amount of time spent by some Mutuals in typing the "Documento Privado Reconocido" is not necessary.

Automated Reporting

Those associations that have computers should have a program to automatically generate the reports needed by CACEN, including those needed by the insurance department. These computer generated reports should be accepted in lieu of retyping the same information on official forms. Even better, the computer systems should be capable of generating the information on diskette or cartridge tape in a form that can be read directly into CACEN's computer, eliminating completely the need for any hand typing or hand entry of data from those associations.

Common Computer Systems

Over the long run the Bolivian Savings and Loan System should migrate toward a single brand of computer, with a common set of programs supported by a single vendor.

Insurance

While the insurance system represents an excellent manual reporting system, there are some changes that should be made so that the system can function efficiently as an automated system. Among these are:

1. Simplify the insurance data forms. There is too much typing for too little real data.

2. Only the absolutely essential documents should be sent to La Paz. Among these are the list of new and canceled policies (with modifications), a revised insurance certificate form, a monthly report of premium payments, and a detailed report on claims. No other document should be forwarded by the Mutuals to La Paz, but the CACEN auditor should periodically audit the associations to verify the existence of supporting documentation.

3. The Certificate of "Desgravacion de Prestamo" and Certificate of "Desgravamen Hipotecaria" should contain all of the information needed by the Insurance Department in CACEN. The present form should be reduced to half a page, with the other half of the page registering the other data items. This should be the only documentation received by CACEN on individual insurance policies.

4. The letter that the Mutuals use to transmit insurance information to CACEN should be changed. The Mutuals should not list the new and expired policies in the letter, but should attach a listing as follows:

New Policies

Carnet	Nombre	Loan Program	Amount of Loan

(Please note that even this is not necessary if the certificates are redesigned as I have suggested)

Canceled Policies

Carnet	Policy Number	Name	Date Canceled

Monthly Premiums Paid

Carnet	Policy Number	Name	Amount

This information would be sufficient to update the data base on a monthly basis, and maintain the integrity of the system.