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# **PRODEM**

Version 2.0

## **NATIONAL AND SUBNATIONAL DEMOGRAPHIC PROJECTIONS BY MICROCOMPUTER**

**UNITED NATIONS  
ECONOMIC COMMISSION FOR LATIN AMERICA AND THE CARIBBEAN (ECLAC)**

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## ABOUT PRODEM

The Latin American Demographic Center (CELADE) has developed a second version of **PRODEM** for personal computers. **PRODEM** contains a set of demographic and mathematical methods which enable the user to carry out and separate at various geographical levels of a country **DEMographic PROjections**.

**PRODEM** is very "user-friendly", since it requires no special programming for its use. It can be operated by any user with basic demographic or computing skills.

Through its modular structure, it enables the user to ensure consistency between the projections being carried out for the different Administrative Divisions of a country, with those of the areas or Major Administrative Division containing them.

This work was made possible thanks to CELADE's Exchange and Cooperation Program together with the Canadian Agency for International Development (ACDI), United Nations Fund for Population Activities (UNFPA) and the Research Center for Development (CIID) from Canada.

Messrs. Carlos Olivares and Juan Carlos Sotomayor participated in the programming of the package, under the supervision of Mr. Ari Silva, Data Processing Chief of CELADE. Mr. Juan Carlos Pérez, an official of the "Instituto Nacional de Estadísticas" of Chile, Mr. Louis Duchesne, Canadian consultant, and Mr. José Miguel Pujol, were in charge of the methodological developments and the preparation of the manual, under the supervision of Mr. Juan Chackiel, Head of the Demography Area of CELADE. Messrs. Manuel Rincón and Harry Hernández, from CELADE San José, contributed their comments and Mr. Han Raggars, Dutch associate expert, collaborated in the translation into English.

**PRODEM** users are requested to cooperate in the improvement and upgrading of the System by sending to CELADE their comments about the package in general or about different approaches that could be added to future versions. Correspondence and requests should be sent to **DEMOGRAPHY AREA or POPULATION DOCUMENTATION AND DATA PROCESSING AREA, CELADE, Casilla 91, Santiago, Chile.**

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## 1. INTRODUCTION

This chapter contains a general description of the PRODEM System, Version 2.0.

### **Target users of this Manual**

Provides indications as to who should use the Manual and PRODEM System.

### **Contents of PRODEM**

Presents the System's structure and possible exchanges of information through the System.

### **Definition of keyboard when using PRODEM**

Describes the use of different keys of the microcomputer and the different symbols used in this Manual.

---

## TARGET USERS OF THIS MANUAL

This manual is aimed at those familiar with demographical procedures that allow population projections; IT IS NOT designed to introduce non-demographers to technical issues.

The first pages provide instructions that allow the proper installation of the system in equipments, such as IBM-PCs or PC compatibles, such as EPSON, COMPAQ, etc. The required configuration and hardware of the computer system are also described here.

Following instructions on how to install the system, the user will find several descriptions on the creation of basic data files which are to be used in any of the Projection Modules.

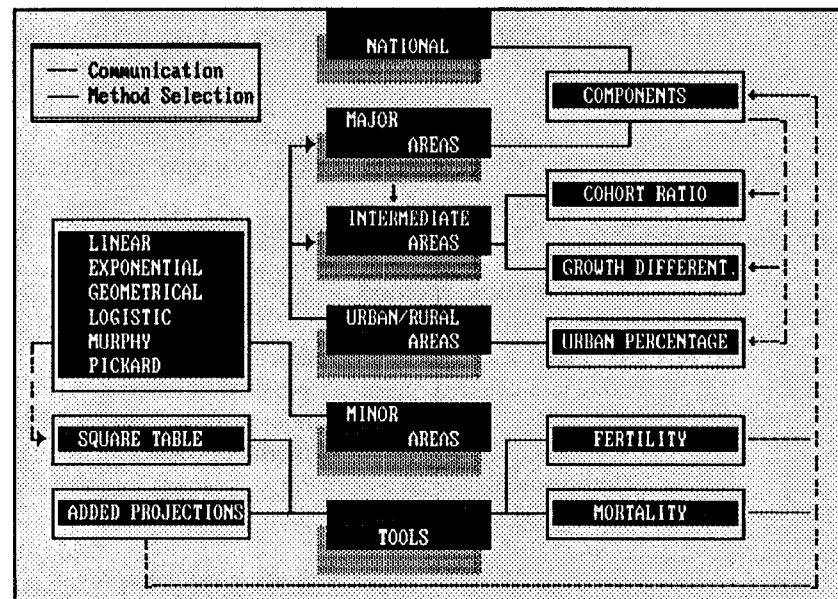
In this Manual, each Projection Module will be described in formats (screen displays) similar to the ones the user will find while operating the System. In order to ensure the correct input of information, the projection algorithms are also introduced. Finally, in case of doubt, a set of references related to methodological questions will be presented.

The Projection Modules end with a list of results obtained when applying the procedures they contain.

The instructions provided in this Manual correspond only to those basic operations that must be performed in order to obtain the results correctly. These instructions do not differ greatly from those introduced in Chapter 2, INSTALLATION OF PRODEM, which ensure that the System has been installed correctly.

## CONTENTS OF PRODEM

PRODEM contains a set of Modules with different Projection Methods. The Modules can communicate with each other and are presented in the following Diagram:



### Projection Modules

PRODEM's projection Modules fall in the following categories: National, Large Areas, Intermediate Areas, Urban-Rural, Small Areas and Tools.

These Modules correspond to blocks that allow the user to access the different projection methods. They also provide the geographical level for which a country's population projection is generally carried out.

Although the user may choose any of the Modules in PRODEM in order to make population projections of a desired geographical area, the user should be aware of the following when selecting a Module:

- Size of the geographical areas to be projected.
- Availability of basic data.
- Structure of the different Political and Administrative Divisions.

## **Projection Methods**

The Projection Methods included in PRODEM can be classified as follows: demographic, semi-demographic and mathematical.

In addition, the Utilities Module includes a set of procedures that has been programmed in order to enable the user, among other operations:

- to project Fertility and Mortality and create a file of basic data for later use in Projection Modules that contain the "component" method,
- to separate projections by sex and age starting from the projection of totals, and
- to group two or more population projections by sex and age groups. This option includes fertility, mortality and migration estimates for the group.

### **Demographic Method**

In PRODEM the demographic method corresponds to that procedure which, in order to project a population, considers the evolution of each of the components of population growth, that is, mortality, fertility and migration. Additionally, this method projects a population longitudinally in time through the management of cohorts and is called the "component" method of population projection.

Within PRODEM, projections using the "component method" can be found in three Modules:

- **National Module.** Projects population by sex and age by 5 years age group and for a period of up to 100 years. Using only the "component method", data input can be done manually or automatically by loading files with estimates prepared in the Utilities Module or by using "Models".

The projection program using the "component method" is the third version of the United Population Projection Computer Program written in Fortran and developed by the United Nations Population Division in 1981.

- **Major Areas Module.** Through the use of the "component method", population is projected by sex and age groups for three geographical areas.

The program included in this Module requires information on fertility, mortality and migration for the Area of Highest Hierarchical Level and the Major Area. With this data set it will project the population for the Area of Highest Hierarchical Level, for the Major Area and the Remaining Area which is obtained as the difference between the two others.

Although this method is to be found in the National, Major Areas and Urban-Rural Modules, it can be applied to any Administrative Division for which the necessary data is available.

### **Semi-Demographic Methods**

In **PRODEM** semi-demographic methods are those procedures which, considering the evolution of the population in the past, project population longitudinally or transversely.

The methods included in **PRODEM** having these characteristics are the following:

- **Cohort Ratio:** Beginning with the composition by sex and age observed in two censuses and referring to a set of Intermediate Areas, and in addition to a population projection which used the "component method" for an Area of Highest Hierarchical Level that contains the Intermediate Areas, the population of each one of these is projected through a longitudinal management of information using the variations of the different cohorts. The population projected by sex and age of each Intermediate Area is finally adjusted to the projection of the Highest Hierarchical Area.
- **Growth Differential:** Starting from the composition by sex and age observed in two censuses for a set of Intermediate Areas and a population projection for the Area of Highest Hierarchical Level, the population is projected by sex and age for each Intermediate Area transversally and the results are adjusted by using the projection of the Highest Hierarchical Level. This method corresponds to an adaption

made by CELADE of the ideas on "growth differential", initially developed by the United Nations in order to project urban and rural populations.

### **Mathematical Methods**

In **PRODEM** the mathematical methods correspond to procedures that use a mathematical function in order to project population.

Although in the Small Areas Module these procedures only enable the user to project the total population of a set of geographical areas, by linking this Module with the Utilities Module, the system separates these projections by sex and age.

The mathematical methods contained in **PRODEM** are the following:

- **Linear:** Projects the population through the use of a straight line with information at two moments; optionally, the results can be adjusted to the Large Area containing these populations.
- **Exponential or Geometrical:** Projects the population through the use of an exponential or geometrical function with information at two moments; optionally the results can be adjusted to the Large Area containing these populations.
- **Logistic:** Projects the population through the use of a logistic function with information at two moments and asymptotic values (low and high) between which the projection period is to be found.
- **Murphy:** Corresponds to a variant of the logistic function; with information at two moments the population is projected using a logistic function under the assumption that the higher asymptote corresponds to the population estimated 60 years after the last observation period; optionally the results can be adjusted to the Large Areas containing these populations.
- **Pickard I and II:** With information at two or three equally spaced moments, the population is projected while the proportion of each Small Area within the Large Area is taken into consideration; optionally the results can be adjusted to the Large Area containing these populations.

## **Tools**

In **PRODEM**, Tools is the Module containing a set of procedures that enable the user to manipulate files already existing in the System or to create auxiliary files.

Through this Module the user can access the following procedures:

- **Square Table:** Disaggregates to age groups the total population by sex projected as a group of Small Areas. The results are adjusted to the Large Area projection that contains them. To use this procedure, the user must supply the projection of the population by sex and age groups of the Large Area, the distribution by age of each of the Small Areas for a initial point in time and the totals projected by sex.
- **Mortality Projection:** Interpolates linearly the death probabilities by sex and age between an Initial Life Table and a Limit Table, and generates Life Tables that reproduce given life expectancies at birth. Optionally, the interpolated Life Tables give estimates of infant mortality and the life expectancy at birth to those who reached 80 years of age.

When a Limit Table is not entered, **PRODEM** provides the possibility of selecting it from a set of Limit Model Life Tables included in the System.

Once the Life Tables have been created, the System optionally generates a file with Survival Ratios, Life Expectancies at Birth and Infant Mortality Rates. These files can automatically be retrieved in the Modules that use the "component method" of projection.

- **Added Projections:** Sums two or more population projections by sex and age groups using the "component method", and generates the population by sex and projected age as well as a set of demographic indicators on fertility, mortality and migration implicit in these added projections.
- **Fertility Projection:** Projects the fertility level (Total Fertility Rate or Gross Reproduction Rate), the age-specific fertility (age-specific fertility rates or relative distribution) related to levels provided by the user or projected in this Module.

Once the fertility projections have been made, the System optionally generates a file with the age-specific fertility rates and the total fertility rates for automatic access in the Modules that use the "component method" of population projection.

---

## KEYBOARD DEFINITION WHEN USING PRODEM

It is **NOT** necessary to have extensive knowledge on how to use the computer in order to use PRODEM successfully; however, the following information provides the tools for a better communication between the user and the System.

In this manual the square parenthesis [ ] are used in order to refer to a direct action key, such as: [2], [Pg Up], [ENTER].

Throughout the use of the System, PRODEM permanently displays a set of Function Keys [Fx] in the lower part of the monitor. These [Fx] keys are generally located on the left side or the first row of the main keyboard; in PRODEM, they enable the user to perform the following operations:

- [F1] Provides a brief description of the information characteristics that have to be entered at the cursor location.
- [F2] Automatically loads into the National or Large Areas Modules the mortality data generated in the Utilities Module using the Mortality Projection Module option.
- [F3] Activates the processing of a population projection. See [F8].
- [F4] Prints the results of a process.
- [F5] Records data entered previous to activating this function.
- [F6] In the file selection and creation option, it enables the user to suppress data files and in the National Module, it enables the data input for estimating fertility through the use of modules.
- [F7] Temporarily disconnects PRODEM and returns to the Operating System (DOS). In order to return to PRODEM, the User must use the EXIT command.
- [F8] Displays on a screen the results of a projection.
- [F9] Displays a screen for creating the Data and Work Directories of the System.

- [F10]** Allows the user to leave a Module or to exit PRODEM.
- [CTRL][F1]** Displays the System organization in the selection of Modules screen.
- [Home]** Allows the user to return to the first screen (generally the General Parameters screen) during the data input or to the first screen of results when the option [F8] has been used.
- [PgDn]** Allows the user to move forward to the following screen in a data input session or during the display of results on screen.
- [PgUp]** Allows the user to move to the previous screen in a data input session or during the display of results on screen.
- [Esc]** Allows the user to exit a screen with incorrect data and to return to the previous screen.
- For the selection of Modules and/or Methods screens, the following keys are available:
- [↑][↓]** Allow the user to select the Projection Methods in the Main Menu or files in the Selection and/or Creation of Files screen.
- [←]** Allows the user to select a Method in the Main Menu.
- [→]** Allows the user to return from the selection of Methods to the selection of Modules in the Main Menu.

---

## 2. INSTALLATION OF PRODEM

You will receive with this manual 3 double density floppy disks. Please make sure that, together with the System identification the labels clearly state: INSTALL-DISK 1, INSTALL-DISK 2, INSTALL-DISK 3.

### System requirements for PRODEM

PRODEM runs on IBM-PC microcomputers or other compatibles such as EPSON, COMPAQ, etc.. Although it contains routines developed in Fortran and C languages, most of its programs and its structure were developed in BASIC, Quickbasic Compiler, Version 3.2 of Microsoft.

In order to run **PRODEM**, you will require a minimum of 640 Kb of RAM, 1 hard disk, 1 floppy disk drive, a (color or mono) monitor and a printer.

### Installation of PRODEM

To install **PRODEM**, carefully follow the following instructions:

- When the equipment is under the Operating System control, that is in the "prompt" mode (C:>), insert the INSTALL 1-DISK1 in drive A and move to drive A: as follows:

A: [ENTER]

- Once you have moved to A:>, enter the installation command typing

INSTALL [ENTER]

and answer the questions of the following screen:

PRODEM 2.0	Installation Procedure
<p>CELADE Centro Latinoamericano de Demografía          Casilla 91 Santiago CHILE          TELEF 288-5051 CABLE UNATIONS FAX (562) 2888252</p>	
<p>¿In what drive/directory are you going to          install the PRODEM programs ?</p>	
<p>Directory : C:\PRODEM _____</p>	
<p>&lt;ENTER&gt; to continue. &lt;ESC&gt; to exit</p>	

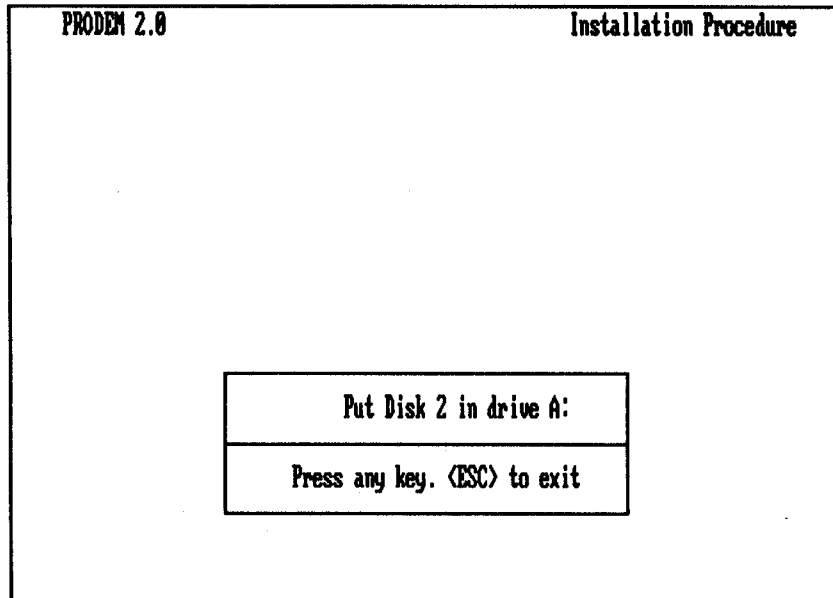
Once you have pressed [ENTER], the following screen will appear:

PRODEM 2.0	Installation Procedure
<p>PRODEM Installation Arguments</p>	
<p>System Directory : C:\PRODEM</p>	
<p>(I)nstall (M)odify (A)bandon</p>	

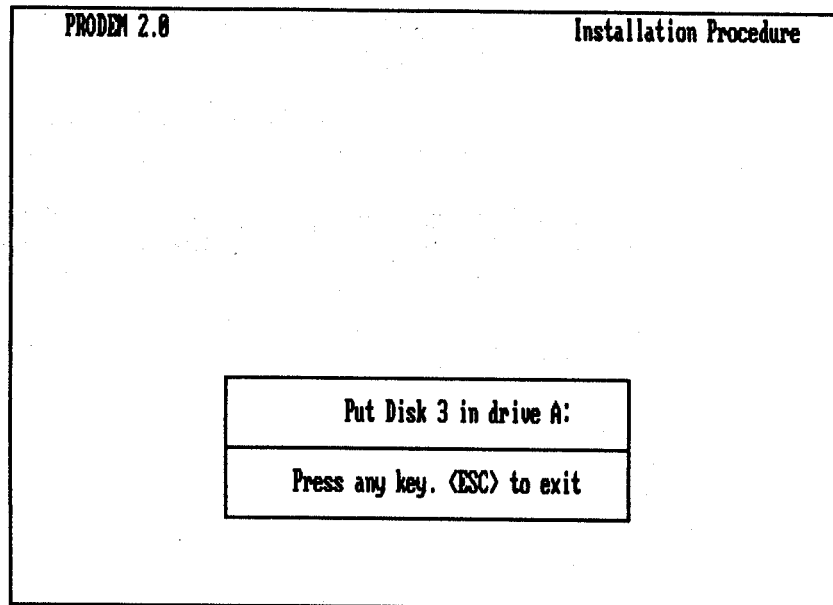
- 1 To indicate to the System that you will carry on with the installation of PRODEM.

- 2 To modify the name of the Directory which will contain the processing programs.
- 3 To exit the installation of **PRODEM** and return to the Operating System.

- Once the Disk 1 files have been copied, your computer will beep in order to carry on with the installation of **PRODEM** and the monitor will display the following message:



- In order to continue with the installation of **PRODEM**, insert the disk labelled **INSTALL-DISK 2** in drive A and press [ENTER]; if you want to interrupt the installation, press [ESC].
- Once the **INSTALL-DISK 2** files have been copied, the System will beep to indicate that the program files from the disk labelled **INSTALL-DISK 3** be loaded:



- At this stage, follow the same instructions given in the two previous paragraphs.
- Once the last installation disk has been copied, read the following message carefully:

The PRODEM system has been installed.

After appending in your AUTOEXEC.BAT  
the sequence :

```
PATH=...:C:\PRODEM  
SET PRODEM=C:\PRODEM
```

execute PRODEM entering the following  
command :

```
PRODEM [ENTER]
```

- When this message appears, your computer will be in mode A:>; leave it under the Operating System by pressing C: [ENTER] and remove from your floppy drive the INSTALL-DISK 3 disk.
- Using one of the Editor Programs available in your System (for example, Sidekick, Edlin or others) perform the following operations:
  - a) Load the AUTOEXEC.BAT file and add to your PATH command the drive in which the PRODEM system files reside with PRODEM. For example:

```
PATH=c:\dos;c:\lotus;C:\PRODEM
```
  - b) In this same AUTOEXEC.BAT file, write the following instruction in a new line:

```
SET PRODEM=C:\PRODEM
```
  - c) Save this new AUTOEXEC.BAT file.
  - d) Press simultaneously the [Ctrl] [Alt] [Del] keys so that your system can now recognize the presence of PRODEM.

---

## TESTING THE INSTALLATION OF PRODEM

To verify that the System has been properly installed, carefully follow the instructions indicated in this Section :

- Before using **PRODEM** it is necessary to create the Directories where the projections basic data and the results are to be stored. Starting from C:\ enter the following commands:

**C:> MD PRODATA [ENTER]**

In this example the PRODATA Directory will be used to store data.

**C:> MD PROOUT [ENTER]**

In this example the PROOUT Directory will be used to store results.

Once these Directories have been created, use

**C:> PRODEM [ENTER]**

to start the program.

The screen will display the System's logo; press any key to continue and access PRODEM's Main Menu:

PRODEM		MAIN	Time 19:28 Date 02/26/1992
		DEFINITION OF MODULES	

NATIONAL	N
MAJOR AREAS	Y
INTERMEDIATE AREAS	I
MINOR AREAS	E
URBAN RURAL	U
TOOLS	R

LINEAR EXPONENTIAL-GEOMETRICAL LOGISTIC MURPHY PICKARD
--

This module contains a set of mathematical models to project the total population of one or more geographical areas observed at 2 or 3 moments in time (for example censuses). In order to separate these projections, by sex and/or age the SQUARE TABLE METHOD can be used.

CAPS

F1-Help ↔SelMenu CtrlF1-Outline	F7-DOS F9-SetUp F10-Quit
---------------------------------	--------------------------

- Since the System has just been installed, you need to indicate the Directories where you wish to store the basic data and the results of the projections; press the [F9] key on the Set-up screen and enter:

C:\PRODATA (for the Data Directory)

C:\PROOUT (for the Working Directory)

**PRODEM** | **Set-Up**

<b>Data Directory</b>	: C:\PRODATA
<b>Work Directory</b>	: C:\PROOUT
<b>Language</b>	: ENG

Full pathname of your data directory.

F10-Exit

- Press the [F10] key to return to PRODEM's Main Menu.
- Press the [E] key to display on the monitor the population projection methods for a Small Areas group and then [ENTER], to access the screen with the file which will contain the projection data:

```
PRODEM          MINOR AREAS          Time 19:37  Date 02/26/1992
$$$$          SELECT ONE OF THE FOLLOWING FILES

TEST FILE TO REVIEW THE CORRECT
PRODEM INSTALATION

F1-Help  CtrlF1-Outline  F6-Erase          CAPS
                                           F10-Quit
```

- On this screen identify the data file to be created:
  - a) Press [ENTER] and provide a four-character code, the first two characters always being alphabetical (in this example, TEST).
  - b) Press [ENTER] and describe in two lines the file to be created, for instance in the first line write FILE TO BE REVIEWED and [ENTER] and in the second one INSTALLATION OF PRODEM and press [ENTER] again.
- Once the specifications of the data file have been entered, the monitor will display the following screen:

```

PRODEM          MINOR AREAS          Time 13:53 Date 01/28/1992
$$$$          SELECT OLD FILE FOR COPY OR DEFAULT

System default

```

- Press [ENTER] to select the System default which corresponds to a fictitious file for use in this Module.

```

PRODEM          MINOR AREAS          Time 19:39 Date 02/26/1992
TEST          METHOD SELECTION

SELECT METHOD          :8
0 Linear
1 Exponential or geometrical
2 Logistical
3 Murphy
4 Pickard I
5 Pickard II

GENERATE COMMUNICATION FILE :8
8 Not necessary
1 With totals projected for
  other modules

CAPS
F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

```

- This screen enables the user to select the procedure by which the Small Areas population will be projected. These can be used as a data file and be separated in the Tools Module.
- Press [F3] to project the data using the selected method (in this case, Pickard II) and wait for the display of the results on the screen:

PRODEM TEST		LISTING				Time 19:40	Date 26/2/1992
<b>PICKARD II METHOD</b>							
<b>A R E A</b>	<b>1985</b>	<b>1990</b>	<b>1995</b>	<b>2000</b>			
SUBAREA 1	187962	117185	126270	135257			
SUBAREA 2	497	387	297	228			
SUBAREA 3	2784	2764	2843	2762			
AREA I	111243	128336	129418	138247			

←→↑↓-MovPg PgUp-PgAnt PgDn-PgPos Ctrl←→-PgLefRig Home-1°Pg End-LastPg F10-Quit

- On this screen, together with the Small Areas population projection, you will find at the bottom of the screen a set of keys which allow you to view the results on the screen when the output exceeds the monitor's size. When you press [F8], this screen configuration will appear at the end of every projection or any already processed projection.
- Once you have checked the results of this Manual with those displayed on the screen, press [F10] to exit the on-screen results option.
- To exit **PRODEM**, press [F10] and answer the System's questions before quitting this working session.

If **PRODEM** displayed all the information presented in this Section of the Manual, the System is now ready to project populations in any of its Modules.

If installing **PRODEM** with the default data did not reproduce the results of this Manual, proceed as follows:

- Verify the procedures for the proper installation of the System.
- Remember that 640K of available RAM is required to run **PRODEM** properly; therefore, you should make sure that your computer has that capacity; usually, the presence of "resident programs" such as Sidekick or others, reduce the available memory. In that case, remove them from your Autoexec.bat.
- Make sure **PRODEM** is in the proper path and that the command **SET PRODEM = C:\PRODEM** has been defined.
- Make sure the **AUTOEXEC.BAT** file contains only those paths needed for frequent use of the equipment.
- If the problem persists refer to your Office's Computer Department, which, among other possibilities, should be able to modify the **CONFIG.SYS** file adding the following commands:  
  
**Shell = command.com /p /e:256**
- If, in spite of these directions, **PRODEM** doesn't work properly, contact CELADE and describe your problem in full detail.

---

### 3. GENERAL OPERATION OF PRODEM

This Chapter contains the following sections:

**Starting a  
Working  
Section**

Describes the way by which you should call **PRODEM** once it is installed.

**PRODEM  
Menus**

Describes **PRODEM's** Main Menu, with a graphical description of each option in the submenus.

**Creating and  
Selecting Data  
files**

Once the procedure to project the population is selected, **PRODEM** allows you to create working files or to select an already created file in a former working session.

**A Few  
Considerati-  
ons**

Describes the hierarchical structure established by **PRODEM** depending upon the selected module, and the options to create and identify the files corresponding to each level.

---

## **STARTING A WORKING SESSION**

If PRODEM is not installed, follow the instructions specified in Chapter 2 **INSTALLATION OF PRODEM**; if the System is already installed then enter the following command:

**C:> PRODEM [ENTER]**

The screen will display the System logo. To move forward, press any key, as indicated at the bottom of the screen, and you will access PRODEM's Main Menu.

---

## PRODEM MENUS

PRODEM provides two menus from where you can reach the projection procedures; the first one corresponds to the geographical level for which you want to project your population (MODULE) while the second one refers to the projection procedures (METHOD).

After processing a projection, the PRODEM user can send his results to printer or load them automatically in other modules. By doing so, the user can break them up at other geographical levels (COMMUNICATION).

This is the System's Main Menu:

PRODEM	MAIN	Time 19:43	Date 02/26/1992
DEFINITION OF MODULES			
NATIONAL	N	COMPONENTS	C
MAJOR AREAS	V	COHORT RATIO	H
INTERMEDIATE AREAS	I	GROWTH DIFFERENTIAL	F
MINOR AREAS	E		
URBAN RURAL	U		
TOOLS	R		

Enables to project the population by sex and age for two or more geographical areas for which a projection of the population by sex and age of the highest hierarchical area that contains them is available.

CAPS

F1-Help   ↔SelMenu   CtrlF1-Outline                      F7-DOS F9-SetUp F10-Quit

In this screen you can:

- Select a Projection Module.
- Select the Projection Procedures.
- Return to DOS.

- Indicate to the System where you wish to store the basic data and the results.
- Find out which modules can inter-communicate.
- Exit a working session in PRODEM.

### **Selecting and entering a Projections Module**

To select a Projection Module in Prodem, you use the [↑] or [↓] keys; concurrently, at the right of each menu, the System displays a sub-menu with the Projection Procedures. Press the [ENTER] key to enter the Projections Module.

If you interrupt a working session in PRODEM and you wish to continue in the same Projections Module, instead of using the scroll keys, you can type the identification letter of the module to be selected; for example, to enter the Large Areas, you only have to press the [Y] key.

Once a Projection Module is selected, you can correct this selection by using the [-] key, provided the Procedure is not yet loaded into the computer memory.

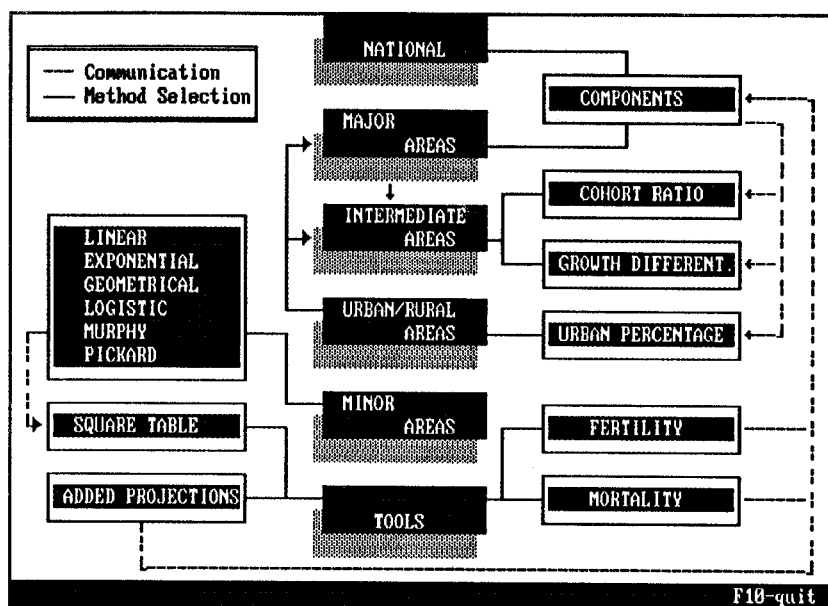
### **Entering a Projection Procedure**

To access a Projection Procedure, place the cursor in the method to be used and press [ENTER].

If you interrupt a working session and wish to continue in the same Module and Projection Method, pressing the keys with the identification letters of the Module and the Method in the main screen will get you there; for example, to access directly the Major Areas Module and the Cohort Ratio Method, first press [Y] and then [H].

### **Communications Diagram**

If you wish to disaggregate the projection further for different geographical levels, pressing the [Ctrl] [F1] keys simultaneously will display the System's outline showing those Modules that can inter-communicate; by pressing [F10] you can return to the selection of Modules.



**Partial interruption of a working session**

In the main screen, [F7] enables the user to suppress PRODEM, thus leaving the equipment under the Operating System (DOS) control; in this case you must follow these steps:

- a) Press [F7].
- b) Press any key to temporally suppress PRODEM.
- c) When the System is under the DOS control, it is possible to perform any command belonging to the Operating System, for example, the Copy, Rename, Change Directory, Make Directory, Format commands or others.
- d) Return to PRODEM typing the EXIT command followed by [ENTER].

Use this option to create Directories where you want to load the basic data, and where you want to store the projections output files created by PRODEM. See Set-Up.

**Use of the  
Set-Up option**

PRODEM enables the user to address the storage location for both the basic and the elaborated information; to achieve this, perform the following operations in the Modules selection screen:

- a) Press [F7].
- b) Press any key to suppress PRODEM.
- c) Create the Directories where you wish to store data or change to the directories where the basic data files and the projections elaborated in PRODEM are located, for example:

```
C:> MD PRODATA      (for data files)
C:> MD PROOUT       (for results files)
```

- d) Return to PRODEM typing the EXIT command and pressing the [ENTER] key.
- e) Press [F9] and indicate the just created Directories in the Set-Up screen.
- f) Press [F10] to pursue the work in PRODEM.

It is worth mentioning that there is a possibility to work with the floppy disks; in this case, you should determine the respective unit, for example, A:\

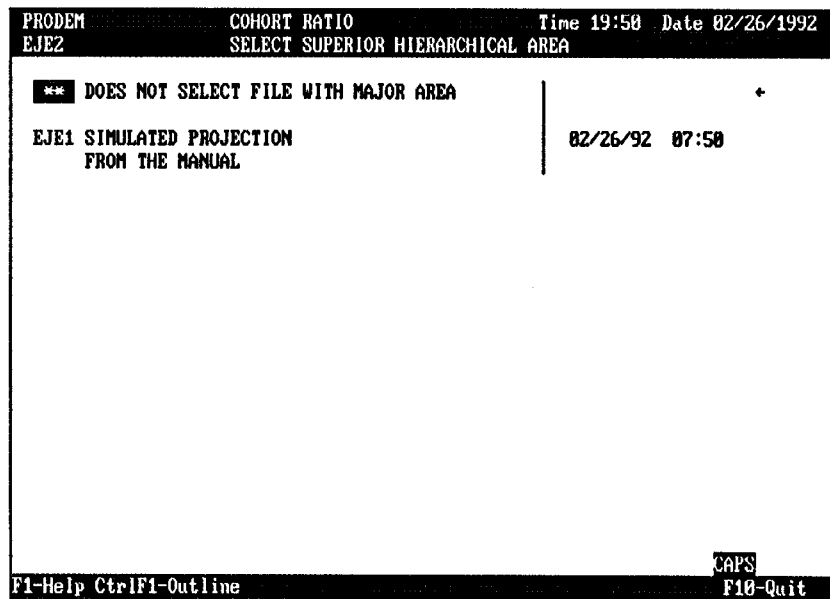




- b) **Use of existing files:** If data files for the PRODEM Module in use are available, this screen enables the user to create a new file from an existing one. In this case, select the existing file, which will serve as a base to generate a new one. You should use this option if you wish to modify the data of an existing projection.

**Selecting files of the Highest Hierarchical Level**

While projecting at urban-rural level, for major administrative divisions or intermediate areas, the Highest Hierarchical Level projection, which contains the lower hierarchical levels should generally be divided. In these cases, if you projected the Highest Hierarchical Level through the System and you indicated that you wanted to inter-communicate with another Module in this file, PRODEM will show, in addition to the screens provided for the creation of files, the following:



The purpose of this screen is to avoid the manual input of the projection corresponding to the Highest Hierarchical Level. To use, follow these instructions:

- If the projection, which is to be divided, has not been elaborated in PRODEM, select the option "Do not select file with Highest Hierarchical Level". This will indicate to the System that the information will be entered manually together with the basic data of the areas to be projected.

- If the projection, which is to be divided, has been elaborated and is found in PRODEM, select the file with the corresponding data so that the System will load it automatically.

---

## **A FEW CONSIDERATIONS CONCERNING THE FILE SELECTION AND CREATION SCREENS**

- When working with the "component method" in the Major Area and the Urban-Rural Modules, PRODEM will automatically load as Highest Hierarchical Level files, those files created in the National Module as well as those created in the active Module.
- Using the "component method" from the Major Areas Module, PRODEM you can simultaneously execute up to three projections, i.e. the Highest Hierarchical Level one, the Major Area one, and the one obtained as the difference between the former ones. For the latter, the System will request the identification of the corresponding file.
- If the Cohort Ratio and the Growth Differential methods are used, the Highest Hierarchical Level files displayed by PRODEM are those entered manually or those of the National, Major Areas or Urban-Rural Modules ("component methods"), provided that you selected "Generate Communication File" while creating it.
- In case of the Minor Areas Module, you can only project the population totals; therefore, no screens are provided for the display of Highest Hierarchical Level files.
- You should be aware that PRODEM provides the possibility of creating new files through the "\$\$\$ System default option". This "default", which corresponds to fictitious data, has been included in the System in order to review its installation and to help the user during the data input process. See Chapter 2 INSTALLATION OF PRODEM.

**Data and  
Results Files**

The data and result files in their respective Directories (see Section: Use of the Set-Up option) have the following configuration:

**PRxxxxnn.EXT**

where,

- PR** corresponds to characters assigned by the System,
- xxxx** corresponds to the identification given by the user for the file,
- nn** corresponds to the identification of the projections Module given by the System,
- EXT** corresponds to the identification of the type of file given by the System to differentiate, for example, the output (OUT), basic data (INP) and temporary use (TMP) files.

## 4. NATIONAL MODULE

When you select the National Module, the System will load the Population Projection Program for microcomputers developed by the United Nations Population Bureau, called ABACUS. This program enables the user to project populations with the "component method".

In this Module PRODEM presents a set of screens, which allow the input of basic data manually or the input of data generated in other Modules of the System (for example, fertility and mortality projections).

To enter this Module select the following option in PRODEM's main menu:

MODULE	KEY
NATIONAL	N
MAJOR AREAS	Y
INTERMEDIATE AREAS	I
MINOR AREAS	E
URBAN RURAL	U
TOOLS	R

COMPONENTS

For a period of up to 30 quinquenniums, population projections and backward projections by sex and age group are made using the component method. Fertility, mortality and migration data can be supplied by the user or estimated using the models provided within this software.

F1-Help +SelMenu CtrlF1-Outline F7-DOS F9-SetUp F10-Quit CAPS

### Objectives of the Module

In this Module, the population can be projected or retrojected (backward population projection) by sex and 5 year age groups from 0-4 to 80+ years of age, for a period of up to 100 years.

In addition to the population projected by sex and age for each quinquennium of the period covered by the projection, you can obtain a

listing with the basic data entered and several fertility, mortality and migration indicators and rates.

#### **Basic Information**

This Module enables the user to project the population with the following basic information:

- Total population by sex, in 5 years age groups, for the base year of projection.
- Net migrant balances by sex, for 5 years age groups, for every quinquennium projection period. Additionally, among other options total migration rates, by sex or by age groups can be indicated here.
- Total fertility rates or gross reproduction rates for each projection quinquennium. These synthetic fertility variables can be used to produce age related estimates through the use of Models.
- Age-specific fertility rates by age of the women, or fertility structures for each quinquennium of the projection. Additionally, among other options, estimates developed in the Tools Module can be loaded or the user can resort to the use of Models.
- Life expectancy at birth by sex, for each quinquennium of the projection. This synthetic mortality measure can be used in order to estimate the survival ratios according to specific Models.
- Survival ratios by sex, for 5 year age groups, for each quinquennium of the projection. Additionally, among other options, estimates developed in the Tools Model can be loaded or the user can resort to the use of Models.

#### **Module Options**

Once the new file has been identified (following instructions in Chapter 3, Section File Selection and Creation), PRODEM offers, by use of the Parameters screen, the user the possibility to:

- **Describe the general characteristics of the projection:** name of the geographical area, projection period, comments, etc.
- **Describe the characteristics of the migration data:** net balances, migration rates, relative distribution of migrants by single years of age etc.

- Describe the characteristics of the fertility data: fertility rates by single years of age, fertility structure by single years of age, use of Models, etc.
- Describe the characteristics of the mortality data: life expectancy at birth, survival ratios at birth, survival ratios by sex and age, use of Models, etc.

**General Parameters**

Once the projection file has been identified, the screen displays the General Parameters and indicates to PRODEM the type of projection and data:

```

PRODEM          NATIONAL          Time 14:22 Date 03/02/1992
EJE1           GENERAL PARAMETERS

POPULATION NAME          : TERRITORIO NACIONAL
BEGINNING YEAR OF FORWARD PROJECTION : 1988
ENDING YEAR OF FORWARD PROJECTION   : 2000
BASE YEAR OF FORWARD PROJECTION     : 1988

TYPE OF FORWARD PROJECTION          : 0 GENERATE COMMUNICATION FILE : 0
0 Forward projection                 0 Not necessary
1 Backward projection                1 With population projected by
2 Forward projection/backward        age and sex for other modules
  projection

DIRECT SELECTION OF COMPONENTS      : 0
0 Normal Flow  2 Fertility
1 Migration    3 Mortality

COMMENTS:  SYSTEM DEFAULT

                                     CAPS
F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

```

**NAME OF THE POPULATION**

The geographical area to be projected should be identified with a maximum of 28 characters.

**BEGINNING YEAR OF PROJECTION  
FINAL YEAR OF PROJECTION  
BASE YEAR OF PROJECTION**

This information determines the period to be covered by the projection; the intervals determined by these years should correspond to a multiple of five and the relationship between them should correspond to the **TYPE OF PROJECTION** (projection, backward projection or projection and backward projection).

**TYPE OF PROJECTION**

This parameter relates to the chronological order in which the dates for the period covered by the projection are supplied; when selecting the type of projection you should consider the following:

**0 PROJECTION**

In this option the base year and the beginning year coincide and the final year should be larger.

**1 BACKWARD PROJECTION**

In this option the final year and the base year coincide and the beginning year should be larger.

**2 PROJECTION AND BACKWARD PROJECTION**

In this option the beginning year should be smaller than the base year and the base year should be smaller than the final year of the projection.

**DIRECT SELECTION OF THE COMPONENTS**

This parameter allows the user to directly access the fertility, mortality and migration screens:

- 0 Allows the user to enter or modify the base population, migration, fertility and mortality data.
- 1 Allows the user to enter or modify information relating only to **migration**.
- 2 Allows the user to enter or to modify information relating only to **fertility**.

- 3 Allows the user to enter or to modify information relating only to mortality.

Use always option 0 when you are creating a projection for the first time. If you want to repeat a projection changing the migration, fertility or mortality data, use options 1, 2, or 3 respectively.

#### CREATE COMMUNICATION FILE

- 1 After completing the projection processing, the System creates a file for future use as a data file for the Highest Hierarchical Level both in the Major Areas Module as in the Urban-Rural Module. In PRODEM you can only create a communication file when the type of projection has been coded 0 PROJECTION.
- 0 PRODEM does not create communication files.

#### COMMENTS

In this section, the user can register in two lines a few observations related to the projection file to be created; these comments will be printed in the output file. You should not use more than 64 characters per line, otherwise the comment will appear incomplete on the screen.

After entering the information into this screen, access the following screen by pressing [PgDn].

PRODEM EJES1	NATIONAL GENERAL PARAMETERS	Time 14:23 Date 03/02/1992
<b>TYPES OF OUTPUT</b>		
0 Yes 1 No		
Population by Five Years Age Groups	:	0
Population by Single Years of Age	:	1
Structure and Masculinity Proportion	:	1
Pyramide	:	1
Input	:	1
COPS		
F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NextSCR F10-Quit		

#### TYPES OF OUTPUT

Allows the user to indicate to the System the detail desired for the printing of the projection results; code 0 to calculate and print them and 1 when calculation and printing are not desired. The System always calculates and prints the demographic indicators of the projection.

Request the calculation and printing of:

- **Population by Quinquennial Groups**  
In this case, the output contains the composition by sex, according to age groups and a set of demographic indicators for each quinquennium of the projection.
- **Population by Single Years of age**  
In this case the output contains the composition by sex, according to age groups, a set of demographic indicators for each quinquennium of the projection and an estimate of the population aged 0 to 24 by single years of age.

- **Sex Structure and Ratio**  
In this case, the output contains the relative structure of the population by sex and age groups and the sex ratios for each quinquennium of the projection.
- **Pyramid**  
In this case, the output contains the composition by sex and age groups of the population and an age pyramid for the base year and the final year of the projection.
- **Input**  
In this case, the output contains only the basic data.

After completing the information input of this screen, press [PgDn] to move to the next screen.

**Base  
Population  
Input**

The input of numerical data begins with the next screen:

PRODEM		NATIONAL		Time 14:24 Date: 03/02/1992	
EJE1		BASE YEAR POPULATION			
YEAR: 1980		AGE	MALES	FEMALES	
TOTAL MALES :	5498444	0- 4	614597	595528	
TOTAL FEMALES:	5646331	5- 9	633485	616915	
		10-14	637783	623626	
		15-19	636854	625817	
		20-24	553953	546777	
		25-29	467862	464986	
		30-34	308057	303949	
		35-39	325597	334772	
		40-44	261831	272837	
		45-49	232822	251278	
		50-54	282368	224658	
		55-59	168841	184981	
		60-64	131846	158565	
		65-69	108948	128576	
		70-74	76247	102486	
		75-79	46159	67227	
		80-Y+	38558	63449	

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit  
To enter the base population of the projection, i.e. totals by sex and ages, type the data and press [ENTER] or [↑].

### Correction of errors

Before entering the total population for each sex, you should verify that the total corresponds exactly to the sum of the population by ages; if not, once the data input has been completed and moving to the following screen, PRODEM:

- Will indicate the sex and the total the System obtains by adding the data entered by age groups, and
- Will not be able to continue with the working session as long as the error is not corrected. In order to correct, press [PgUp] to move back to the last screen and then press [PgDn] to obtain the screen containing the error.

Whenever finished with the base population, press [PgDn] to enter the migration parameters.

### Migration Parameters

To enter the migration information, the following options are available in the next screen:

```
PRODEM          NATIONAL          Time 14:24 Date 03/02/1992
EJE1           MIGRATION PARAMETERS

BEGINNING YEAR OF MIGRATION      :1988
ENDING YEAR OF MIGRATION         :2000
TYPE OF DATA FOR MIGRATION      :3
0 No migration is assumed
1 Migrants by sex + Distr by sex and age
3 Migrants by sex and age
4 Net rates of migration + Perc. Distr. for both sexes combined

DATE OF MIGRATION                :1
0 In the middle of the quinquennium
1 At the end of the quinquennium

CAPS
F1-Help F2-Run F4-Print F5-Save F8-View Home-Is1SCR Pg-NxtSCR F10-Quit
```

**BEGINNING YEAR OF MIGRATION**  
**FINAL YEAR OF MIGRATION**

This information determine the projection period that assumes migration; the beginning year and the final year of migration should be multiples of 5 and both dates must be comprised between the beginning year and the final year of projection.

**TYPE OF DATA FOR MIGRATION**

Communicates to the System the way Migration data will be provided; the following options are available in PRODEM:

- 0 Indicates that this projection does not include migration.
- 1 Allows the user to enter the total migration balance by sex of each quinquennium and a single relative distribution by sex and age; the algebraic sum for each sex must be equal to 1. Negative migration data should be preceded by a (-) sign.
- 3 Allows the user to enter the total net migration balances by sex and age of each period in absolute values. Negative migration data should be preceded by a (-) sign.
- 4 Allows the user to enter net migration rates for both sexes by period and a single relative distribution by sex and age; the algebraic sum of the distributions should be equal to 1 for both of the sexes. Negative migration data should be preceded by a (-) sign.

**DATE OF MIGRATION**

Allows the user to indicate to the System when to add migrants to the projection :

- 0 If migration takes place in the **middle** of each quinquennium.
- 1 If migration takes place at the **end** of each quinquennium.

Depending on the option selected in the Type of Data for Migration parameter, pressing [PgDn] will display the screens that allow the input of this "component" of demographic growth:

- a) If the option selected is 0, i.e. "No migration assumed", pressing [PgDn] will cause the System to ask for information on Fertility.
- If the option selected is 1, i.e. "Migrants by Sex + Percentage Distribution by Sex and Age", data should be provided through the following screens:

PRODEM		NATIONAL		Time 14:30 Date 03/02/1992	
EJE1		MIGRANTS			
	MALES		FEMALES		
1980-85	0		0		
1985-90	0		0		
1990-95	0		0		
1995-00	0		0		

CAPS

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

For each quinquennium in which the user wishes to assume migration, give the total net migration balances by sex with their sign and press [PgDn].

AGE	MALES	FEMALES
0- 4	0.000000	0.000000
5- 9	0.000000	0.000000
10-14	0.000000	0.000000
15-19	0.000000	0.000000
20-24	0.000000	0.000000
25-29	0.000000	0.000000
30-34	0.000000	0.000000
35-39	0.000000	0.000000
40-44	0.000000	0.000000
45-49	0.000000	0.000000
50-54	0.000000	0.000000
55-59	0.000000	0.000000
60-64	0.000000	0.000000
65-69	0.000000	0.000000
70-74	0.000000	0.000000
75-79	0.000000	0.000000
80-Y+	0.000000	0.000000

CAPS

F1-Help F2-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

Enter the single relative distribution of the migration balances given in the previous screen; the algebraic sum for each sex should be equal to 1.

- c) If the option selected is 3, i.e. "Migrants by Sex and Age", the following screen will be the screen in which to enter the basic data for each quinquennium of the period covered by the migration:

PRODEM		NATIONAL		Time 14:32	Date 03/02/1992
EJE1		NUMBER OF MIGRANTS			
QUINQUENNium 1980- 1985		AGE	MALES	FEMALES	
TOTAL MALES :	-28000	0- 4	-900	-1000	
TOTAL FEMALES:	-32000	5- 9	-1200	-1300	
		10-14	-1800	-2200	
		15-19	-3000	-3500	
		20-24	-5300	-6700	
		25-29	-6600	-7100	
		30-34	-2000	-3500	
		35-39	-2700	-2400	
		40-44	-1700	-1600	
		45-49	-800	-1000	
		50-54	-500	-700	
		55-59	-400	-550	
		60-64	-100	-100	
		65-69	-90	-120	
		70-74	-60	-00	
		75-79	-40	-60	
		80-Y+	-10	-10	

CAPS

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

Provide net migration balances by sex and age with their respective sign.

#### Correction of errors

Before entering the migration balances of each sex, verify that the total corresponds exactly to the sum of the migration balances by age; if this condition is not fulfilled, once the data input has been completed and moving to the next screen, PRODEM:

- Will indicate the sex and the total the System obtains by adding the data input by age groups, and
  - Will not be able to continue with the working session as long as the error has not been rectified. In order to correct, press [PgUp] to move back to the previous screen and then press [PgDn] to obtain the screen containing the error.
- d) If the option selected is 4, i.e. "Net Migration Rates + Percentage Distribution of Both Sexes", the migration data should be entered as follows:

PRODEM		NATIONAL		Time 14:33 Date 03/02/1992	
EJE1		NET MIGRATION			
NET MIGRATION RATES per 1000					
1980-85	0.0000	1985-90	0.0000	1990-95	0.0000
1995-00	0.0000	null	0.0000	null	0.0000

CAPS

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

For each projection period that assumes migration, enter the Total Net Migration Rates expressed in thousands with the respective sign and press [PgDn].

PRODEM		NATIONAL		Time 14:34 Date 03/02/1992	
EJE1		DISTRIBUTION OF MIGRANTS			
AGE	MALES	FEMALES			
0- 4	0.000000	0.000000			
5- 9	0.000000	0.000000			
10-14	0.000000	0.000000			
15-19	0.000000	0.000000			
20-24	0.000000	0.000000			
25-29	0.000000	0.000000			
30-34	0.000000	0.000000			
35-39	0.000000	0.000000			
40-44	0.000000	0.000000			
45-49	0.000000	0.000000			
50-54	0.000000	0.000000			
55-59	0.000000	0.000000			
60-64	0.000000	0.000000			
65-69	0.000000	0.000000			
70-74	0.000000	0.000000			
75-79	0.000000	0.000000			
80-Y+	0.000000	0.000000			

CAPS

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

Enter a single relative distribution of the migrants by sex for the whole projection period; the algebraic sum of the distributions should equal 1 for the total of both sexes.

**Fertility Parameters**

To enter information on Fertility, the options shown in the following screen are available:

```

PRODEM          NATIONAL          Time 15:22 Date 03/02/1992
EJE1           FERTILITY PARAMETERS

TYPE OF DATA FOR FERTILITY      :0

0 Rel. distr. of fertility by five years age groups
1 Fertility rates by five years age groups
3 Rel. distr. of fertility by single year of age
4 One set of fertility rates
5 AFRICAN model
6 ARABIC model
7 ASIAN model
8 Limiting model for relative distribution
9 Limiting model for Fertility rates
  (F6:Model Input and year of Forward projection)

FERTILITY LEVEL                  :0

0 GRR given by the user
1 TFR given by the user

CAPS
F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

```

**TYPE OF FERTILITY DATA**

In order to communicate to PRODEM the characteristics of the age-specific Fertility data:

- 0 Allows the user to enter a **relative distribution** of age-specific fertility rates for each quinquennium of the projection.
- 1 Allows the user to enter the **age-specific fertility rates** for each quinquennium of the projection.
- 3 Allows the user to enter a **single relative distribution** of age-specific fertility rates for the whole projection period.

- 4 Allows the user to enter a **single set of fertility rates** by age for the whole projection period.
- 5,6,7 The system selects from the United Nations Fertility Models, relative fertility distributions by age valid for each quinquennium of the projection, starting from the given gross reproduction rates or total fertility rates.
- 8 By interpolating, the System calculates **fertility structures**, given an initial structure, a limit structure and gross reproduction rates or global fertility rates. Optionally, you can select a limit structure among models - with a gross reproduction rate equal to 1 - of an early, intermediate or late peak.
- 9 The only difference with the previous option is that in this case the System calculates **fertility rates**.
- [F6] Whenever the options 8 or 9 in **TYPE OF FERTILITY DATA** have been selected, pressing [F6] will display a screen to select the limit model and to indicate the year from which interpolation will start.

In the next example, which projects the relative fertility structures, the following instructions were given:

- a) In **TYPE OF FERTILITY DATA**, 8 was selected to indicate that the user wishes to calculate the relative fertility structures.
- b) [F6] was pressed and 3 [ENTER] selected, to indicate that the late peak fertility model will be used as a limit.
- c) 1990 [ENTER], to indicate that calculations will be made starting from the year 1990.
- d) In **FERTILITY LEVEL**, 1 was selected to indicate that global fertility rates will be provided for each quinquennium of the projection.

PRODEM	NATIONAL	Time 15:22 Date 83/82/1992
EJE1	FERTILITY PARAMETERS	

TYPE OF DATA FOR FERTILITY : 3

0 Rel. distr. of fertility by five years age groups  
 1 Fertility rates by five years age groups  
 3 Rel. distr. of fertility by single year of  
 4 One set of fertility rates  
 5 AFRICAN model  
 6 ARABIC model  
 7 ASIAN model  
 8 Limiting model for relative distribution  
 9 Limiting model for Fertility rates  
 (F6:Model Input and year of Forward project

FERTILITY LEVEL : 0

0 GRR given by the user  
 1 TFR given by the user

FERTILITY MODEL : 3

1 Early  
 2 Intermediate  
 3 Late

Beginning year of the Fertility Projection : 1990

CAPS

F1-Help F3-Run F4-Print F5-Save F8-View None-1stSCR Pg-NxtSCR F10-Quit

#### FERTILITY LEVEL

- 0 Allows the user to indicate that the fertility level will be entered in terms of the GRR for all the quinquennia of the projection.
- 1 Allows the user to indicate that the fertility level will be entered in terms of the TFR for all the quinquennia of the projection.

**F2** This option belongs to the new PRODEM version, which allows to select and load automatically the fertility level and structure (relative rates or distribution) estimated through the usage of the Fertility Projection Procedure from the Utilities Module. In order to use [F2] enter 0 or 1 in TYPE OF FERTILITY DATA.

The screen for fertility level input is the following:

```

PRODEM          NATIONAL          Time 15:23 Date 03/02/1992
EJE1           FERTILITY RATIOS

MASCULINITY PROPORTION AT BIRTH: 1.04 (Default 1.05)

                FERTILITY LEVEL

1980-85 1.3700 1985-90 1.3300 1990-95 1.3000 1995-00 1.2700 null 0.0000

OR...

F2 :Selection of communication file generated in the module
    UTILITIES (FERTILITY PROJECTION) contains
    masculinity proportion, fertility level, fertility rates
    and unit.

                                CAPS
F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

```

In this screen, in addition to the total fertility rates or the gross reproduction rates, the user must enter the sex ratio at birth (with a maximum of three decimals, although the screen only shows 2). If this information is not entered, the System will assume 1.05.

Once the fertility level data input has been completed, [PgDn] will display the screen in which to provide fertility by ages depending on the option selected in the TYPE OF FERTILITY DATA parameter.

**Mortality  
Parameters**

In order to enter the Mortality data, the options presented in the following screen are available:

```

PRODEM                                NATIONAL                                Time 15:24 Date 03/02/1992
EJE1                                  MORTALITY PARAMETERS
CHOOSE..

TYPE OF LIFE TABLE : 3
United Nations Coale and Demeny

0 LATIN AMERICAN Model (U.N.)      6 Given by the user
1 GENERAL model (U.N.)
2 WESTERN model                    7 CHILEAN model (U.N.)
3 NORTHERN model                   8 SOUTH-ASIAN model (U.N.)
4 EASTERN model                    9 FAR EASTERN model (U.N.)
5 SOUTHERN model

LIFE EXPECTANCIES AT BIRTH: Must be given by the user

OR...

F2 :Selection of communication file generated in the module
UTILITIES (MORTALITY FORWARD PROJECTION option) contains
life expectancies at birth, survival ratio and
infant mortality rates.

```

CAPS

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

#### TYPE OF LIFE TABLE

In order to communicate the characteristics of the Mortality information to the System:

- 0 The System estimates survival ratios by sex and age, from the Life Tables developed by the **United Nations, Latin American Model**, which, in turn, reproduce the given life expectancy at birth by sex or for both sexes combined for each quinquennium of the projection.
- 1 The System estimates survival ratios by sex and age, from Life Tables developed by the **United Nations, General Model**, which, in turn, reproduce the given life expectancy at birth by sex or for both sexes combined for each quinquennium of the projection.

2, 3, 4 and 5

The System estimates survival ratios by sex and age, from the Model Life Tables developed by **Coale and Demeny**, which, in turn, reproduce the given life expectancy at birth

by sex or for both sexes combined for each quinquennium of the projection.

- 6 Allows to indicate that for each quinquennium of the projection, all the mortality data will be entered by the User.

Always enter option 6, **Given by the User**, if later on you will load a mortality file using the [F2] key.

- F2 Enables PRODEM to display a screen to automatically select and load the life expectancy at birth and survival ratios, estimated through the Mortality Projection of the Utilities Module procedure.

7, 8 y 9

The System estimates survival ratios by sex and age, from the Life Tables developed by the **United Nations, Chilean Model, South Asian Model or Far Eastern Model**, which in turn reproduce the given life expectancy at birth by sex or for both sexes combined for each quinquennium of the projection.

If in the **TYPE OF LIFE TABLE** the use of Model Tables was selected, PRODEM will display the following screen when pressing [PgDn]:

```
PRODEM          NATIONAL          Time 15:24 Date 03/02/1992
EJE1           SURVIVAL RATIO SELECTION

SURVIVAL PROPORTIONS          : 1

0 Selection of the life table model
1 Selection using the modified method

F10-Quit
```

**SURVIVAL RATIOS**

- 0 Survival ratios for each quinquennium are calculated from the selected Model Life Table.
- 1 Survival ratios are calculated from the life expectancy at birth by sex and the survival ratios of the Stationary Population by sex and age as in the base year of the projection. The following information will be displayed when pressing [PgDn]:

```

PRODEM          NATIONAL          Time 15:26 Date 03/02/1992
EJE1           SURVIVAL PROPORTIONS RATIO

SURVIVAL TYPE OF DATA      : 1
0 Survival proportions
1 Stationary population (nLx)

BASE YEAR LIFE EXPECTANCY AT BIRTH
-----
MALES   : 0.00      FEMALES : 0.00

CAPS
F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

```

**TYPE OF SURVIVAL DATA**

- 0 Survival ratios by sex and age are estimated given data on these survival ratios and life expectancy at birth for the base year are provided. The calculated survival ratios will gradually evolve to the lowest mortality level in the selected Model. You should use this option only if you foresee that the mortality of the population being studied will show a tendency to decline.
- 1 Survival ratios are estimated by sex and age given a stationary population and the life expectancy at birth at the base year; the survival ratios will gradually evolve to the lowest mortality level in the selected Model. You should use this option only if you foresee that the mortality of the population being studied will show a tendency to decline.

Once the TYPE OF LIFE TABLE data input has been completed, [PgDn] will display the screen in which to enter the life expectancy at birth for each quinquennium :



PRODEM	NATIONAL	Time 15:26 Date 03/02/1992	
EJE1	LIFE EXPECTANCY AT BIRTH		
QUINQUENNium	MALES	FEMALES	BOTH SEXES (Opt)
1980-85	72.55	74.55	0.00
1985-90	68.05	75.05	0.00
1990-95	60.54	75.59	0.00
1995-00	69.00	76.10	0.00

CAPS

F1-Help F3-Run F4-Print F5-Save F6-View Home-1stSCR Pg-NxtSCR F10-Quit

While choosing the options in the TYPE OF LIFE TABLE section above, the user did not choose the Models option, [PgDn] will present the following screen in which the Survival Ratios by age and sex should be filled in:

PRODEM	NATIONAL	Time 15:32 Date 03/02/1992	
EJE1	SURVIVAL RATIO		
AGE	MALES	FEMALES	QUINQUENNium 1980- 1985
0- 4	0.97293	0.97714	INFANT MORTALITY RATES (Opt)
5- 9	0.99544	0.99628	
10-14	0.99720	0.99815	MALES : 0.02576
15-19	0.99613	0.99793	FEMALES: 0.02160
20-24	0.99330	0.99733	
25-29	0.99000	0.99651	
30-34	0.98743	0.99519	
35-39	0.98401	0.99310	
40-44	0.97785	0.98996	
45-49	0.96804	0.98490	
50-54	0.95297	0.97696	
55-59	0.93309	0.96410	
60-64	0.90432	0.95029	
65-69	0.86129	0.92102	
70-74	0.80153	0.86917	
75-79	0.71131	0.80204	
80-Y+	0.52303	0.57586	

CAPS

F1-Help F3-Run F4-Print F5-Save F6-View Home-1stSCR Pg-NxtSCR F10-Quit

---

## BACKWARD PROJECTION

If you select 1 in the General Parameters screen of this Module, i.e. a backward projection of a population, you must first indicate a procedure which will estimate the 75-79 and 80 and over age groups of the population and the Gross Reproduction Rate.

```
PRODEM          NATIONAL          Time 15:33 Date 03/02/1992
EJE1           ESTIMATE OF THE FINAL AGE GROUPS

ESTIMATE 75-79 AND OVER 80 YEARS-POPULATION : 0
0 WESTERN model stable population
1 UN model stationary population

CAPS
F1-Help F3-Run F4-Print F5-Save F8-View Home 1stSCR Pg-NxtSCR F10-Quit
```

### ESTIMATE POPULATION AGED 75-79 AND 80 AND OVER

- 0 Estimates the 75-79 and 80 + age groups using the relative weight of these groups in a Stable Population aged 75 and over of the West Model of the Coale and Demeny Life Tables; the model is selected according to the life expectancy at birth that will be entered subsequently.
- 1 Estimates the 75-79 and 80 + age groups using the relative weight of these groups in a Stable Population aged 75 and over of the United Nations Model; the Model is selected according to the life expectancy at birth that will be entered subsequently.

```

PRODEM          NATIONAL          Time 15:34 Date 03/02/1992
EJE1          GROSS REPRODUCTION RATE

GROSS REPRODUCTION RATE : 1
0 Not considered
1 Considered

CAPS
F1-Help F3-Run F4-Print F5-Save F8-View None-1stSCR Pg-NxtSCR F10-Quit

```

**GROSS REPRODUCTION RATE**

- 0 Indicates that specific fertility rates will not be entered; the System does not calculate gross reproduction rates and global fertility rates.
- 1 Indicates that the relative fertility distributions for each quinquennium will be entered; the System will calculate gross reproduction rates or global fertility rates.

After indicating the treatment of the age group 75-79 and 80 + and the provision of fertility data, PRODEM will display the basic input screens for Migration, Fertility and Mortality.

---

## PROJECTION/BACKWARD PROJECTION

When on the General Parameters screen of this Module option 2 Projection/Backward Projection has been selected, perform the following operations before entering the information:

### To Project Backwards

In order to project backwards, PRODEM requires that one of the alternatives to estimate the age groups 75-79 and 80+ is selected and that the screen Gross Reproduction Rates is coded 1, i.e. "Is Assumed"

### To Project

To project, PRODEM requires that the base year population by sex and 5 year age groups is the same as the one that will be used for the projection and the backward projection; in addition, the fertility, mortality and migration data should be entered with the same characteristics as those given in the General Parameters screen for the TYPE OF PROJECTION 0 , i.e. "Projection".

In order to project backwards, PRODEM employs the fertility structure corresponding to the first projection quinquennium.

---

## RESULTS

After completing the input of basic data, press [F3] for processing and the obtainment of the results.

Once the processing has been completed, PRODEM displays the results on screen. In order to view them without printing them, use the keys shown at the bottom of the results screen. Press [F10] to exit the editing mode.

The results obtained in the National Module depend on the code given in the Type of Output parameter of the General Parameters Screen. Next, you will find a list of all the information that can be obtained through this Module:

### POPULATION:

- Beginning population by sex, for 5 years age groups.
- Total population by sex.
- Total population aged 15 to 64.
- Female population aged 15 to 49.
- Population by sex, for 5 years age groups and single years of age from 5 to 24.
- Relative population distribution by sex and age groups.
- Sex ratios, by 5 years age groups.
- Dependency ratio.
- Total population sex ratio.
- Mean age of population.

### MORTALITY:

- Life expectancy at birth for both sexes and survival ratios by sex, for 5 years age groups, for each quinquennium of the period covered by the projection.
- Total deaths.
- Crude mortality rate.
- Life expectancy at birth, by sex and for both sexes combined.
- Infant mortality rate, by sex and for both sexes combined.
- Total deaths for aged 0-1, aged 0-4 and 1-4.

**FERTILITY:**

- Gross Reproduction Rate for each quinquennium of the period covered by the projection.
- Age-specific fertility rates, for each quinquennium of the period covered by the projection.
- Births according to mother's age.
- Total births.
- Children-women ratio.
- Crude birth rate.
- Gross and net reproduction rate.
- Total and General fertility rate.
- Mean age of fertility.

**MIGRATION:**

- Net migration balances by sex, for 5 years age groups, for each quinquennium of the period covered by the projection.
- Number of net migrants and net migration rates.

**GROWTH:**

- Mean annual growth rate.
- Natural growth rate.

**GRAPHICS:**

- Pyramid of beginning population and final population of projection.
- Evolution of life expectancy at birth and total fertility rate for each quinquennium of the projection.

---

## PROJECTION ALGORITHMS

In the National Module, starting from a base population and information on fertility, mortality and migration for each quinquennium of the period the projection will cover, PRODEM projects the population using the "component method" and the following algorithms:

- For the population under 5 years of age:

$${}_5N_0^{t+5} = B^{t+5} * P_b^{t+5} + {}_5M_0^{t+5}$$

- For the population aged 5 to 75:

$${}_5N_{x+5}^{t+5} = {}_5N_x^t * {}_5P_x^{t+5} + {}_5M_{x+5}^{t+5}$$

- For the population over 80 years of age:

$$N_{80y+}^{t+5} = N_{75y+}^t * {}_5P_{75y+}^{t+5} + M_{80y+}^{t+5}$$

in these ratios,

$B^{t+5}$  are the births of the period  $t,t+5$ .

$P_b^{t+5}$  is the survival ratio of the period  $t,t+5$  which applied to the births of this period, enables the user to estimate the population aged 0-4 at moment  $t+5$ .

${}_5N_{x+5}^{t+5}$  is the population of a five year age group projected to the moment  $t+5$ .

${}_5N_x^t$  is the population of a five year age group at the moment  $t$ .

${}_5P_x^{t,t+5}$  are survival ratios of the period  $t,t+5$  which applied to a 5 year age group at moment  $t$ , enable the user to estimate the population of the next 5 year age group at moment  $t+5$ .

${}_5M_{x+5}^{t,t+5}$  is the net migratory balance -immigrants minus migrants- of a 5 year age group for period  $t,t+5$ .

---

## **Bibliographical References**

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Methods for demographic projections, Series E, N°1003, San Jose, Costa Rica, 1984.

### **Coale and Demeny**

Regional Model Life Tables and Stable Populations, Second Edition, Princeton, Academic Press, New York, 1983.

### **DANE-CELADE**

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### **UNITED NATIONS**

Mortality Models by Sex and Age: Model Mortality Tables for Developing Countries, ST/ESA/Series A/77, New York, 1983.

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World Population Prospects as Assessed in 1973, Sales N°E.76.XIII.4, 1973.

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A Modified Method Estimating Age-Specific Survival Ratios, ESA/P/WP.61, New York, 1977.

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A User's Manual to the Population Projection Computer Programme of the Population Division of the United Nations, New York, 1982.

## 5. MAJOR AREAS MODULE

After activating the System through the PRODEM command, following the logotype, the Definition of Modules screen will appear. In order to enter the Major Areas Module in this screen, press the [Y] key or place the cursor in the corresponding section and press [ENTER]. After completing this operation, PRODEM will present the following screen in which a Projection Method should be selected:

PRODEM	MAIN	Time 15:34	Date 03/02/1992
DEFINITION OF MODULES			
NATIONAL	N	COMPONENTS	C
MAJOR AREAS	Y	COHORT RATIO	H
INTERMEDIATE AREAS	I	GROWTH DIFFERENTIAL	F
MINOR AREAS	E		
URBAN RURAL	U		
TOOLS	R		

It is necessary to provide fertility, mortality and migration information for the highest hierarchical area and one of its subareas. The system projects the highest hierarchical area, the subarea and the complement to the highest hierarchical area.

CAPS

F1-Help ↔SelMenu CtrlF1-Outline F7-DOS F9-SetUp F10-Quit

This Module enables the user to project the population through three procedures: Component Method, Cohort Ratio and Growth Differential.

For a better understanding of the options that PRODEM presents for each method, this Chapter only describes population projection by sex and age through the "component method". The "Cohort Ratio" and "Growth Differential" methods will be described in further detail in Chapter 6, INTERMEDIATE AREAS MODULE.

**Objectives of the Module**

When selecting the "component method" in the Major Areas Module, PRODEM will load the adaption made by CELADE of the Population Projections Program of the United Nations Population Division.

With this method, you can project population by sex and 5 year age groups from the 0-4 age group up to the 80 and over age group, for a maximum of three geographical areas and for a period of up to a 100 years.

The geographical areas projected through this procedure correspond to one of a Highest Hierarchical Level that has previously been projected through the "component method" (generally in the National Module), a Major Area and an area that is obtained as a difference between the former two and is called Remaining Area.

This Module enables the user to continue breaking up the Major and Remaining Area Projections, as long as basic information for the use of the "component method" is available. This is a major advantage whenever projections are to be made for a set of Major Areas.

**Basic Information**

To project through the "component method", the following basic information is required :

For the Highest Hierarchical Level area:

- A projection by sex and five year age groups, done with the "component method", either in the National Module or in the same Module if it corresponds to a separation of projections.

For the Major Area:

- Total population by sex and 5 years age groups for the projection base year.
- Net migratory balances by sex and 5 year age groups, for every quinquennium of the projection. Additionally, total migration rates by sex or by age, among other options, can be entered.
- The gross reproduction rates or total fertility rates for every quinquennium of the projection.
- The specific fertility rates, for every quinquennium of the projection.

- Life expectancy at birth by sex, for every quinquennium of the projection. This synthetical mortality variable can be used to estimate the survival ratios by use of Models.
- Survival ratios by sex and 5 year age groups, for every quinquennium of the projection. You can also automatically load estimates calculated in the Tools Module or use the Models, among other options.

**Options of the Module**

After identifying the Major Area file and selecting the Highest Hierarchical Level (see instructions in Chapter 3, "File Selection and Creation"), in the Parameters screen, PRODEM provides the possibility to:

- Describe the general characteristics of the projection: name of the geographical area, projection period, comments, etc.
- Describe the Migration data characteristics: net balances, migration rates, relative distribution of migrants by age, etc.
- Describe the Fertility characteristics: fertility rates by age, fertility structure by age, use of Models, etc.
- Describe the Mortality data characteristics: life expectancy at birth, survival ratios by sex and age, use of Models, etc.

**General Parameters**

After identifying the Major Area file and selecting the Highest Hierarchical level file, the General Parameters screen will be displayed:

PRODEM TTTT	COMPONENTS GENERAL PARAMETERS	Time 15:35	Date 03/02/1992
HIGHEST HIERARCHICAL AREA (HHA)	:EJE1		
PROJECTION PERIOD OF SHA	:1988 - 2000		
NAME OF POPULATION	:AREA I		
BEGINNING YEAR OF PROJECTION	:1988		
ENDING YEAR OF PROJECTION	:2000		
NAME OF POPULATION GENERATED BY DIFFERENCE (HHA-Major Area)	:RESI		
GENERATE COMMUNICATION FILE	:1	DIRECT SELECTION OF COMPONENTS	:0
0 Not necessary		0 Normal flow	2 Fertility
1 With population projected by age and sex for other modules		1 Migration	3 Mortality
COMMENTS:	DEFAULT DEL SISTEMA		
			CAPS
F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit			

#### AREA OF HIGHEST HIERARCHICAL LEVEL (AHL)

This information appears automatically and corresponds to the identification of the Highest Hierarchical Level file, which contains the Major Area to be projected.

#### PROJECTION PERIOD OF AHL

This information appears automatically and corresponds to the period covered by the Highest Hierarchical Level projection which contains the Major Area to be projected.

#### NAME OF POPULATION

With a maximum of 28 characters, indicate the name of the Major Area to be projected.

#### BEGINNING YEAR OF PROJECTION (BY)

#### ENDING YEAR OF PROJECTION (EY)

These data determine the projection period; the interval determined by these years should be a multiple of five and both dates should be

comprised between the beginning year of the projection and the ending year of the projection of the Highest Hierarchical Level.

#### NAME OF THE POPULATION GENERATED BY DIFFERENCE

You must enter a name for the projection which is obtained by difference between the Area of Highest Hierarchical Level and the Major Area with four characters, the first two characters always being alphabetical.

#### GENERATING A COMMUNICATION FILE

- 1 After completing the processing of the Major Area projection, the System generates a data file of the Major Area and of the area obtained by Difference. These files can be used as data files of the Highest Hierarchical level in the Major Areas Module or in the Urban-Rural Module.
- 0 PRODEM does not generate communication files.

#### DIRECT SELECTION OF COMPONENTS

This parameter enables direct access to the fertility, mortality and migration screens:

- 0 Enables the user to enter or modify the base population or migration, fertility and mortality data.
- 1 Enables the user to enter or modify information exclusively related to **migration**.
- 2 Enables the user to enter or modify information exclusively related to **fertility**.
- 3 Enables the user to enter or modify information exclusively related to **mortality**.

Always use option 0 when creating a projection for the first time. If you want to repeat the projection modifying the migration, fertility or mortality data, use options 1, 2 or 3 respectively.

## COMMENTS

In this section the user can register (in two lines) a few observations related to the projection file to be created; these comments will be printed in the output file. It is not recommended to use more than 64 characters in one line; if more characters are used, the comment will appear incomplete on the screen.

After completing the data input of this screen, move to the next screen by pressing the [PgDn] key.

PRODEM TTTT	COMPONENTS GENERAL PARAMETERS	Time 15:36 Date 03/02/1992
<b>TYPES OF OUTPUT</b>		
0 Yes 1 No		
Population by 5 years age Groups	:	0
Population by Single Years of Age	:	1
Structure and Masculinity Propor.	:	1
Pyramid	:	1
Input	:	1
CAPS		
F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit		

## TYPES OF OUTPUT

Enables the user to indicate to the System the required amount of detail for the printing of the projection results. Code "0" will calculate and print the results while code "1" will not print and calculate them. No matter what option is chosen, the system always calculates and prints the demographic indicators of the projection.

Request the calculation and printing of:

**Population by 5 Year Age Groups**

In this case, the output contains the composition by sex and age groups as well as a set of demographic indicators for each quinquennium of the projection.

**Population by Single Years of Age**

The output will contain the composition by sex and age groups as well as a set of demographic indicators for each quinquennium of the projection and an estimate of the population aged 0 to 24 by single years of age.

**Sex Structure and Masculinity Proportion**

The output will contain the relative structure of the population by sex and age groups and the masculinity proportions for each quinquennium of the projection.

**Pyramid**

In this case, the output contains the composition by sex and age groups of the population and an age pyramid for the base and final year of the projection.

**Input**

The output contains only the basic data.

The options which communicate to the system the detail of the results refer exclusively to the Major Areas projection and the projection obtained by Difference. The output characteristics for the Highest Hierarchical Level will correspond to those provided during the creation of the original file.

After specifying the output format and the parameter **GENERATING OUTPUT FILE** of the General Parameters has been coded 1, i.e. "With population projected by age and sex for other Modules", pressing [PgDn] will display the following screen:

PRODEM TTTT	COMPONENTS COMMUNICATION WITH OTHER MODULES	Time 15:45 Date 03/02/1992
<p>GENERATE COMMUNICATIONS FILE FOR :0</p> <p>0 Major Area 1 Area obtained by difference 2 Both</p>		
		CAPS
F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit		

#### GENERATE COMMUNICATION FILES

- 0 To indicate that in subsequent separations only the Major Area projection will be used.
- 1 To indicate that in subsequent separations only the projection obtained by Difference between the Highest Hierarchical Level and the Major Area will be used.
- 2 To indicate that in subsequent separations both the Major Area projection and the projection obtained by Difference will be used.

Base  
Population  
Input

The input of numerical data begins in the following screen:

PRODEM	COMPONENTS	Time 15:46 Date 03/02/1992	
TTTT	BASE YEAR POPULATION		
YEAR: 1980	AGE	MALES	FEMALES
TOTAL MALES :	8- 4	34554	34887
TOTAL FEMALES:	5- 9	35862	35298
	10-14	32214	32850
	15-19	32498	30881
	20-24	32185	29276
	25-29	31154	26959
	30-34	23764	21976
	35-39	19471	18177
	40-44	14714	14248
	45-49	13297	12661
	50-54	11148	11286
	55-59	8631	8696
	60-64	6148	6459
	65-69	4341	5289
	70-74	3882	4129
	75-79	1974	2716
	80-Y+	1662	2363
			CAPS
F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit			

To enter the base population, i.e. totals by sex and age groups, type the data and press [ENTER] or [↵].

### Correction of errors

Before entering the total population of each sex, verify that the total corresponds exactly to the sum of the population by age groups; if this condition is not met, once you have completed the data input and when moving to the following screen, PRODEM:

- Will indicate sex and the total the System obtains by summing the data by age groups, and
- Will not be able to continue with the working session until the error has been corrected. To correct, return to the former screen by pressing [PgUp] and then [PgDn] to obtain the screen which contains the error.

Given the base population, press [PgDn] to enter the migration.

### Migration Parameters

For the input of migration data the following options presented in the next screen are available:

PRODEM TTTT	COMPONENTS MIGRATION PARAMETERS	Time 15:46 Date 03/02/1992
BEGINNING YEAR OF MIGRATION	:1900	
ENDING YEAR OF MIGRATION	:2000	
TYPE OF DATA FOR MIGRATION	:3	
0 Migration not assumed 3 Migrants by sex and age 4 Net migration rates + Perc. Distr for both sexes combined (as Proj)		
DATE OF MIGRATION	:1	
0 In the middle of quinquennium 1 At the end of quinquennium		
CAPS		
F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit		

**BEGINNING YEAR OF MIGRATION  
FINAL YEAR OF MIGRATION**

This information determines the projection period that assumes migration; the beginning and ending year of migration should be multiples of 5 and both dates should be comprised between the beginning and ending year of the projection.

**TYPE OF MIGRATION DATA**

Communicates to the System the way in which the migration data will be provided; the following options are available in PRODEM:

- 0 Indicates that the projection does not consider migration.
- 3 Allows the user to enter the total net migratory balances by sex and age for each period in absolute values. The negative migration data should be preceded by a (-) sign.
- 4 Enables the user to enter net migration rates for both sexes by periods and a single relative distribution by sex and age. The sum of the distribution should be equal to 1 for both sexes

combined. The negative migration data should be preceded by a (-) sign.

### MIGRATION DATE

Enables the user to indicate when the migrants should be added to the projection:

- 0 Migration occurs in the middle of each quinquennium.
- 1 Migration occurs at the end of each quinquennium.

Depending on the options selected for the parameter in the Type of Migration Data, pressing [PgDn] will show the following screens which enable the user to enter the data referring to this "component" of demographic growth:

- a) If the option selected was 0, i.e. "No Migration Assumed", pressing [PgDn] will cause the System to ask for Fertility data.
- b) If the option selected was 3, i.e. "Migrants by sex and age", a screen for basic data input will be displayed for each quinquennium of the period the projection will cover:

PRODEM	COMPONENTS	Time 15:47	Date 03/02/1992
TTTT	NUMBER OF MIGRANTS		
QUINQUENNIUM 1980- 1985	AGE	MALES	FEMALES
TOTAL MALES :	0- 4	557	179
TOTAL FEMALES:	5- 9	558	171
	10-14	533	146
	15-19	1529	934
	20-24	1564	881
	25-29	972	274
	30-34	727	137
	35-39	232	53
	40-44	155	39
	45-49	138	40
	50-54	187	39
	55-59	62	28
	60-64	59	26
	65-69	49	22
	70-74	35	16
	75-79	21	18
	80-84	18	13

CAPS

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

Provide net migratory balances by sex and age with their respective signs.

**Correction of errors**

Before entering the migratory balances for each sex, make sure the total corresponds exactly to the sum of the migratory balances by age. If this condition is not met, and data input has been completed, moving to the next screen will cause PRODEM to:

- Indicate sex and total obtained through summing of the data entered by age groups, and
- Will not be able to continue with the working session as long as the error has not been corrected. To correct, move back to the previous screen by pressing [PgUp] and then [PgDn] to obtain the screen containing the error.

c) If option 4 was selected, i.e. "Net Migration Rates + Percentage Distribution of Both Sexes", the migration data should be provided in the following way:

PRODEM	COMPONENTS		Time 15:47 Date 03/02/1992		
TTTT	NET MIGRATION				
NET MIGRATION RATES per 1000					
1980-85	0.0000	1985-90	0.0000	1990-95	0.0000
1995-00	0.0000	null	0.0000	null	0.0000

CAPS

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

For each period of the projection that will assume migration, enter the Total Net Migration Rates expressed in thousands with the respective signs and press [PgDn].

PRODEM TTTT	COMPONENTS DISTRIBUTION OF MIGRANTS	Time 16:00	Date 03/02/1992
AGE	MALES	FEMALES	
0- 4	0.000000	0.000000	
5- 9	0.000000	0.000000	
10-14	0.000000	0.000000	
15-19	0.000000	0.000000	
20-24	0.000000	0.000000	
25-29	0.000000	0.000000	
30-34	0.000000	0.000000	
35-39	0.000000	0.000000	
40-44	0.000000	0.000000	
45-49	0.000000	0.000000	
50-54	0.000000	0.000000	
55-59	0.000000	0.000000	
60-64	0.000000	0.000000	
65-69	0.000000	0.000000	
70-74	0.000000	0.000000	
75-79	0.000000	0.000000	
80-Y+	0.000000	0.000000	

CAPS

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

Enter a single relative distribution of migrants by sex for the entire projection period; the algebraic sum of the distributions should be equal to 1 for both sexes combined.

**Fertility  
Parameters**

The next screen presents the options for the fertility data input:

```
PRODEM          COMPONENTS          Time 15:50 Date 03/02/1992
TTTT          FERTILITY PARAMETERS

TYPE OF DATA FOR FERTILITY          :0

0 Relative distribution of fertility rates by quinquennium
1 Fertility rates by quinquennium

CAPS
F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit
```

**TYPE OF DATA FOR FERTILITY**

To communicate to PRODEM the characteristics of the Age Specific Fertility:

- 0 Enables the user to enter a **relative distribution** of the age-specific fertility rates for each quinquennium of the projection.
- 1 Enables the input of **age-specific fertility rates** for each quinquennium of the projection.

After indicating the type of fertility data for the projection of the Mayor Area, pressing [PgDn] will show the following screen:

PRODEM TTTT	COMPONENTS FERTILITY INDICATORS	Time 15:51	Date 03/02/1992
<b>MASCULINITY RATIO AT BIRTH : 1.04 (Default 1.05)</b>			
<b>GROSS REPRODUCTION RATE</b>			
1980-85	1.3700	1985-90	1.3400
1990-95	1.3100	1995-00	1.2800
			null 0.0000
OR...			
<b>F2 :</b> Selection of communication generated in the module UTILITIES ( FERTILITY PROJECTION option ), which contains masculinity ratio, fertility level and fertility rates.			
			CAPS
F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit			

In this screen, in addition to the total fertility rates or the gross reproduction rates, the user must enter the masculinity ratio at birth with a maximum of 3 decimals (although the screen only shows 2). If the masculinity ratio is not provided, the system assumes a value of 1.05.

**F2** Option of this new PRODEM version, allowing to select and load automatically the level and structure of the estimated fertility, through the usage of the Fertility Projection Procedure of the Utilities Module.

Whenever data entry has been finished in this screen and depending on the option selected in the TYPE OF FERTILITY DATA parameter, pressing [PgDn] will display a screen in which the user should provide age-specific fertility.

### Mortality Parameters

For the Mortality information, the following options presented in the next screen are available:

```

PRODEM                                COMPONENTS                                Time 15:51 Date 03/02/1992
TTTT                                MORTALITY PARAMETERS
CHOOSE...

TYPE OF LIFE TABLE : 0

United Nations - Coale & Demeny

0 LATIN AMERICAN Model      6 Provided by the user
1 GENERAL Model (U.N.)
2 WESTERN Model              7 CHILEAN Model
3 NORTHERN Model             8 SOUTH-ASIAN Model
4 EASTERN Model              9 FAR EASTERN Model
5 SOUTHERN Model

OR..

F2 : Selection of communication file generated in the
      UTILITIES module (MORTALITY PROJECTION option),
      which contains life expectancies at birth,
      survival ratios and infant mortality rates.

CAPS
F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

```

### TYPE OF LIFE TABLE

To indicate the characteristics of the information on Mortality:

0 Survival ratios by sex and age will be estimated by referring to the Life Tables developed by **United Nations, Latin American Model**, which in turn reproduce the given life expectancy at birth by sex or for both sexes combined for each quinquennium of the projection.

1 Survival ratios by sex and age will be estimated by referring to the Life Tables developed by **United Nations, General Model**, which in turn reproduce the given life expectancy at birth by sex or for both sexes combined for each quinquennium of the projection.

2, 3, 4 and 5

Survival ratios by sex and age will be estimated by referring to the Model Life Tables developed by **Coale and Demeny**, which in turn reproduce the given life expectancy at birth by sex or for both sexes combined for each quinquennium of the projection.

- 6 Indicates that for each quinquennium of the projection all the information on Mortality will be entered by the User.

Everytime you code option 6, "Given by the User", if you will load a mortality file by using F2.

- F2 In this case PRODEM will display a screen in which to select and automatically load the life expectancy at birth and the survival ratios, estimated through the use of the Mortality Projection procedure in the Tools Module.

7, 8 and 9

Survival ratios by sex and age will be estimated by referring to the Life Tables developed by United Nations, Chilean, South Asian or Far Eastern Model, which in turn reproduce the given life expectancy at birth by sex or for both sexes combined for each quinquennium of the projection.

After providing the basic characteristics of mortality, pressing [PgDn] will cause PRODEM to display the following screen in which to enter the life expectancy at birth (with two decimals) for each quinquennium of the projection:

PRODEM		COMPONENTS		Time 15:52	Date 03/02/1992
TTTT		LIFE EXPECTANCY AT BIRTH			
QUINQUENNium	MALES	FEMALES	BOTH SEXES (Opt)		
1980-85	57.46	75.07	0.00		
1985-90	67.92	75.58	0.00		
1990-95	68.42	76.09	0.00		
1995-00	68.88	76.57	0.00		

CAPS

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

Whenever the TYPE OF LIFE TABLE parameter does not indicate the use of Models and the life expectancy at birth has been provided, pressing [PgDn] will display the following screen in which the user should provide the survival ratios by sex and age:

PRODEM TTTT	COMPONENTS SURVIVAL RATIOS		Time 15:52 Date 03/02/1992
AGE	MALES	FEMALES	QUINQUENNIAL 1980- 1985
0- 4	0.97415	0.97699	INFANT MORTALITY RATES (Opt)
5- 9	0.99594	0.99681	
10-14	0.99778	0.99845	MALES : 0.82446
15-19	0.99673	0.99811	FEMALES: 0.82286
20-24	0.99438	0.99741	
25-29	0.99176	0.99675	
30-34	0.99086	0.99561	
35-39	0.98752	0.99393	
40-44	0.98175	0.99118	
45-49	0.97288	0.98651	
50-54	0.95541	0.97878	
55-59	0.93363	0.96637	
60-64	0.89828	0.95279	
65-69	0.84454	0.92518	
70-74	0.77443	0.87475	
75-79	0.67713	0.81159	
80-Y+	0.48648	0.57334	

CAPS

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

Besides the Survival Ratios, the System will optionally allow the input of Infant Mortality.

---

## RESULTS

After entering the basic data, press the [F3] key to process the information and obtain the projection.

The results will be displayed on screen and in order to view them (without printing them) use the keys indicated at the bottom of the results screen. Press the [F10] key to exit the edit mode.

The results obtained in the MAJOR AREAS Module depend on the Type of Output Parameter of the General Parameters Screen. This is the information that can be obtained through this Module:

### POPULATION:

- Beginning population by sex and 5 year age groups .
- Total population by sex.
- Total population aged 15 to 64.
- Female population aged 15 to 49.
- Population by sex, for 5 year age groups and single year of age from 5 to 24 (not for the projection obtained by Difference).
- Relative distribution by sex and age groups.
- Masculinity proportions, for 5 year age groups.
- Dependency ratio.
- Masculinity rate for the total population.
- Mean age of the population.

### MORTALITY:

- Life expectancy at birth for both sexes and survival ratios by sex for 5 year age groups, for each quinquennium of the projection period.
- Total deaths.
- Crude Death Rate.
- Life expectancy at birth, both sexes combined and by sex.
- Infant mortality rate, both sexes combined and by sex.
- Total deaths for ages 0-1, 0-4 and 1-4.

#### **FERTILITY:**

- Gross Reproduction Rate for each quinquennium of the projection period.
- Age-specific fertility rates, for each quinquennium of the projection period.
- Births according to mother's age.
- Total births.
- Female-infant ratio.
- Crude birth rate.
- Gross and net reproduction rate.
- Total and general fertility rate.
- Mean age of fertility.

#### **MIGRATION:**

- Net migratory balances by sex, for 5 year age groups, for each quinquennium of the projection period.
- Number of net migrants and net migration rates.

#### **GROWTH:**

- Mean annual growth rate.
- Natural growth rate.

#### **GRAPHICS:**

- Pyramid of the beginning and ending population of the projection.
- Evolution of the life expectancy at birth and of the total fertility rate for each quinquennium of the projection.

---

## PROJECTION ALGORITHMS OF THE DIFFERENCE

The algorithms used to project the population by sex and age groups in this procedure are the same as the ones presented in the National Module as far as the geographical area of the Highest Hierarchical Level (HL) and the Major Area (MA) is concerned. The main difference consists in the estimate of the "components" of demographical growth for the Area obtained by Difference with the former ones or Remainder (R).

Given that:

**NJS** is the population of the Area of Highest Hierarchical Level,

**NAM** is the population of the Major Area to be projected,

**NR** is the population of the geographical area that is obtained by difference between NJS and NAM.

a) The population projected for the Remaining Area is obtained through the ratio:

$${}_5NR_x^t = {}_5NJS_x^t - {}_5NAM_x^t$$

where  ${}_5NR_x^t$ , which is the population of a five year age group at time t, obtained as the difference between the population in the Area of Highest Hierarchical Level and the population of the Major Area for the same age groups and at the same moment in time.

Therefore,  ${}_5NR_x^t$  will be the population of a five year age group at the moment t.

b) Fertility is calculated with the following equation:

$$({}_5BR_x^{t+5}) = \frac{5}{2} [ {}_5fJS_x^{t,t+5} ({}_5NFJS_x^t + {}_5NFJS_x^{t+5}) - {}_5fAM_x^{t+5} ({}_5NFAM_x^t + {}_5NFAM_x^{t+5}) ]$$

where  ${}_5BR_x^{t+5}$ , are the estimated births by age of the mother for the 5 years  $t, t+5$ . These are calculated as the difference between the product of age specific fertility rates ( ${}_5f_x$ ) by age and the mean female population between the ages 15 and 50 for the Area of Highest Hierarchical Level and the Major Area, in the period  $t, t+5$ :

$${}_5fR_x^{t+5} = [1/5 * {}_5BR_x^{t+5}] / [1/2 * ({}_5NFR_x^t + {}_5NFR_x^{t+5})]$$

$$TGF^{t+5} = 5 * \sum {}_5fR_x^{t+5} \text{ for each group aged between 14 and 49.}$$

c) Migration is calculated as:

$${}_5MR_x^{t+5} = {}_5MJS_x^{t+5} - {}_5MAM_x^{t+5}$$

where  ${}_5MR_x^{t+5}$ , is the net migration rate of a five year age group for the period  $t, t+5$  and is calculated as the difference between the net migrants of the Highest Hierarchical Level and the Major Area for the same period and five year age group. For the Major Area, both the International Migration as the Internal Migration are considered.

d) Mortality (i.e. survival relations) is calculated as in the following equation:

$${}_5PR_x^{t+5} = [{}_5NR_{x+5}^{t+5} - {}_5MR_{x+5}^{t+5}] / {}_5NR_x^t$$

where  ${}_5PR_x^{t+5}$ , are the survival ratios. Applied to a five year age group at moment  $t$ , they permit the estimation of the population which will still be alive in the next 5 year age group at time  $t+5$ . Note that the numerator is represented by the population in an age group at moment  $t+5$ , with migration excluded.

$${}_5PR_0^{t+5} = [{}_5NR_0^{t+5} - {}_5MR_0^{t+5}] / BR^{t+5}$$

where  ${}_5PR_0^{t+5}$ , is the survival ratio which applied to births, enables the user to estimate the population aged 0-4 at moment  $t+5$ .

Life expectancy at birth ( $e_0^0$ ) is calculated as a function of the survival rates by age.

---

## **Bibliographical References**

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A User's Manual to the Population Projection Computer Programme of the Population Division of the United Nations, New York, 1982.

### **Rincón, M.**

Sistema para elaborar proyecciones de población de áreas geográficas de un país, según sexo y grupos de edad, por el método de los componentes, CELADE, San José, Costa Rica, 1985.

## 6. INTERMEDIATE AREAS MODULE

After activating the System through the PRODEM command, following the logotype the Definition of Modules screen will be displayed. To load the Intermediate Areas Module, press the [T] key or place the cursor in the corresponding section and press [ENTER]. After completing this operation, PRODEM presents the following screen in which the Projection Method to be used can be selected:

PRODEM	MAIN	Time 16:28	Date 03/02/1992
	DEFINITION OF MODULES		
NATIONAL	N		
MAJOR AREAS	Y		
INTERMEDIATE AREAS	T	COHORT RATIO	H
MINOR AREAS	E	GROWTH DIFFERENTIAL	F
URBAN RURAL	U		
TOOLS	R		

Enables to project population by sex and age of one or more areas using the COHORT RATIO and the GROWTH DIFFERENTIAL METHOD. In this module the user should provide pop. data for the areas at two moments in time (for ex. censuses) and the projection of the highest hierarchical area that contains them.

CAPS

F1-Help ↔SelMenu CtrlF1-Outline F7-DOS F9-Setup F10-Quit

This Module contains programs to project population by sex and five years age groups by the Cohort Ratio and Growth Differential methods; to load one of these methods press the [H] or [F] key, accordingly.

- **Cohort Ratio:** this method projects the population for a maximum of five quinquennia and can be used only if an "component method" Area projection of the Major Area, which contains the Intermediate Areas to be projected, is available.

- **Growth Differential:** this method can only be used if an Area projection of the Major Area, containing the Intermediate Areas to be projected, is available.

Both methods require that the projection period of the Intermediate Areas should be shorter or equal to the period covered by the Area projection of the Major Area.

### **Objectives of the Module**

Using the Cohort Ratio and Growth Differential Methods the user can project population by sex and five years age groups for the ages 0-4 to age 80 and over simultaneously for a maximum of 10 Intermediate Areas.

In PRODEM, using the Cohort Ratio and Growth Differential methods the user can project the population for a maximum of up to 5 quinquennia. In the Growth Differential method an option for estimates of intermediate years is included.

In addition to the population projected by sex and age groups for each quinquennium of the projection period, it will be possible to obtain as a result the basic input information and some indicators related to the sex and age composition of the projected population.

This module does not allow the execution of population projections for independent geographic areas.

### **Basic Information**

A population projection for the Major Area, no matter what method was selected to project the Intermediate Areas, is always required as basic input.

#### **Cohort Ratio:**

This method requires a "component method" projection of the Major Area and the sex and age composition of every Intermediate Area to be projected for two consecutive censuses.

If the projection has been carried out in the National or Major Areas Modules it can be entered automatically; if not, it should be entered manually.

In order to enter the Major Area projection manually, the information should refer to each quinquennium of the period covered by the

**Intermediate Areas projection. The following information should be provided for :**

- **Population by sex and age groups.**
- **Total fertility rates.**
- **Survival ratios at birth by sex.**
- **Total births.**
- **A relative distribution of the age specific fertility rates.**
- **Sex ratio at birth.**

**Growth Differential:**

**This method requires a Major Area projection and the sex and age composition of every Intermediate Area to be projected for two consecutive censuses.**

**If the projection has been carried out in the National or in the Major Areas Module, it can be entered automatically; if not, it should be entered manually.**

## COHORT RATIO

To enter the Intermediate Areas Module in the Definition of Modules Screen press [T] or place the cursor in the corresponding section and press [ENTER]. Then, enter the Cohort Ratio method by pressing [H] key:

PRODEM	MAIN	Time 16:28	Date 03/02/1992
DEFINITION OF MODULES			
NATIONAL	N		
MAJOR AREAS	Y		
INTERMEDIATE AREAS	T	COHORT RATIO	H
MINOR AREAS	E	GROWTH DIFFERENTIAL	F
URBAN RURAL	U		
TOOLS	R		

By entering population by sex and age of two censuses for a set of geographical subareas and the projection of the highest hierarchical area that contains them, it projects the population by cohorts for each one of them and adjusts them to the highest hierarchical area.

CAPS

F1-Help   ↔SelMenu   CtrlF1-Outline                      F7-DOS F9-Setup F10-Quit

After selecting the Cohort Ratio method, the System will display the screens that allow the user to:

- Identify the file that will contain the data of the Intermediate Areas to be projected.
- Indicate that the data of the Major Area projection will be entered manually or to select a file (created with the "component" method) in another of PRODEM's modules.

For a better understanding of the handling of these files, see Chapter 3, the Creation and Selection of Data Files Section.

## General Parameters

After identifying the Intermediate Areas file and selecting the Major Area projection, the General Parameters screen is displayed:

```
PRODEM          COHORT RATIO          Time 16:38 Date 03/02/1992
RCB1           GENERAL PARAMETERS

NAME OF MAJOR AREA      :AREA I
DATE OF FIRST CENSUS    :21/ 4/1978
DATE OF SECOND CENSUS   :21/ 4/1982
YEAR OF BEGINNING POPULATION :30/ 6/1988

NUMBER OF QUINQUENNIA   : 4
NUMBER OF AREAS TO BE PROJECTED: 7

GROWTH FACTORS (K)      :0  SELECTION OF DATA INPUT      :0
  0 Original              0 Normal flow      3 Beginning popul
  1 Modified              1 Major area fert  4 Major Area proj
                          2 Census population 5 Modification K

COMMENTS:  SYSTEM DEFAULT

CAPS
F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit
```

### NAME OF THE MAJOR AREA

With a maximum of 28 characters, indicate the name of the Major Area which contains the Intermediate Areas to be projected.

### DATE OF FIRST CENSUS DATE OF SECOND CENSUS

In dd/mm/yyyy (day, month, year) format, enter the exact date of the first and second census for the Intermediate Areas to be projected; for example, if the first census was taken on April 21st, 1970 and the second on April 21st, 1982, the information of this section has to be entered as 21/04/1970 y 21/04/1982 respectively.

### YEAR OF BEGINNING POPULATION

In dd/mm/yyyy format enter the initial date for the projections; it should correspond to a year of the Major Area projection.

### NUMBER OF QUINQUENNIA

The number of quinquennia -maximum 5- must be equal or smaller than the one of the Major Area projection.

### NUMBER OF AREAS

Corresponds to the number of Intermediate Areas to be projected. PRODEM enables the user to project a maximum of 10 areas.

### K GROWTH FACTORS

Enables the user to modify the "(K) growth factors" of the Intermediate Areas (for the definition of K factors, see Section **PROJECTION OF ALGORYTHMS** in this Chapter):

- 0 If a population projection for the Intermediate Areas is carried out for the first time, it generates the K factors based on the basic information.
- 1 To modify the K factors. When selecting this code, the Data Input Selection parameter must be coded 5, "K Modification".

### SELECTION OF DATA INPUT:

This parameter enables the user to access directly the basic data screens:

- 0 Enables the user to enter or modify **all the basic information**.
- 1 Enables the user to enter or modify information on **fertility and mortality of the Major Area**.
- 2 Enables the user to enter or modify the information of the **population censuses** of the Major Area and the Intermediate Areas.
- 3 Enables the user to enter or modify the **beginning population** of the Intermediate Areas projection.
- 4 Enables the user to enter or modify the population by sex and age of the Major Area projection.

- 5 Enables the user to modify the K growth factors. Select this option only if previous Intermediate Areas projections are available.

After modifying the K factors, press [F5] to save the file with the new values and from here on always use option 1 "Modified" for this file.

#### COMMENTS

In this section, the user can add a few comments to the projections file to be created; this comments wil appear printed in the output file. You should not use more than 64 characters per line, otherwise the comment will appear incomplete on screen.

After entering information in this screen, move to the following one by pressing [PgDn].

PRODEM RC01	COHORT RATIO NAMES OF AREAS TO BE PROJECTED	Time 16:30 Date 03/02/1992
1. SUBAREA 1		
2. SUBAREA 2		
3. SUBAREA 3		
4. SUBAREA 4		
5. SUBAREA 5		
6. SUBAREA 6		
7. SUBAREA 7		
CAPS		
F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit		

This screen enables the user to identify the Intermediate Areas to be projected and to indicate the order in which the information contained in each one will be entered.

**Fertility and Mortality**

After identifying the Intermediate Areas, pressing [PgDn] will display the screens in which to enter the fertility and mortality data of the Major Area.

With respect to this information the user should bear in mind that:

- a) If the Major Area file has already been processed in another of PRODEM's Modules and it was indicated that it should be used in this Module, the information on fertility and mortality will be loaded automatically.
- b) If in the selection screen of the Major Area File the user indicated that the information would be entered manually, the DATA INPUT SELECTION parameter in the General Parameters screen should be 0, "Normal Flow" or 1, "Major Area Fertility".

To enter manually the basic data on fertility and mortality of the Major Area, PRODEM displays the following screens:

TOTAL FERTILITY RATES (in thousands)		SURVIVAL RATIOS AT BIRTH		
QUINQUENNIUM	RATES	QUINQUENNIUM	MALES	FEMALES
1980-85	2579.70	1980-85	0.97529	0.98289
1985-90	2512.10	1985-90	0.98053	0.98696
1990-95	2444.70	1990-95	0.98175	0.98748
1995-00	2389.90	1995-00	0.98293	0.98854

CAPS

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

**TOTAL FERTILITY RATES**

Enables the input of the total fertility rates for each quinquennium of the projection.

## SURVIVAL RATIOS AT BIRTH

Enter the Survival Ratios at Birth by sex for each quinquennium of the projection.

After entering the total fertility rates and the survival ratios at birth, pressing [PgDn] will display the following screens:

BIRTHS		FERTILITY STRUCTURE	
QUINQUENNIUM	TOTAL	AGE	
1980-85	137801	15-19	0.126
1985-90	145288	20-24	0.292
1990-95	146611	25-29	0.271
1995-00	146181	30-34	0.182
		35-39	0.096
		40-44	0.038
		45-49	0.003
SEX BIRTH RATIO		: 1.04	

CAPS

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

## BIRTHS

Enter the total births for both sexes for each quinquennium of the projection.

## FERTILITY STRUCTURE

Enter the relative distribution of the age-specific fertility rates.

## SEX RATIO AT BIRTH

Enter the sex ratio at birth; if this information is not provided, 1.05 will be assumed.

**Census  
Population**

After entering the fertility and mortality data of the Major Area, press [PgDn] which will show the following screens. These screens enable the user to enter the census population of the Major Area and of each of the Intermediate Areas. Option 2, "Census Population", of the Data Input Selection parameter in the General Parameters screen allows the user to access them directly.

PRODEM will display a set of screens similar to the following one for the data input of the first and second census of the Major Area and for each of the Intermediate Areas.

PRODEM		COHORT RATIO		Time 14:17	Date 03/03/1992
RC01		FIRST CENSUS POPULATION			
AGE	MALES	FEMALES	MAJOR AREA		
0- 4	56650	54899	AREA: AREA I		
5- 9	62889	62984			
10-14	58125	58100			
15-19	48182	48958			
20-24	39515	42528			
25-29	32988	35248			
30-34	26823	30155			
35-39	28256	31456			
40-44	25744	28883			
45-49	28183	22256			
50-54	17523	19991			
55-59	14933	17554			
60-64	12691	14792			
65-69	9839	11267			
70-74	6549	7833			
75-79	3982	5874			
80-Y+	4863	6554			

CAPS

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

**Initial  
Population**

After entering the census data of the Major Area and the Intermediate Areas, pressing [PgDn] will show the following screens in which the user should enter the beginning population of the projection. Option 3, "Beginning Population", of the Data Input Selection parameter in the General Parameters screen allows the user to access them directly.

PRODEM will display a set of screens similar to the following one; in which to enter the beginning population of the Major Area and for each of the Intermediate Areas.

PRODEM RC01		COHORT RATIO BEGINNING POPULATION		Time 14:19	Date 03/03/1992
AGE	MALES	FEMALES	MAJOR AREA		
0-4	65152	61436	AREA: AREA I		
5-9	62584	60900			
10-14	62704	60960			
15-19	66095	65363			
20-24	57059	58352			
25-29	47969	49423			
30-34	39489	40976			
35-39	34202	36815			
40-44	27666	30832			
45-49	26536	29957			
50-54	24428	28114			
55-59	19229	23217			
60-64	16861	20863			
65-69	12815	16278			
70-74	9349	13037			
75-79	5727	8492			
80-84	4527	7665			

CAPS

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

When entering the information of this screen you should remember that:

- a) The information for the Intermediate Areas should refer to a date, multiple of 5, comprised in the period covered by the Major Area projection.
- b) The sum of the Beginning Population by sex and age of each of the Intermediate Areas to be projected should be equal to the population of the Major Area.

### Major Area Projection

After entering the beginning population of the Major Area and of the Intermediate Areas, pressing [PgDn] will show the following screens in which the Major Area projection should be entered.

With respect to this information you should remember that:

- a) If the Major Area file was processed in another of PRODEM's modules and it was indicated for usage here, the population of the Major Area will be loaded automatically.
- b) If in the selection screen of the Major Area File the user indicated that the information would be entered manually, you should use option 4, "Major Area Projection" of the DATA INPUT SELECTION parameter in the General Parameters screen.

If the Major Area projection is to be entered manually, PRODEM displays the following screen for each year:

AGE	MALES	FEMALES	YEAR: 1985
0-4	60451	66422	
5-9	64762	61248	
10-14	62235	68783	
15-19	62119	68698	
20-24	65499	65828	
25-29	57254	57567	
30-34	47348	48984	
35-39	38531	48519	
40-44	33351	36369	
45-49	26784	38332	
50-54	25238	29259	
55-59	22719	27132	
60-64	17377	22887	
65-69	13786	18477	
70-74	9514	14899	
75-79	6476	18368	
80-Y+	5283	9869	

CAPS

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

### Modification of the K factors

The "K factors" of the Intermediate Areas are calculated starting from census information, thus becoming one of the most important parameters of this projection method. To modify these factors, in the General Parameters screen use options 1, "Modified", in the (K) GROWTH FACTORS and 5, "K Modification" in the DATA INPUT SELECTION parameter. After performing these operations, press [PgDn] to access the screens that will enable you to modify the values of the "k factors" for all of the Intermediate Areas:

PRODEM RC01		COHORT RATIO CORRECTION FACTOR K		Time 14:23 Date 03/03/1992
AGE	MALES	FEMALES	MAJOR AREA	
0-4	0.96692	0.97069	AREA: SUBAREA 1	
5-9	0.95992	0.94827		
10-14	0.94613	0.91724		
15-19	0.97145	0.95444		
20-24	0.99642	1.01890		
25-29	0.97267	0.99324		
30-34	0.97124	0.97374		
35-39	0.99023	0.99099		
40-44	0.99107	1.00176		
45-49	0.99219	0.98515		
50-54	0.98088	0.96456		
55-59	0.99578	0.98538		
60-64	1.01578	1.00817		
65-69	1.01578	1.00817		
70-74	1.01578	1.00817		
75-79	1.01578	1.00817		
80-8+	0.00000	0.00000		

CAPSNUM

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

After modifying the K factors, press [F5] to save the file containing the new values. If you need to use the modified file later on, select option 1, "Modified", in the General Parameters screen.

---

## GROWTH DIFFERENTIAL

To enter the Intermediate Areas Module press [T] in the Definition of Modules screen or move the cursor to the corresponding section and press [ENTER]. After performing this operation, access the Growth Differential method by pressing [F]:

PRODEM	MAIN	Time 18:55	Date 03/03/1992
DEFINITION OF MODULES			
NATIONAL	N		
MAJOR AREAS	Y		
INTERMEDIATE AREAS	T		
MINOR AREAS	E		
URBAN RURAL	U		
TOOLS	R		
		COHORT RATIO	H
		GROWTH DIFFERENTIAL	F

Given the population by sex and age of two censuses for one or more subareas and the projection of the highest hierarchical area that contains them, it projects the population for each one of them and adjusts them to the highest hierarchical area using the ideas of "Growth Differential" of the U.N.

CAPS

F1-Help ↔SelMenu CtrlF1-Outline F7-DOS F9-SetUp F10-Quit

After selecting the Growth Differential method, the following screens will be displayed that allow the user to:

- Identify the file that will contain the information of the Intermediate Areas to be projected.
- Indicate that the information of the Major Area projection will be entered manually or to select a file (created with the "component" method) in another of PRODEM's modules.

For a better comprehension of the use of these files, see Chapter 3, the **Creation and Selection of Data Files** Section.

**General Parameters**

After identifying the Intermediate Areas file and selecting the Major Area projection, the General Parameters screen is then displayed:

PRODEM DIF1	GROWTH DIFFERENTIAL GENERAL PARAMETERS		Time 18:56 Date 03/03/1992
NAME OF MAJOR AREA	:	AREA 1	
DATE OF FIRST CENSUS	:	4/ 5/1970	
DATE OF SECOND CENSUS	:	21/ 4/1982	BASE YEAR FOR PROJ OF MAJOR AREA 1980
YEAR BEGINNING POPULAT	:	1985	
NUMBER OF AREAS	:	3	GROWTH DIFFERENTIAL (GD) :0 0 Original 1 Modified
PROJECTION PERIOD	:	1	SELECTION OF DATA INPUT :0 0 Normal flow 4 Special date 1 Census popul 5 GD model 2 Major are popul 6 Modified GD 3 Dates GD
NUMBER OF PERIODS	:	4	
COMMENTS:	SYSTEM DEFAULT		
CAPS			
F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit			

**NAME OF THE MAJOR AREA**

Using 28 characters at the most, indicate the name of the Major Area which contains the Intermediate Areas to be projected.

**DATE OF THE FIRST CENSUS  
DATE OF THE SECOND CENSUS**

Using a dd/mm/yyyy format (day, month, year) enter the exact date of the first and second census of the Intermediate Areas to be projected. For example, if the first census was taken on May 4, 1970 and the second was taken on April 21, 1982, the information of this section should be entered as 05/04/1970 and 21/04/1982 respectively.

**YEAR OF BEGINNING POPULATION**

Enter the beginning date of the projections; this date should correspond to a year of the Major Area projection.

## **NUMBER OF AREAS**

Corresponds to the number of Intermediate Areas to be projected. PRODEM enables the user to project a maximum of 31 areas.

## **PROJECTION PERIOD**

- 1 To project at 5 year intervals, starting from the BEGINNING YEAR.
- 2 To give annual estimates. When you select this option, the System will later request the annual population of the Major Area for each of the years indicated in the NUMBER OF PERIODS parameter.

## **NUMBER OF PERIODS**

If you selected 1, "Quinquennial", in PROJECTION PERIOD, the NUMBER OF PERIODS should not exceed 4.

If you selected 2, "Annual", in PROJECTION PERIOD, the NUMBER OF PERIODS should be 6 or 11. The program does not accept values other than the ones indicated.

## **BASE YEAR OF MAJOR AREA PROJECTION**

Enter the beginning year of the Major Area projection containing the Intermediate Areas to be projected.

## **GROWTH DIFFERENTIALS (GD)**

Enables the user to modify the "growth differential factors (GD)" of the Intermediate Areas (for a definition of GD factors, see the PROJECTION ALGORITHMS Section of this Chapter):

- 0 If this is a first time population projection for the Intermediate Areas; the GD factors will be based on the basic information.
- 1 To modify the GD factors. When selecting this code, the Data Input Selection parameter should be coded 6, "GD Modification"

## DATA INPUT SELECTION

This parameter enables the user to access directly the basic data screens:

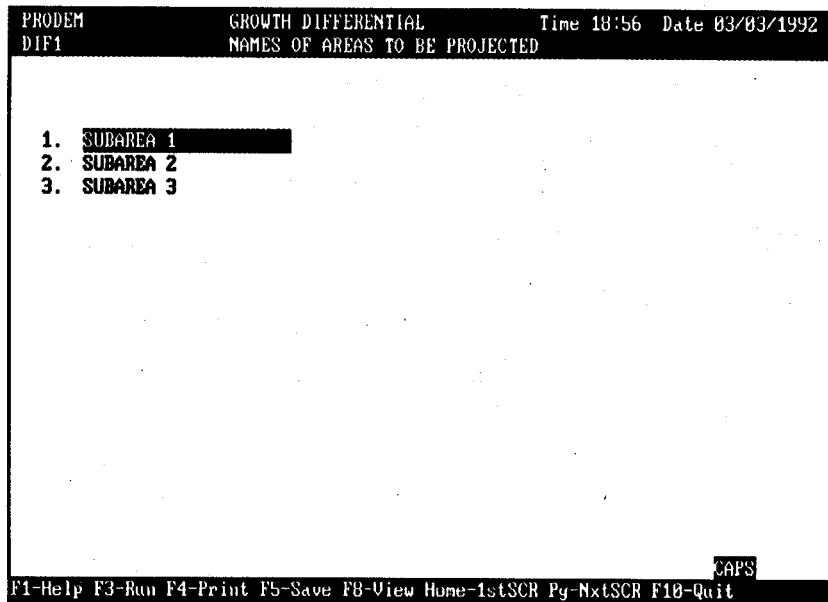
- 0 Enables the user to enter or modify **all the basic information**.
- 1 Enables the user to enter or modify information of the population censuses of the Major Area and the Intermediate Areas.
- 2 Enables the user to enter or modify information of the Major Area **projection**.
- 3 Enables the user to enter or modify the limit dates the GD should reach in each of the Intermediate Areas.
- 4 Enables the user to enter up to 10 different estimate dates other than those indicated in the NUMBER OF PERIODS parameter.
- 5 Enables the user to **modify the model GD growth differentials**.
- 6 Enables the user to **modify the GD growth differentials**. Select this option only if previous projections of the Intermediate Areas are available.

If the GD factors are modified, press [F5] to save the file containing the new values and hereafter you should always use option 1 "Modified" for this file.

## COMMENTS

In this section, the user can register a few projection comments for the file to be created in two lines; these comments will appear in the output file. You should use no more than 64 characters per line, otherwise the comment will appear incomplete on screen.

After completing the data input in this screen, move to the following screen by pressing [PgDn].



This screen allows the user to identify the Intermediate Areas to be projected and to indicate the order in which the information for each one of them will be entered.

**Census  
Population**

After entering the General Parameters, pressing [PgDn] will show the next screens which allow the user to enter the census population of the Major Area and of each of the Intermediate Areas. Option 1, "Census Population", of the Data Input Selection parameter in the General Parameters screen, allows the user to access them directly.

PRODEM will display a set of screens, similar to the following one, for the data input of the first and second census of the Major Area and for each of the Intermediate Areas.

PRODEM		GROWTH DIFFERENTIAL		Time 18:56	Date 03/03/1992
DIF1		POPULATION OF FIRST CENSUS			
AGE	MALES	FEMALES			
0-4	2204	2274	AREA: SUBAREA 1		
5-9	2598	2595			
10-14	2322	2436			
15-19	1555	1790			
20-24	1363	1422			
25-29	1435	1313			
30-34	1221	1191			
35-39	1272	1225			
40-44	1332	1069			
45-49	961	759			
50-54	760	687			
55-59	528	480			
60-64	444	395			
65-69	343	318			
70-74	219	194			
75-79	117	123			
80-Y+	100	150			

CAPS

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

### Major Area Projection

After entering the census population of the Major Area and the Intermediate Areas, pressing [PgDn] will show the next screens which allow the user to enter the Major Area projection.

With respect to this information you should remember that:

- a) If the Major Area file was processed in another of PRODEM's Modules and it was indicated that it should be used here, the Major Area population will be loaded automatically.
- b) If in the selection screen of the Major Area File you indicated that the information would be entered manually, use option 4, "Major Area Projection" of the DATA INPUT SELECTION parameter in the General Parameters screen.

If the Major Area projection is to be entered manually, PRODEM will display the following screen for each year:

PRODEM		GROWTH DIFFERENTIAL		Time 18:57	Date 03/03/1992
DIF1		MAJOR AREA POPULATION			
YEAR: 1980		AGE	MALES	FEMALES	
TOTAL MALES :	170740	0- 4	19614	19528	
TOTAL FEMALES:	167355	5- 9	20613	20582	
		10-14	18341	18279	
		15-19	17364	16781	
		20-24	17520	16640	
		25-29	16846	15192	
		30-34	13165	12175	
		35-39	10620	10007	
		40-44	8149	7914	
		45-49	7563	7174	
		50-54	6351	6331	
		55-59	4911	4956	
		60-64	3529	3730	
		65-69	2503	2947	
		70-74	1719	2357	
		75-79	1068	1532	
		80-Y+	872	1310	

CAPS

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

**Modification of the GD differentials**

The "GD differentials" of the Intermediate Areas are based on census information, thus becoming one of the most important parameters for this projection method. To modify these differentials, use option 1, "Modified" in the GROWTH DIFFERENTIAL (GD) parameter in the General Parameters screen and for the DATA INPUT SELECTION parameter select:

- 3 To modify the limit date of the Model Growth Differentials:

PRODEM		GROWTH DIFFERENTIAL	Time 18:58 Date 03/03/1992
DIF1		LIMIT DATE FOR GD	
	<u>AREA</u>	<u>YEAR</u>	
	SUBAREA 1	2000	
	SUBAREA 2	2000	
	SUBAREA 3	2000	

CAPS

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

- 4 To provide up to 10 estimate dates of special interest and different to those used in the NUMBER OF PERIODS parameter:

PRODEM		GROWTH DIFFERENTIAL			Time 18:58 Date 03/03/1992
DIF1		DATES OF SPECIAL INTEREST			
	<u>DAY</u>	<u>MONTH</u>	<u>YEAR</u>		
1	30	- 6	- 1987		
2	30	- 0	- 1992		
3	0	- 0	- 0		
4	0	- 0	- 0		
5	0	- 0	- 0		
6	0	- 0	- 0		
7	0	- 0	- 0		
8	0	- 0	- 0		
9	0	- 0	- 0		
10	0	- 0	- 0		

You have the possibility of projecting up to a maximum of 10 specific dates or calendar-years.

CAPS

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

5 To modify or enter the Growth Differentials by sex and limit ages for each of the Intermediate Areas:

PRODEM		GROWTH DIFFERENTIAL		Time 18:59	Date 03/03/1992
DIF1		DIFFERENTIALS OF MODEL GROWTH			
AGE	MALES	FEMALES			
0-4	0.00000	0.00000	AREA: SUBAREA 1		
5-9	0.00000	0.00000			
10-14	0.00000	0.00000			
15-19	0.00000	0.00000			
20-24	0.00000	0.00000			
25-29	0.00000	0.00000			
30-34	0.00000	0.00000			
35-39	0.00000	0.00000			
40-44	0.00000	0.00000			
45-49	0.00000	0.00000			
50-54	0.00000	0.00000			
55-59	0.00000	0.00000			
60-64	0.00000	0.00000			
65-69	0.00000	0.00000			
70-74	0.00000	0.00000			
75-79	0.00000	0.00000			
80-Y+	0.00000	0.00000			

CAPS

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

6 To modify the GD Growth Differential Factors of each Intermediate Area obtained from the basic information.

PRODEM DIF1	GROWTH DIFFERENTIAL CORRECTION OF GROWTH DIFFERENTIALS		Time 19:00 Date 03/03/1992
AGE	MALES	FEMALES	
0-4	0.0000	0.0000	AREA: SUBAREA 1
5-9	0.0000	0.0000	
10-14	0.0000	0.0000	
15-19	0.0000	0.0000	
20-24	0.0000	0.0000	
25-29	0.0000	0.0000	
30-34	0.0000	0.0000	
35-39	0.0000	0.0000	
40-44	0.0000	0.0000	
45-49	0.0000	0.0000	
50-54	0.0000	0.0000	
55-59	0.0000	0.0000	
60-64	0.0000	0.0000	
65-69	0.0000	0.0000	
70-74	0.0000	0.0000	
75-79	0.0000	0.0000	
80-9+	0.0000	0.0000	

CAPS

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

---

## RESULTS

After entering the basic data of a projection, press [F3] in order to obtain the results.

After completing the processing, PRODEM displays the results on the screen and, in order to view them without printing them, use the keys as indicated at the bottom of the results screen. Press [F10] to quit from the edit mode.

What follows is all the information that can be obtained through this Module :

### Cohort Ratio

#### POPULATION:

- Total population by sex and five years age groups, for the Major Area and each Intermediate Area at the census moments.
- Population of each Intermediate Area as percentage of the Major Area by sex and each age group at the census moments.
- Total "not adjusted" projected population by sex and five years age groups.
- Total "adjusted" population projected by sex and five years age groups.
- Population of each Intermediate Area as percentage of the Major Area by sex and age groups.
- Relative structure of the population by sex and age groups for the beginning and ending years of the projection.
- Sex ratio for five years age groups.
- Growth factors (GF) of the Major Area by sex and age groups.
- Differential growth indices (K factors) by sex and five years age groups.

#### FERTILITY AND MORTALITY:

**Growth  
Differential**

- Total fertility rates for geographical Areas.
- Relative fertility structure and sex ratio at birth for the Major Area.
- Survival ratios at birth by sex of the Major Area.

**POPULATION:**

- Total population by sex and five years age groups for the Major Area and each Intermediate Area at the census moments.
- Total "adjusted" projected population by sex and five years age groups.
- Relative distribution of the total population by sex and five years age groups.
- Total population by sex.
- Total population aged 15 to 64.
- Total female population aged 15 to 49.

**RATIOS:**

- Children-women ratio.
- Total sex ratio.
- Mean age of the total population.
- Total dependency ratio.
- Sex ratio for five years age groups.
- Mean annual growth rates by sex and age groups.
- Growth Differentials (GD) by sex and age groups.

---

## PROJECTION ALGORITHMS

The algorithms used to project the population by sex and age groups for each of the procedures described in this Chapter are the following:

### Cohort Ratio

The projection algorithms for an Intermediate Area comprise the following parameters:

- For the population under 5 years of age:

$${}_5N_0^{t+5} = B^{t,t+5} * P_b^{t,t+5} * K_b^{t,t+5}$$

- For the population aged 5 to 75:

$${}_5N_{x+5}^{t+5} = {}_5N_x^t * {}_5CR_x^{t,t+5} * {}_5K_x^{t,t+5}$$

- For the population 80 years of age and over:

$$N_{80y+}^{t+5} = N_{75y+}^t * {}_5CR_{75y+}^{t,t+5} * {}_5K_{75y+}^{t,t+5}$$

where,

${}_5N_x^t$  is the population of an Intermediate Area for a five years age group at moment t,

${}_5N_{x+5}^{t+5}$  is the population of an Intermediate Area for a five years age group at moment t+5,

$B^{t,t+5}$  are the births in the t,t+5 period of an Intermediate Area, estimated from a fertility structure of the Major Area and differential fertility indices which are derived

from the sex ratio at birth observed in the Intermediate Area at the moment of the last census,

$P_b^{t+5}$

is the survival ratio of the Major Area containing the Intermediate Area to be projected and which, when applied to the births of the latter, enables the user to estimate the age groups 0-4 at moment  $t+5$ ,

${}_5K_x^{t+5}$

is the growth differential index of an Intermediate Area relative to the Major Area and which applied to a five years age group at moment  $t$ , enables the user to obtain the next age group at moment  $t+5$ . This growth differential index is obtained by relating the observed population by cohorts and sex in two censuses for the Intermediate Area and the Major Area respectively,

$K_b^{t+5}$

is the growth differential index of an Intermediate Area, which, together with the survival ratio at birth enables the user to estimate the population aged 0-4 at moment  $t+5$ . This index is derived from the estimated value of  $K$  for the group aged 5-9,

${}_5CR_x^{t+5}$

is the growth factor of the Major Area which is calculated for each quinquennium of the population projection in this area. This factor is estimated by relating the population of a five years age group at moment  $t+5$  and the population corresponding to the previous age group at moment  $t$ .

**Growth  
Differential**

The projection algorithms for an Intermediate Area comprise the following parameters:

$${}_5N_x^n = 100 / [1 + (R_x^t / N_x^t) * \exp^{-DCx * n}]$$

where,

${}_5N_x^n$  is the population of a five years age group in the Intermediate Area, projected at moment  $t+5$ ,

$R_x^t$  is the difference between the populations of the Major Area and the Intermediate Area at moment  $t$ , corresponding to the age group to be projected,

$N_x^t$  is the population of the Intermediate Area at moment  $t$ , corresponding to the age group to be projected,

$DCx$  is the growth differential of the age group to be projected, and which is calculated as the difference between intercensal (exponential) growth rates of the complement of the Intermediate Area and the Major Area and that is corresponding to the same age group in the Intermediate Area,

$n$  represents the year for which the projection is carried out, that is, the time elapsed between the last census and the projection date.

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## 7. MINOR AREAS MODULE

Starting the System through the PRODEM command the logotype will be displayed, press any key and in the then active Definition of Modules screen and press [E] to load the Minor Areas Module (or move to the corresponding section and press [ENTER]). Next, PRODEM provides the screen with the mathematical projection methods: Linear, Exponential or Geometrical, Logistic (with two asymptotes), Murphy, Pickard I and Pickard II.

PRODEM	MAIN	Time 19:03	Date 03/03/1992
DEFINITION OF MODULES			
NATIONAL	M		
MAJOR AREAS	V		
INTERMEDIATE AREAS	T		
MINOR AREAS	E		
URBAN RURAL	U		
TOOLS	R		

LINEAR
EXPONENTIAL-GEOMETRICAL
LOGISTIC
MURPHY
PICKARD

This module contains a set of mathematical models to project the total population of one or more geographical areas observed at 2 or 3 moments in time (for example censuses). In order to separate these projections, by sex and/or age the SQUARE TABLE METHOD can be used.

CAPS

F1-Help    ↔SelMenu    CtrlF1-Outline    F7-DOS    F9-SetUp    F10-Quit

Unlike the former Modules, the selection of the projection methods in the Minor Areas Module occurs after identifying a projection file; therefore, in this screen you can not select one of the methods previously mentioned.

### Objectives of the Module

The methods in this Module enable the user to project -in absolute or relative values- exclusively the total population of a set of Minor Areas. However, as we shall later see, in order to separate these populations by sex and quinquennial age groups, the Tools Module can also be used. Optionally, the System "adjusts" the results of the separation so that the

sum of the projections for each Minor Area reproduces the population of the Major Area, which contains these Minor Areas.

**Basic Information**

After selecting the Minor Areas Module, the System will display screens which allow the user to:

- Identify the file that will contain the basic data of the Minor Areas.
- Indicate if the data will be modified starting from a File already created and available in PRODEM or if the data will be entered from the System's "default" file.

For a better comprehension of the handling of these files, see Chapter 3, the **Selection and Creation of Data Files Section**.

The methods incorporated in this Module use as starting point the following data:

**Information on the Major Area (optional):**

- A population projection of the Major Area containing all the Minor Areas to be projected.

The input of this information is optional, since the user can request PRODEM either to "adjust" or not to "adjust" the projections of the Minor Areas to a projection of the Major Area containing them.

**Information on the Minor Areas:**

- The total population of each Minor Area for two moments in time -for example- two censuses.
- The total population of each Minor Area for three moments in time -for example- three censuses in the case Pickard II is used.
- Values ranging between 0 and 1 -higher and lower asymptote- in the case the population is projected using the logistical function.

**Options of the Module**

After identifying the Minor Areas file according to the instructions provided in Chapter 3, the **File Selection and Creation Section**, PRODEM

offers the user the possibility of selecting the projection procedure, as in the next screen:

PRODEM TEST	MINOR AREAS METHOD SELECTION	Time 19:03 Date 03/03/1992
<b>SELECT METHOD</b> : 2		
0 Linear		
1 Exponential or geometrical		
2 Logistical		
3 Murphy		
4 Pickard I		
5 Pickard II		
<b>GENERATE COMMUNICATION FILE</b> : 0		
0 Not necessary		
1 With totals projected for other modules		
CAPS		
F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit		

#### SELECT METHOD

- 0 **Linear:** Projects the population using a straight line with information at two moments; optionally the results can be adjusted to the Major Area containing these populations.
- 1 **Exponential or Geometrical:** Projects the population using exponential and geometrical functions with information at two moments; optionally, the results can be adjusted to the Major Area containing these populations.
- 2 **Logistic:** Projects the population using of a logistic function with information at two moments and asymptotic values (lower and higher) between which the projection period is found; when this method is used, the asymptotes should vary between 0 and 1.
- 3 **Murphy:** Corresponds to a variant of the logistic function with information at two moments; the population is projected using a logistic function under the assumption that the higher asymptote corresponds to the population estimated 60 years

after the last observation moment; optionally, the results can be adjusted to the Major Area containing these populations.

- 4,5 **Pickard I and II:** With information for two or three moments equally spaced, the population projection takes into consideration the proportion each Minor Area represents in the Major Area; optionally, the results can be adjusted to the Major Area containing these populations. The Pickard I method is not applicable when the population decreases during the observed period; in these cases, the System generates asterisks instead of numerical results and unacceptable values for adjustment to the Major Area.

#### GENERATE COMMUNICATION FILE

- 0 PRODEM does not generate a file with projection results for later use in the Tools Module.
- 1 PRODEM will generate a file for later usage in the "Square Table method" of the Utilities Module.

After selecting the projection method and the communication option, pressing [PgDn] will show the following screen, in which the user should indicate the type of projection, i.e. in absolute or relative values.

PRODEM	MINOR AREAS	Time 19:06	Date 03/03/1992
TEST	TYPE OF VALUES		
<b>PROJECTS VALUES : 0</b>			
<b>0 Absolute</b>			
<b>1 Relative</b>			
<b>CAPS</b>			
F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit			

## PROJECTION VALUES

In this Module the information must be entered in absolute terms; the selection of one of these codes is associated with the treatment of the basic data in the projection procedure:

- 0 In the projection algorithm it uses directly the entered absolute values; this option is valid for the **linear, exponential, Murphy, Pickard I and II** methods.
- 1 Is used to project the relative weight of the Minor Areas in the Major Area; this option is valid for the **linear, exponential and logistic** methods.

After entering the information in the Type of Values screen, press [PgDn]. For those procedures using information obtained in two censuses -linear, exponential or geometrical, logistic, Murphy and Pickard I- the user should provide the following specifications:

PRODEM	MINOR AREAS	Time 19:06	Date 03/03/1992
TEST	GENERAL PARAMETERS		
NAME OF MAJOR AREA : AREA I			
DATE OF FIRST CENSUS : 29/11/1960			
DATE OF SECOND CENSUS : 22/ 4/1970			
NUMBER OF ESTIMATES : 4			
NUMBER OF AREAS : 3			
ADJUSTEMENT TO MAJOR AREA :1			
0 No			
1 Yes			
COMMENTS: SYSTEM DEFAULT			
CAPS			
F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit			

### NAME OF THE MAJOR AREA

Using a maximum of 28 characters, indicate the name of the Major Area containing the Minor Areas to be projected.

**DATE OF FIRST CENSUS**  
**DATE OF SECOND CENSUS**

Following a dd/mm/yyyy (day, month, year) format, enter the exact date of the first and second census of the Intermediate Areas to be projected; for example, if the first census was taken on April 21, 1970 and the second was on April 21, 1982, the information in this section should be entered as 21/04/1970 and 21/04/1982 respectively.

If the Pickard II method was selected, this screen includes the date corresponding to a third census; the time elapsed between the censuses should be equal.

**NUMBER OF ESTIMATES**

Enter the number of projection dates (maximum 10) for the Minor Areas; this value should correspond to the number of years for which information will be provided for the Major Area.

The Pickard II method excludes this option. In this case, PRODEM estimates for four quinquennia starting from the date of the last census.

**NUMBER OF MINOR AREAS**

Enter the number of Minor Areas to be projected, 30 at the most.

**ADJUSTMENT TO THE MAJOR AREA**

- 0 The sum of the projections of the Minor Areas does not correspond to the total population of the Major Area containing them.
- 1 The sum of the projections of the Minor Areas reproduces the total population of the Major Area containing them.

**COMMENTS**

In this section, in two lines the user can register a few observations related to the projections file to be created; these comments will be printed in the output file. The user should not use more than 64 characters per line, otherwise the comment will appear incomplete on the screen.

After completing the data input of this screen, press [PgDn] for the next screen in which to identify each of the Minor Areas to be projected:

PRODEM	MINOR AREAS	Time 19:07	Date 03/03/1992
TEST	NAMES OF MINOR AREAS		
<ol style="list-style-type: none"> <li>1. SUBAREA 1</li> <li>2. SUBAREA 2</li> <li>3. SUBAREA 3</li> </ol>			
CAPS			
F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit			

After identifying the Minor Areas, press [PgDn] to access the screen in which to enter the dates for the projection:

PRODEM	MINOR AREAS	Time 19:07	Date 03/03/1992
TEST	PROJECTION DATES		
		DAY	MONTH
		YEAR	
1		0	0
2		0	0
3		0	0
4		0	0
5		0	0
6		0	0
7		0	0
8		0	0
9		0	0
10		0	0
Please, enter 4 projection dates			
CAPS			
F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit			

In this screen:

- The information is valid for all the Minor Areas, and therefore, it will not be possible to obtain projections at different dates for different geographical areas.
- In a dd/mm/yyyy (day, month, year) format, provide a maximum of 10 projection dates if you wish to adjust the results to a projection of the Major Area and only 8 dates if you do not wish an adjustment.

After providing the projection dates, press [PgDn] and the System will request the information on the Major Area projection; this information must correspond to the same years entered in the screen on Projection Dates for the Minor Areas:

PRODEM TEST	MINOR AREAS DATA OF MAJOR AREA	Time 19:07 Date 03/03/1992										
	<table><thead><tr><th>YEAR</th><th>PROJECTION VALUE</th></tr></thead><tbody><tr><td>0</td><td>111245</td></tr><tr><td>0</td><td>120337</td></tr><tr><td>0</td><td>129411</td></tr><tr><td>0</td><td>138248</td></tr></tbody></table>	YEAR	PROJECTION VALUE	0	111245	0	120337	0	129411	0	138248	
YEAR	PROJECTION VALUE											
0	111245											
0	120337											
0	129411											
0	138248											

CAPS

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

After providing the information of the Major Area projection, press [PgDn] to obtain the screens where the census data of the Major Area and of each of the Minor Areas should be entered:

PRODEM TEST		MINOR AREAS CENSUS POPULATION	Time 19:08 Date 03/03/1992
YEAR	TOTAL	MAJOR AREA	
1968	57277	AREA: AREA I	
1976	72806		

CAPS

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

After completing the data input in this Module, press [F5] to save the information as a basic data file and then press [F3] to project the data set.

Whenever the projection method 2 is selected, i.e. "Logistic", PRODEM will show, before the basic data is entered, the following screen in which the higher and lower asymptotes should be indicated:

```
PRODEM          MINOR AREAS          Time 19:09 Date 03/03/1992
TEST           ASYMPTOTES

K1             :0.00000
K1+K2          :0.00000

CAPS
F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit
```

---

## **RESULTS**

After entering the basic data of a Minor Areas projection, press [F3] for processing and obtainment of the results.

Once completed the processing, PRODEM will display the results on screen; in order to view them without printing use the keys indicated at the bottom of the results screen. Press [F10] to quit the edit mode.

Using any of the methods of the Minor Areas module will give as a result the basic information of each of the geographical areas to be projected as well as the total projected population of the Minor Areas for all the requested dates.

---

## PROJECTION ALGORITHMS

The algorithms to project the total population for one or several Minor Areas for all the procedures described in this Chapter are the following:

### Linear

$$N^{t+n} = a + bn$$

where,

$N^{t+n}$  is the population of a Minor Area, projected at moment  $t+n$ ,

$n$  is the elapsed time between the moment where the observed data refer to and the projection moment,

$a$  and  $b$  are the parameters of the linear function which are based on the observed data.

### Exponential or Geometrical

$$N^{t+n} = N^t e^{rn} \quad (\text{exponential})$$

$$N^{t+n} = N^t (1+r)^n \quad (\text{geometrical})$$

where,

$N^{t+n}$  is the population of a Minor Area, projected at moment  $t+n$ ,

$N^t$  is the population of a Minor Area at the initial moment  $t$ ,

$n$  is the elapsed time between the initial moment  $t$  (to which the observed data refer) and the final moment for which the population is calculated,

$r$  is the mean annual growth rate of a Minor Area, which is calculated as:

$$r = [1/n] * \ln ( N_{cc} / N_c ) \quad \text{exponential}$$

$$r = [ N_{cc} / N_c ]^{1/n} - 1 \quad \text{geometrical}$$

In these ratios,  $N_c$  and  $N_{cc}$  are the populations at the first and second moment of observation, whereas  $t$  is the time elapsed between each moment to which the observed data refer to.

**Logistic**

$$N^{t+n} = K(1) + [K(2) / (1 + e^{a+bn})]$$

where,

$N^{t+n}$  is a Minor Area population, projected at moment  $t+n$ ,

$n$  is the elapsed time between the initial moment  $t$  (to which the observed data refer to) and the moment  $t+n$ ,

$K(1)$  and  $K(2)$

are asymptotic values, which correspond to the proportion of a Minor Area to be projected in a Major Area at a moment previous to the initial one ( $K(1)$ ) and a at a moment later than the second one ( $K(2)$ ).

**Murphy**

$$N^{t+n} = \frac{N^t R^{60/T} (R^{60/T} - 1)^{[(n-t)/T-1]}}{(R^{(60/T)-1} - 1)^{[(n-t)/T]} + (R^{60/T} - 1)^{[(n-t)/T-1]}}$$

where,

$N^{t+n}$  is the population of a Minor Area projected at moment  $t+n$ ,

$$R = N^{cc} / N^c$$

$$T = (N^{cc} \text{ date} - N^c \text{ date})$$

$N^c$  is the population of a Minor Area at the first observation moment,

$N^{cc}$  is the population of a Minor Area at the second observation moment,

$n$  is the elapsed time between  $N_c$  and the projection moment.

**Pickard I**

$$N_s^{t+n} = N_s^c + [(N_s^{cc} - N_s^c) / (NM^{cc} - NM^c)] * (NM^n - NM^{cc})$$

where,

- $N_s^{t+n}$  is the population of a Minor Area, projected at moment  $t+n$ ,
- $N_s^c$  is the population of a Minor Area at the first observation moment,
- $N_s^{cc}$  is the population of a Minor Area at the second observation moment,
- $NM^c$  is the population of the Major Area at the first observation moment,
- $NM^{cc}$  is the population of the Major Area at the second observation moment,
- $n$  is the time elapsed between the first observation moment and the projection moment.

#### Pickard II

This procedure is the only one included in PRODEM to project the Minor Areas populations starting from information collected in three censuses.

In its original version, the method enables the user to project population only for a moment later than the second census and which is equivalent to the time elapsed between the date of the first and the third census. However, based on the calculation of the weights determined as a function of the census dates, an adaption was developed to obtain estimates by quinquennia.

Basically, the procedure consists of:

- a) the calculation of "exchange rates" using the difference between the natural logarithms resulting from the transformation of the percentage of the Minor Area to be projected in the Major Area at the moment of each census,
- b) the weighting of the rates calculated in (a) with the number of times, being the difference in time periods between the last census and each of the previous ones, and then add them and divide them by the sum of the weights, and finally,
- c) the projection of the ratio representing the Minor Area in the Major Area. To the result obtained in (b) the natural logarithm of the ratio is added and the antilogarithm taken.

---

## **Bibliographic References**

### **CELADE**

Métodos para proyecciones demográficas, Serie E, N°1003, San José, Costa Rica, 1984.

### **DANE-CELADE**

Seminario Internacional sobre Proyecciones Subnacionales de Población, Serie OI No. 42, Bogotá, Noviembre 1989.

### **Granados, María del Pilar**

"Técnicas de proyecciones de población de áreas menores. Aplicación y evaluación", CELADE, Serie B, Número 55, LC/DEM/G.63, Santiago, Chile, 1988.

### **Kayani, Ashraf**

"Preparing Subnational Population Projections: A Manual for selected indirect methods", CELADE, Serie B, N°48, Santiago, Chile, 1980.

### **Murphy**

"Propuesta de Murphy para calcular la asíntota superior en la función logística para proyectar la población. Presentada por W. Brass", Apuntes de Jorge L. Somoza, CELADE, Inédito.

## 8. URBAN-RURAL MODULE

Once the user has activated the System through the PRODEM command, press any key to pass the logotype and the Definition of Modules screen will be displayed. In order to load the Urban-Rural Module, press [U] or move the cursor to the corresponding section and press [ENTER]. PRODEM will now show the following screen in which to select the Projection Method to be used:

PRODEM	MAIN	Time 19:11	Date 03/03/1992																				
	DEFINITION OF MODULES																						
<table border="1"><tr><td>NATIONAL</td><td>N</td></tr><tr><td>MAJOR AREAS</td><td>Y</td></tr><tr><td>INTERMEDIATE AREAS</td><td>I</td></tr><tr><td>MINOR AREAS</td><td>E</td></tr><tr><td><b>URBAN RURAL</b></td><td><b>U</b></td></tr><tr><td>TOOLS</td><td>R</td></tr></table>		NATIONAL	N	MAJOR AREAS	Y	INTERMEDIATE AREAS	I	MINOR AREAS	E	<b>URBAN RURAL</b>	<b>U</b>	TOOLS	R	<table border="1"><tr><td>COMPONENTS</td><td>C</td></tr><tr><td>COHORT RATIO</td><td>H</td></tr><tr><td>GROWTH DIFFERENTIAL</td><td>F</td></tr><tr><td>URBAN PERCENTAGES</td><td>P</td></tr></table>		COMPONENTS	C	COHORT RATIO	H	GROWTH DIFFERENTIAL	F	URBAN PERCENTAGES	P
NATIONAL	N																						
MAJOR AREAS	Y																						
INTERMEDIATE AREAS	I																						
MINOR AREAS	E																						
<b>URBAN RURAL</b>	<b>U</b>																						
TOOLS	R																						
COMPONENTS	C																						
COHORT RATIO	H																						
GROWTH DIFFERENTIAL	F																						
URBAN PERCENTAGES	P																						
Enables to project population by sex and age of one or more areas using the COMPONENT METHOD, the COHORT RATIO METHOD and the GROWTH DIFFERENTIAL METHOD. URBAN PERCENTAGES can also be used. In order to use this method it will be necessary to have the projection of the highest hierarchical area.																							
CAPS																							
F1-Help ++SelMenu CtrlF1-Outline		F7-DOS F9-SetUp F10-Quit																					

This Module contains programs to project population by sex and Urban-Rural areas, for age groups, using the Component, Cohort Ratio and Growth Differential methods. These methods are described in the chapters 5, Major Areas Module, and 6, Intermediate Areas Module, of this Manual.

In addition to these procedures, this Module contains an option called Urban Percentages; usage of which is explained in this Chapter.

To enter the Urban Percentages option, select the Urban-Rural Module in the Definition of Projection Modules screen and press the [->] key and then the [R] key.

**Objectives of the Module**

The Urban Percentages option contains a set of procedures which enable the user to separate a total population projection by sex and five years age groups into projections at Urban-Rural level by sex and age.

If this option is used, PRODEM projects population at Urban and Rural level by sex for ages 0-4 up to 80 and over for a period equal or smaller than the total population projection.

**Basic Information**

In order to project at Urban-Rural level in the Urban Percentages option, the user must have as basic information a total population projection and ratios of the Urban population.

If the projection of total population was done using the National or Major Areas Modules the data can be loaded automatically; if not, it should be entered manually.

When the Major Area projection is entered manually, the information should refer to the population by sex and age groups for same quinquennium as the period that will be covered by the Urban Rural Areas projection.

The ratios of Urban population should be organized in one of the following ways:

- By sex and age groups for each quinquennium of the period covered by the Total Area projection.
- By sex and five years age groups for the beginning year of the projection and sex ratios for each quinquennium of the period covered by the Total Area projection.
- By sex and the dates to which these ratios will be applied in the Total Area projection.
- Totals by sex and five years age groups for each quinquennium prior to an interpolation date and ratios of urban population by sex starting from this date until completing the period covered by the Total Area projection.

**Options of the Module**

After selecting the Urban Percentages option, the following screens will be displayed, in which to:

- Identify the file that will contain the information of the Urban and Rural Areas to be projected.
- Indicate that the data of the Major Area projection will be entered manually or read from a file, which was created (using the "component" method) in another of PRODEM's modules.

For a better understanding of the use of these files see Chapter 3, Section **Creation and Selection of Data files.**

**General Parameters**

After identifying the Urban and Rural Areas file and selecting the Major Area projection, the General Parameters screen will be displayed:

```
PRODEM          URBAN PERCENTAGES          Time 19:20 Date 03/03/1992
URO1            GENERAL PARAMETERS

NAME OF AREA    :AREA I
BEGINNING YEAR OF PROJECTION :1980
ENDING YEAR OF PROJECTION   :2000

PROCEDURE       :0

0 Application of given percentages.
1 Disaggregation by age based on
  totals by sex.
2 Linear interpolation of totals by
  sex and disaggregation by age.
3 Application of given percentages and
  disaggregation by age based on
  totals by sex.

COMMENTS : DEFAULT DEL SISTEMA

CAPS
F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit
```

**NAME OF THE AREA**

Using a maximum of 28 characters, indicate the name of the Major Area containing the urban and rural areas to be projected.

**BEGINNING YEAR OF PROJECTION**  
**FINAL YEAR OF PROJECTION**

This information will determine the period that will be covered by the urban and rural areas projection. The indicated years must be comprised in the period covered by the total projection.

**PROCEDURE**

After identifying the total area projection and the period for the urban and rural projection, PRODEM asks for the characteristics of the basic data that will be entered in order to separate the total projection.

**Procedure 0 - Application of given percentages:**

To indicate that urban population ratios will be entered by sex and five years age groups for each year of the projection. Pressing [PgDn] will display the following data input screen:

PRODEM		URBAN PERCENTAGES		Time 19:21	Date 03/03/1992
URO1		URBAN POPULATION PERCENTAGE (BETWEEN 0 - 1)			
YEAR: 1980		AGE	MALES	FEMALES	
TOTAL MALES :	0.7931	0- 4	0.7954	0.7972	
TOTAL FEMALES:	0.8295	5- 9	0.7856	0.7914	
		10-14	0.7889	0.7968	
		15-19	0.7911	0.8362	
		20-24	0.8035	0.8562	
		25-29	0.8145	0.8592	
		30-34	0.8167	0.8580	
		35-39	0.8127	0.8555	
		40-44	0.8042	0.8474	
		45-49	0.7958	0.8417	
		50-54	0.7829	0.8372	
		55-59	0.7691	0.8334	
		60-64	0.7543	0.8307	
		65-69	0.7453	0.8281	
		70-74	0.7531	0.8342	
		75-79	0.7589	0.8346	
		80-Y+	0.7553	0.8294	

CAPS

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

In this screen the total ratios urban by sex and the ratios urban by age must be calculated for the total population of each sex and age in the Major area.

**Procedure 1 - Separation by age starting from totals by sex:**

To indicate that population ratios will be entered for the urban area by sex and five years age groups at the beginning year of the projection and sex ratios for each quinquennium of the projection. [PgDn] will display the following data input screen:

PRODEM		URBAN PERCENTAGES		Time 19:21 Date 03/03/1992	
UR01		% OF URBAN POP. IN BEGINNING YEAR (BETWEEN 0 - 1)			
YEAR: 1980		AGE	MALES	FEMALES	
TOTAL MALES :	3.0000	0- 4	0.0000	0.0000	
TOTAL FEMALES:	0.0000	5- 9	0.0000	0.0000	
		10-14	0.0000	0.0000	
		15-19	0.0000	0.0000	
		20-24	0.0000	0.0000	
		25-29	0.0000	0.0000	
		30-34	0.0000	0.0000	
		35-39	0.0000	0.0000	
		40-44	0.0000	0.0000	
		45-49	0.0000	0.0000	
		50-54	0.0000	0.0000	
		55-59	0.0000	0.0000	
		60-64	0.0000	0.0000	
		65-69	0.0000	0.0000	
		70-74	0.0000	0.0000	
		75-79	0.0000	0.0000	
		80-Y+	0.0000	0.0000	

CAPS

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

After providing this data, press [PgDn] to obtain the following screen:

PRODEM		URBAN PERCENTAGES		Time 19:22 Date 03/03/1992	
URO1		% TOTAL URBAN POPULATION BY SEX (BETWEEN 0 - 1)			
YEAR	MALES	FEMALES			
1985	3.0000	0.0000			
1990	0.0000	0.0000			
1995	0.0000	0.0000			
2000	0.0000	0.0000			

CAPS

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

In these screens the total ratios by sex and those corresponding to the urban population by age, must be calculated for the total population of each sex and age in the Major Area.

**Procedure 2 - Linear interpolation of totals by sex and separation by age:**

To indicate that the urban population ratios will be entered by sex and age groups at the beginning year of the projection and sex ratios be entered for a projection year. This will enable interpolations or extrapolations of the urban and rural population by sex and age. Pressing [PgDn] will display the following screens for the data input:

PRODEM		URBAN PERCENTAGES		Time 19:22 Date 03/03/1992	
URO1		% OF URBAN POP. IN BEGINNING YEAR (BETWEEN 0 - 1)			
YEAR: 1988		AGE	MALES	FEMALES	
TOTAL MALES :	3.0000	0- 4	0.0000	0.0000	
TOTAL FEMALES:	0.0000	5- 9	0.0000	0.0000	
		10-14	0.0000	0.0000	
		15-19	0.0000	0.0000	
		20-24	0.0000	0.0000	
		25-29	0.0000	0.0000	
		30-34	0.0000	0.0000	
		35-39	0.0000	0.0000	
		40-44	0.0000	0.0000	
		45-49	0.0000	0.0000	
		50-54	0.0000	0.0000	
		55-59	0.0000	0.0000	
		60-64	0.0000	0.0000	
		65-69	0.0000	0.0000	
		70-74	0.0000	0.0000	
		75-79	0.0000	0.0000	
		80-Y+	0.0000	0.0000	

CAPS

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

In this screen the total ratios by sex and those corresponding to the urban population by age for the beginning year of the projection must be calculated for the total population of each sex and age in the Major Area. Pressing [PgDn] will display the following screen:

PRODEM	URBAN PERCENTAGES	Time 19:23	Date 03/03/1992
UR01	URBAN PERCENTAGES BY SEX (BETWEEN 0 - 1)		
FINAL MALE URBAN PERCENTAGE		:	0.0000
FINAL FEMALE URBAN PERCENTAGE		:	0.0000
INDICATE FOR HOW MANY FOLLOWING QUINQUENNIA YOU WILL APPLY THE PERCENTAGES		:	0
			CAPS
F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit			

Although this screen asks for the urban population percentages by sex for a final moment, it is not necessary to provide the date to which this information is related since in the General Parameters screen the projection period has been indicated.

**Procedure 3 - Application of given percentages and separation by age starting from totals by sex:**

To indicate that for population ratios for the urban areas will be entered by sex and age groups until a specific projection year and that starting from that year, only urban population ratios will be entered by sex until the whole projection period will be covered. Pressing [PgDn] will display the following screens for data input:

```

PRODEM          URBAN PERCENTAGES          Time 19:23 Date 03/03/1992
URO1           BEGINNING YEAR OF INTERPOLATION

INTERPOLATION YEAR : 0

CAPS
F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

```

Indicate in this screen the year from which you wish to extrapolate the urban population percentages by age. After completing this operation, press [PgDn] to access the following screens:

```

PRODEM          URBAN PERCENTAGES          Time 19:24 Date 03/03/1992
URO1           URBAN POPULATION PERCENTAGE (BETWEEN 0 - 1)

YEAR: 1980

TOTAL MALES : 0.0000
TOTAL FEMALES: 0.0000

AGE          MALES          FEMALES
0- 4        0.0000          0.0000
5- 9        0.0000          0.0000
10-14       0.0000          0.0000
15-19       0.0000          0.0000
20-24       0.0000          0.0000
25-29       0.0000          0.0000
30-34       0.0000          0.0000
35-39       0.0000          0.0000
40-44       0.0000          0.0000
45-49       0.0000          0.0000
50-54       0.0000          0.0000
55-59       0.0000          0.0000
60-64       0.0000          0.0000
65-69       0.0000          0.0000
70-74       0.0000          0.0000
75-79       0.0000          0.0000
80-Y+       0.0000          0.0000

CAPS
F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

```

The System will display screens identical to the one presented for the urban population ratios by sex and age for the beginning population as well as for each of the projection years prior to the interpolation date. Pressing [PgDn] will cause PRODEM to display the following screen:

PRODEM		URBAN PERCENTAGES		Time 19:24 Date 03/03/1992	
URO1		URBAN POPULATION TOTAL PERCENTAGE (BETWEEN 0 - 1)			
YEAR	MALES	FEMALES			
1985	0.0000	0.0000			
1990	0.0000	0.0000			
1995	0.0000	0.0000			
2000	0.0000	0.0000			

CAPS

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

Enter in this screen the total urban population ratios by sex for each year of extrapolation. These must be calculated for the total population of each sex in the Major Area.

In the Urban Percentages of this Module, each time you finish entering the percentages of urban population of each PROCEDURE the system starts to display the screens that contain the Total Population by Sex and Age of the Major Area to be separated.

## COMMENTS

In this section, the user can register a few observations related to the projection file to be created. These comments will appear in the output file. Use no more than 64 characters per line, otherwise the comment will appear incomplete on the screen.

---

## **RESULTS**

After entering the basic information for an Urban and Rural projection press [F3] for processing and the results.

PRODEM will display the results on screen and to view them without printing, use the keys indicated at the bottom of the results screen. Press [F10] key to exit the edit mode.

In each of the Urban Percentages PROCEDURES, PRODEM enables the user to obtain for the Total Area to be separated and for each quinquennium of the projection the following results:

- Total population by sex and five years age groups.
- Urban population by sex and five years age groups.
- Rural population by sex and five years age groups.
- Urban population ratios by sex and five years age groups.
- Rural population ratios by sex and five years age groups.

---

## ALGORITHMS

In order to project the urban population, PRODEM uses for all procedures the following algorithm:

$${}_5NU_x^t = {}_5N_x^t * {}_5U_x^t$$

where,

${}_5NU_x^t$  is the urban population of the Total Area projected at moment t, for a five years age group.

${}_5N_x^t$  is the total population of the Total Area projected at moment t, for a five years age group.

${}_5U_x^t$  is the urban population ratio of the Total Area projected at moment t, for a five years age group.

For all those Procedures in which urban population ratios by sex are entered at a beginning moment or up to a specific year and then sex ratios are given until the projection period is covered, the estimates of the age groups ratios for each year are obtained by applying to the beginning year sex and age ratios, the "differential" by sex for a given year and those corresponding to the previous year.

---

## **Bibliographical References**

### **CELADE**

"Métodos para proyecciones demográficas", Serie E, N°1003, San José, Costa Rica, 1984.

### **DANE-CELADE**

Seminario Internacional sobre Proyecciones Subnacionales de Población, Girardot, Colombia, 1988.

### **NACIONES UNIDAS**

"Métodos para hacer proyecciones de la población urbana y rural", Manual VIII, ST/ESA/Ser.A/55, Nueva York, 1975.

## 9. TOOLS MODULE

Load the program using the PRODEM command at the DOS prompt, press any key to pass the logotype and the Definitions of Module screen will be displayed. To access the Tools Module from that screen, press [R] or place the cursor in the corresponding section and press [ENTER]. Follows a screen with the following procedures: Sum of Projections, Square Table, Mortality Projection and Fertility Projection. The user can access these screens through the following screen:

PRODEM		MAIN		Time 19:28 Date 03/03/1992	
DEFINITION OF MODULES					
NATIONAL	M				
MAJOR AREAS	Y				
INTERMEDIATE AREAS	T				
MINOR AREAS	E				
URBAN RURAL	U				
TOOLS	R				
		ADDED PROJECTIONS	S		
		SQUARE TABLE	B		
		MORTALITY PROJECTION	M		
		FERTILITY PROJECTION	J		
<p>Using files created in PRODEM it is possible to group projections or to make separations by sex and/or age using the ADDED PROJECTIONS OPTION and SQUARE TABLE OPTION. It also enables the user to project MORTALITY and FERTILITY for future use with the COMPONENT METHOD.</p>					
CAPS					
F1-Help ↔SelMenu CtrlF1-Outline			F7-DOS F9-Setup F10-Quit		

### Objetives of the Module

The Tools Module of this version of PRODEM provides a set of procedures which enable some special operations with files, such as adding up and separating projections of the "component method", project fertility and mortality, and create basic data files for later use in the National and Major Areas Modules.

**Options of the Module**

After selecting the Utilities Module, PRODEM presents the screen in which to access the Procedures. Select:

- S Sum of Projections:** To add two or more "component method" population projections by sex and age groups.
- B Square Table:** To separate by age groups the total population by sex of a set of Minor Areas.
- M Mortality Projection:** To interpolate death probabilities by sex and age between an Initial Life Table and a Limit one and construct Life Tables which will give life expectancies at birth. Also use this option to generate a file with the Survival Ratios, Life Expectancies at Birth and Infant Mortality Rates which in turn can automatically be accessed in the Modules of the "component method" population projections.
- J Fertility Projection:** To project fertility level (Total Fertility Rate or Gross Reproduction Rate) and age-specific fertility (age-specific fertility rates or relative distribution) related to levels provided by the user or projected in this Module. Also use this option to generate a file with age-specific fertility rates and the total fertility rates which in turn can automatically be accessed in the Modules of the "component method" population projections.

After selecting the procedure to be used in the Module, PRODEM displays the screens in which to identify the file that will contain the basic information of the geographical area to be processed. Perform these operations following the instructions provided in Chapter 3, Section **File Selection and Creation**.

What follows is a detailed description of these procedures and how to use the data input screens.

## SUM OF PROJECTIONS

To use this procedure, a "component method" projection of the population by sex and age groups made either in the National Module or the Major Area Module must be available. Furthermore, each one of them should cover the same projection period.

To enter the Sum of Projections procedure, select the Tools Module in PRODEM's main menu by moving the cursor to that section and pressing [ENTER] or pressing the [R] key. When PRODEM displays the Procedures Menu, press the [S] key as indicated below:

PRODEM	MAIN	Time 19:28	Date 03/03/1992
DEFINITION OF MODULES			
NATIONAL	N		
MAJOR AREAS	Y		
INTERMEDIATE AREAS	T		
MINOR AREAS	E		
URBAN RURAL	U		
TOOLS	R		
		ADDED PROJECTIONS	S
		SQUARE TABLE	B
		MORTALITY PROJECTION	M
		FERTILITY PROJECTION	J
This module enables the user to add population projections by sex and age groups prepared in PRODEM using the component method.			
CAPS			
F1-Help ↔SelMenu CtrlF1-Outline		F7-DOS F9-Setup F10-Quit	

After selecting the procedure, PRODEM displays a screen in which to identify the file that will contain the basic information of the geographical area to be processed. Perform these operations following the instructions provided in Chapter 3, Section File Creation and Selection and press [PgDn] to access the following screen:

PRODEM SUB01	ADDED PROJECTIONS GENERAL PARAMETERS	Time 19:32 Date 03/03/1992
<p>IDENTIFICATION OF RESULTING AREA : AREA 1</p> <p>MODULE CONTAINING AREAS TO BE ADDED : 0</p> <p>0 National 1 Major areas</p> <p>COMMENTS : ARCHIVO DEFAULT</p>		
		CAPS
<p>F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit</p>		

#### IDENTIFICATION OF THE RESULTING AREA

With a maximum of 20 characters, indicate the name of the geographical area that will contain the sum of projections elaborated independently in PRODEM for different geographical areas.

#### MODULE CONTAINING THE AREAS TO BE ADDED

- 0 To indicate that the projections to be added are to be found in the National Module.
- 1 To indicate that the projections to be added are to be found in the Major Areas Module.

#### COMMENTS

In this section the user can register in two lines a few observations concerning the projection file to be created; these comments will appear in the output file. It is recommended not to use more than 64 characters per line, since longer lines will appear incomplete on screen.

Once the information has been entered into this screen, access the next screen by pressing [PgDn].

```
PRODEM          ADDED PROJECTIONS          Time 19:36  Date 03/03/1992
SUB01          NATIONAL MODULE FILE SELECTION

TO SELECT ENTER "1".

  1 P001 COMMENT
    COMMENT
  0 P002 COMMENT
    COMMENT
  0 P003 COMMENT
    COMMENT
  0 P004 COMMENT
    COMMENT

CAPS
F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit
```

In this screen, type:

- 0 To indicate that the selected projection will not be added.
- 1 To indicate that the projections will be added.

Once the selection has been completed, press [F3] for processing.

---

## SQUARE TABLE

To use this procedure, the population projection which is to be separated can be entered manually by the user or those elaborated in the Minor Areas Module can be used as well.

To enter the Square Table procedure, select the Tools Module in PRODEM's Main Menu by moving the cursor to the corresponding option and pressing [ENTER] or press the [R] key. When PRODEM displays the Procedures Menu press the [B] key:

PRODEM	MAIN	Time 19:40	Date 03/03/1992
DEFINITION OF MODULES			
NATIONAL	M		
MAJOR AREAS	Y		
INTERMEDIATE AREAS	T		
MINOR AREAS	E		
URBAN RURAL	U		
TOOLS	R		
		ADDED PROJECTIONS	S
		SQUARE TABLE	B
		MORTALITY PROJECTION	M
		FERTILITY PROJECTION	J

This method enables the user to break down total population projected by subarea whenever an initial population of the subareas and the projection of the major area are available and these projections are at sex and age group level.

CAPS

F1-Help   ↔SelMenu   CtrlF1-Outline   F7-DOS   F9-Setup   F10-Quit

After selecting the procedure, PRODEM displays a screen where the file that contains the basic information of the geographical area to be processed must be identified. Perform these operations by following the instructions provided in Chapter 3, the Section on File Creation and Selection.

After identifying the file, PRODEM will display the projections of the Minor Areas Module where the user can select one to be separated.

If the projections to be separated are not found in the Minor Areas Module, select the **MANUAL INPUT** option to access the respective data input screens.

After selecting the projection to be separated or the manual data input option, press **[ENTER]** to display the following screen:

```
PRODEM          SQUARE TABLE          Time 19:41 Date 03/03/1992
TA01           GENERAL PARAMETERS

NAME OF MAJOR AREA      :AREA I
TYPE OF SEPARATION     :2
  0 By sex
  1 By age
  2 By sex and age
NUMBER OF AREAS TO BE PROCESSED : 3
BEGINNING YEAR OF PROJECTION :1985
ENDING YEAR OF PROJECTION   :2000

COMMENTS:  DEFAULT DEL SISTEMA

CAPS
F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit
```

### NAME OF THE MAJOR AREA

With a maximum of 20 characters, indicate the name of the geographical area containing the projections to be separated.

### TYPE OF SEPARATION

- 0 Separation only by sex. In this case the user should enter:
- The projected population by sex for the Major Area which contains the Minor Areas to be separated.
  - The projected population of both sexes for all the Minor Areas. Their sum must equal to the population of both sexes of the Major Area projection that contains them.

- A sex distribution for all the Minor Areas. This information generally corresponds to observed distribution of the most recent census.

**1 Separation only by age. In this case the user should enter:**

- The total projected population (for example, the total male population), for age groups from ages 0-4 to 80 and over of the Major Area which contains the Minor Areas to be separated.
- The total projected population (for example, the total male population) for each of the Minor Areas. Their sum should be equal to the total population (or the total male population in this example) of the Major Area projection which contains them.
- An age distribution for all of the Minor Areas. This information generally corresponds to the observed distribution of the most recent Census.

**2 Separation by sex and age. In this case the should enter:**

- The projected population by sex and age groups, from ages 0-4 to 80 and over, of the Major Area which contains the Minor Areas to be separated.
- The projected population by sex for each of the Minor Areas. Their sum should be equal to the total population by sex of the Major Area projection which contains them.
- A sex and age distribution for all of the Minor Areas. This information corresponds to the observed distribution in the most recent Census.

**NUMBER OF AREAS TO BE PROCESSED**

Provide the number of Minor Areas which will be separated, with a maximum of 10.

**BEGINNING DATE OF PROJECTION**  
**ENDING DATE OF PROJECTION**

This information determines the projection period; the beginning and ending years of the projection must be multiples of 5 and both dates must be within the projection range of the Major Area projection.

**COMMENTS**

In this section the user can register a few observations related to the projection file; these comments will appear in the output file. Use no more than 64 characters; otherwise, the comment will appear incomplete on screen.

After entering the information for this screen, access the data input screens by pressing [PgDn].

```
PRODEM          SQUARE TABLE          Time 19:41 Date 03/03/1992
TAB1           NUMBER OF AREAS TO BE PROCESSED:

1. SUBAREA 1
2. SUBAREA 2
3. SUBAREA 3

CAPS
F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit
```

Enter the name of each of the Minor Areas to be separated and then press [PgDn] to begin the basic data input.

**Separation by sex**

Whenever the option in TYPE OF SEPARATION is 0, i.e. "By sex", pressing [PgDn] will display the following screen:

PRODEM	SQUARE TABLE	Time 19:42	Date 03/03/1992
TA01	ESTIMATED POPULATION:		
YEAR	TOTAL	AREA :SUBAREA 1	
1985	107962		
1990	117185		
1995	126271		
2000	135258		

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

Enter in this screen for the first Minor Area to be seperated the total projected population for both sexes combined as elaborated in the Minor Areas Module and do this for all the years you want the seperation for. Press [PgDn] to provide this information for the next geographical area. Completed with this data input, press [PgDn] to display the following screen:

PRODEM	SQUARE TABLE	Time 19:42	Date 03/03/1992
TA01	BASE YEAR TOTAL POPULATION BY SEX		
AREA	MALES	FEMALES	
SUBAREA 1	50399	50002	
SUBAREA 2	425	229	
SUBAREA 3	1286	1292	

Enter in this screen the total population by sex for a moment in time (generally for the last census) for all the Minor Areas to be separated and press [PgDn] to access the next screen:

YEAR	MALES	FEMALES
1985	56376	54869
1990	60968	59369
1995	65516	63895
2000	69895	68353

CAPS

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

Enter in this screen the total population by sex for each projection moment for the Major Area containing the Minor Areas to be separated and press [F3] for processing.

**Separation by age**

If TYPE OF SEPARATION is 1, i.e. "By age" and the Minor Areas to be separated are identified, PRODEM displays the following screen by pressing [PgDn]:

PRODEM		SQUARE TABLE	Time 19:44 Date 03/03/1992
TAB01		ESTIMATED POPULATION:	
YEAR	TOTAL	AREA :SUBAREA 1	
1985	107962		
1990	117185		
1995	126271		
2000	135258		

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

In this screen, for the first Minor Area to be separated, enter the total population of both sexes projected in the Minor Areas Module referred to each of the years for which the separation is desired. Press [PgDn] to provide this information for the next geographical areas. After completing this data input, when pressing [PgDn] PRODEM will display the following screen:

PRODEM		SQUARE TABLE	Time 19:45 Date 03/03/1992
TAB01		BASE YEAR POPULATION	
AGE	POPULATION	AREA: SUBAREA 1	
0- 4	0		
5- 9	0		
10-14	0		
15-19	0		
20-24	0		
25-29	0		
30-34	0		
35-39	0		
40-44	0		
45-49	0		
50-54	0		
55-59	0		
60-64	0		
65-69	0		
70-74	0		
75-79	0		
80-Y+	0		

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

In this screen, for each of the Minor Areas to be separated, enter the total population by age groups for a moment in time (generally for the last census).

After completing the data input of the base population for each of the Minor Areas, when pressing [PgDn] the System will display the screen enabling the user to provide for each projection year the population projected by quinquennial age groups for the Major Area containing the Minor Areas to be separated.

**Separation by sex and age**

If in the General Parameters screen the option selected in TYPE OD SEPARATION was 2, "By sex and age", after identifying the Minor Areas to be separated by pressing [PgDn] PRODEM displays the following screen:

PRODEM		SQUARE TABLE		Time 19:46 Date 03/03/1992	
TAB1		ESTIMATED POPULATION:			
YEAR	TOTAL	AREA :SUBAREA 1			
1985	187962				
1990	117185				
1995	126271				
2000	135258				

CAPS

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

Enter in this screen for the first Minor Area to be separated the total projected population of both sexes combined as elaborated in the Minor Areas Module for all the years for which the separation is desired. Press [PgDn] to provide this information for the next geographical area.

After completing this data input, pressing [PgDn] will display the following screen:

AREA	MALES	FEMALES
SUBAREA 1	58399	58882
SUBAREA 2	425	229
SUBAREA 3	1286	1292

PRODEM SQUARE TABLE Time 19:46 Date 03/03/1992  
 TA01 BASE YEAR TOTAL POPULATION BY SEX  
 CAPS  
 F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

In this screen, for each of the Minor Areas to be separated, enter the total population by sex for one moment in time (generally for the last census) and press [PgDn] to access the next screen:

YEAR	MALES	FEMALES
1985	56376	54869
1990	68968	59369
1995	65516	63895
2000	69895	68353

PRODEM SQUARE TABLE Time 19:47 Date 03/03/1992  
 TA01 TOTAL POPULATION ESTIMATED BY SEX  
 CAPS  
 F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

In this screen enter for the Major Area the total population by sex for all of the projection moments, and press [PgDn] to access the next screen:

AGE	MALES	FEMALES	
0-4	6490	6416	AREA: SUBAREA 1
5-9	6457	6445	
10-14	5543	5446	
15-19	4884	5045	
20-24	4690	5146	
25-29	5016	5089	
30-34	4418	4175	
35-39	3553	3287	
40-44	2575	2467	
45-49	1990	1887	
50-54	1760	1571	
55-59	1164	1038	
60-64	7845	700	
65-69	531	593	
70-74	277	375	
75-79	283	242	
80-9+	183	248	

CAPS

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

In this screen, for each of the Minor Areas to be separated, enter the total population by age groups for a moment in time (generally for the last census) and press [PgDn] to access the next screen:

AGE	MALES	FEMALES	YEAR: 1985
0-4	7854	6774	
5-9	6687	6486	
10-14	6534	6589	
15-19	5373	5251	
20-24	4642	4829	
25-29	4898	5088	
30-34	5477	5858	
35-39	4381	3895	
40-44	3421	2979	
45-49	2273	2158	
50-54	1917	1752	
55-59	1426	1331	
60-64	1881	993	
65-69	629	661	
70-74	382	586	
75-79	189	338	
80-Y+	188	277	

CAPS

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

In this screen the user must provide for each projection year the projected population by five years age groups for the Major Area. After completing this data input, press [PgDn] to obtain the projections of the Minor Areas separated by sex and age.

## MORTALITY PROJECTION

In this procedure mortality can be projected by sex and age up to 10 quinquennia, using death probabilities of an Initial Life Table and a Limit one. It will also be possible to extend the projection period through the Concatenation option as will be seen later on.

To enter the Mortality Projection procedure, select in PRODEM's Main Menu the Tools Module by placing the cursor on it and pressing [ENTER] or by pressing the [R] key. When PRODEM displays the Procedures Menu, press the [M] key as indicated next:

PRODEM	MAIN	Time 19:48	Date 03/03/1992
DEFINITION OF MODULES			
NATIONAL	N	ADDED PROJECTIONS	S
MAJOR AREAS	Y	SQUARE TABLE	B
INTERMEDIATE AREAS	T	MORTALITY PROJECTION	M
MINOR AREAS	E	FERTILITY PROJECTION	J
URBAN RURAL	U		
TOOLS	R		

This module enables the user to project mortality by sex and age and to generate a data file for use with the component method. It will be necessary to have an initial life table and the projection of the level of mortality by sex.

CAPS

F1-Help   ↔SelMenu   CtrlF1-Outline                      F7-DOS F9-Setup F10-Quit

After selecting the procedure, PRODEM displays a screen in which to identify the file containing the basic information of the geographical area to be processed. Perform these operations following the instructions provided in Chapter 3, Section File Selection and Creation and press [PgDn] to access the following screen:

PRODEM M081	MORTALITY PROJECTION SELECTION OF APPLICATION	Time 19:51 Date 03/03/1992
<p>CHOOSE OPTION</p> <p>1 Create file</p> <p>2 Link files</p>		
		CAPS
F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit		

#### FILE GENERATION

- 1 **Creation:** To generate a file with Mortality data corresponding to a period that does not exceed 10 quinquennia (50 years) and that will later be used in one of the Modules with the "component method".
- 2 **Concatenation:** To indicate that mortality files generated in option 1, "Creation" will be joined to create a new file with information for a period that may exceed 10 quinquennia and in this way cover a desired period of mortality projection.

#### Creation of Mortality Files

If in the Selection of Application screen option 1, "Creation" was chosen, pressing [PgDn] allows the user to interpolate Abbreviated Life Tables and generate a data file for later use in the projection Modules that use the "component method":

PRODEM		MORTALITY PROJECTION		Time 19:51 Date 03/03/1992	
M001		GENERAL PARAMETERS			
NAME OF POPULATION	:	AREA I			
NUMBER OF QUINQUENNIA	:	9			
BEGINNING YEAR 1st. QUINQUE.	:	1988	INFANT MORTALITY	:	1
			1 Necessary		
			2 Not necessary		
TYPE OF LIMIT TABLE	:	1	CREATE A COMMUNICATION FILE	:	0
1 CELADE - San José			1 Not necessary		
2 Provided by the user			2 For use in other modules		
3 CELADE - Santiago					
4 Coale-Demeny					
COMMENTS	:	SYSTEM DEFAULT			

CAPS

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

### NAME OF THE POPULATION

With a maximum of 20 characters, indicate the name of the geographical area for which a file with Mortality data will be created.

### NUMBER OF QUINQUENNIA

Enter the number (maximum 10) of mortality projection moments.

### BEGINNING YEAR FIRST QUINQUENNIAL

Indicate the beginning year of the quinquennium which corresponds to the first interpolated Life Table.

### TYPE OF LIMIT TABLE

To project mortality it will be necessary to have a Beginning Life Table which in PRODEM is always provided by the user and a Limit Life Table. The latter can be provided by the user, although the program also carries a few. Choose one of the following options:

- 1 **CELADE-SAN JOSE:** Interpolate mortality using one of the 9 Mortality Models developed by CELADE. For females, this

option enables the user to select a single Limit Life Table with a life expectancy at birth of 82.5 years and for males, it enables the user to choose between 8 Life Tables whose life expectancy at birth ranges from age 74 for Limit Model I to age 78 for Limit Model IX (the variation between each Model is 0.5 years).

- 2 **PROVIDED BY THE USER:** The Beginning Life Table as well as the Limit Table will be entered by the user. Select this option to interpolate observed Life Tables.
- 3 **CELADE-SANTIAGO:** Interpolate mortality using the table developed by Bourgeois-Pichat as a Limit Table. This Life Table differs from the author's original one, in that it contains a few considerations on infant that might better describe the mortality experience in Latin America.
- 4 **COALE-DEMENY:** Interpolate mortality using as a Limit Table one of the four families of Model Life Tables developed by Coale and Demeny (West, East, North and South) whose levels vary between 1 to 26.

#### INFANT MORTALITY

- 1 **Necessary:** To indicate that the mortality file will contain for each projected quinquennium the infant mortality expressed as death probabilities from birth up to the exact age of 1 year. With this option, the values of  ${}_1q_0$  must be entered for each quinquennium.
- 2 **Not necessary:** To indicate that for the file with the projected Mortality values for  ${}_1q_0$  will not be entered.

#### GENERATE COMMUNICATION FILE

- 1 To develop Abbreviated Life Tables by sex and to obtain an immediate printing of them.
- 2 To develop Abbreviated Life Tables and to generate a file with mortality data for later use in the National or Major Areas Module. Select this option if you later wish to join (concatenate) a set of independant files in order to obtain a mortality projection period covering more than 10 quinquennia.

After providing the General Parameters, that is, the characteristics of the Mortality Projection file, press [PgDn] to display the basic data input screens.

**Basic Information**

For the Beginning Life Table the user must provide:

- Death probabilities ( ${}_5q_x$ ) by sex and age groups for the population over 5 years of age.
- Death probabilities ( $q_0$  and  ${}_4q_1$ ) by sex for the population under 5 years of age.
- Life expectancies by sex at the moment of birth ( $e_0^0$ ) and at age 80 ( $e_{80}^0$ ).
- Separation factors ( $f_0$  and  ${}_4f_1$ ) by sex for the population under 5.

**Options of the Procedure**

Independently of the Limit Life Table selected in the General Parameters screen, pressing [PgDn] will display the screen in which to enter the life expectancy at birth for each quinquennium of the projection:

QUINQUENNIUM	MALES	FEMALES
1988-85	77.550	74.550
1985-90	68.850	75.850
1990-95	68.540	75.590
1995-00	69.800	76.100
2000-05	69.440	76.570
2005-10	69.860	77.830
2010-15	70.260	77.440
2015-20	70.640	77.830
2020-25	70.990	78.200

CAPS

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit



QUINQUENNIUM	MALES	FEMALES
1988-85	0.02472	0.02272
1985-90	0.01914	0.01714
1990-95	0.01706	0.01506
1995-00	0.01669	0.01469
2000-05	0.01568	0.01368
2005-10	0.01456	0.01256
2010-15	0.01362	0.01162
2015-20	0.01272	0.01072
2020-25	0.01191	0.00991

CAPS

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

After providing the infant mortality and if in the General Parameters screen for the TYPE OF LIMIT TABLE option, 1 was selected, i.e "CELADE-San Jose" or "Coale-Demeny", pressing [PgDn] will cause the program to request:

- The number of the Limit Model Table to be used for the male population, between 1 and 9, in the case of "CELADE-San Jose", or
- The family of the Model Tables to be used (East, West, North or South) and the mortality level for each sex (between 1 and 26).

### Concatenate Mortality Files

If in the Selection of Application screen option 2 "Concatenation" was chosen, the user indicated that two or more mortality files generated in this same Module are available and that the user wishes to join them to cover a desired mortality projection period.

To join mortality files press [PgDn] to display to following screen:

PRODEM	MORTALITY PROJECTION	Time 19:54 Date 03/03/1992
M001	CONCATENATION OF FILES	
NAME OF TOTAL POPULATION	:	AREA 1
CREATE COMMUNICATION FILE	:	0
1 Not necessary		
2 With projected mortality		
for use in other modules		
COMMENTS	:	SYSTEM DEFAULT
F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit		

#### NAME OF THE TOTAL POPULATION

With a maximum of 20 characters, indicate a name for the geographical area for which a "concatenated" file with Mortality data will be created.

#### GENERATE COMMUNICATION FILE

- 1 To join two or more mortality files and to keep the resulting "concatenated" file present in the Utilities Module without generating a file for another Projection Module.
- 2 To join two or more mortality files and to generate a file with mortality data for later use in the National or Major Areas Module.

#### COMMENTS

Here, in two lines the user can register a few observations related to the projection file to be created; these comments will appear in the output file. It is recommended not to use more than 64 characters per line.

After providing the characteristics for the File Concatenation screen, press [PgDn] to display a file listing with mortality projections which can be concatenated for later use in one of the projection Modules.

In this screen type 1 to choose the files you wish to join and after completing the selection press [F3] for processing.

When creating the file with the projected mortality, if you inform the System the initial year of the first projection quinquennium, PRODEM will be able to concatenate these files without taking into account the Initial and Limit Mortality Tables for each one of them.

---

## FERTILITY PROJECTION

In this procedure total fertility rates (or the gross reproduction) can be projected through a logistic function and/or through the use of the (modified) Gompertz function (or gross reproduction). Also age specific fertility for a period of up to 100 years can be projected.

In addition, the results can be loaded into a fertility projection file for later use in a "component method" of the National or Major Areas Modules.

To access the Fertility Projection procedure, select the Tools Module by placing the cursor on it and pressing [ENTER] or press the [R] key in the main menu. When PRODEM displays the Procedures Menu, press [J] as indicated below:

```
PRODEM                MAIN                Time 19:54 Date 03/03/1992
                   DEFINITION OF MODULES
```

NATIONAL	N
MAJOR AREAS	Y
INTERMEDIATE AREAS	T
MINOR AREAS	E
URBAN RURAL	U
TOOLS	R

ADDED PROJECTIONS	S
SQUARE TABLE	B
MORTALITY PROJECTION	M
FERTILITY PROJECTION	J

This module enables to project fertility rates by age and to generate a data file for use with the component method. It will be necessary to have the observed and standard rates by age in addition to the  $\alpha$ ,  $\beta$  parameters and the projected TFR.

CAPS

```
F1-Help  ←SelMenu CtrlF1-Outline                F7-DOS F9-Setup F10-Quit
```

After selecting the procedure, PRODEM displays a screen in which to identify the file that will contain the basic information of the geographical area to be processed. Perform these operations following the instructions provided in Chapter 3, Section **File Selection and Creation** and press [PgDn] to move to the next screen:

PRODEM FE01	FERTILITY PROJECTION GENERAL PARAMETERS	Time 19:55 Date 03/03/1992
<b>BEGINNING YEAR OF PROJECTION: 1988</b> <b>ENDING YEAR OF PROJECTION : 2000</b> <b>SEX RATIO AT BIRTH : 1.05</b>		
<b>TYPE OF RATE TO BE PROJECTED : 0</b> <b>GENERATES COMMUNICATION FILE : 1</b>		
<b>0 Total fertility rate</b> <b>0 For use in other modules</b> <b>1 Gross reproduction rate</b> <b>1 Not necessary</b>		
<b>PROJECTION OF RATES : 1</b>		
<b>0 Projects using LOGISTIC</b> <b>1 Given by the user</b>		
<b>COMMENTS:      SYSTEM DEFAULT</b>		
<b>CAPS</b>		
<b>F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit</b>		

#### NAME OF THE POPULATION

With a maximum of 24 characters, indicate a name for the geographical area for which the fertility projection will be carried out.

#### BEGINNING YEAR OF THE PROJECTION ENDING YEAR OF THE PROJECTION

This information determine the period of the the fertility projection; the interval determined by these years must be a multiple of five.

#### MASCULINITY RATIO AT BIRTH

Enter here the number of male births for each female birth. If no value is provided, 1.05 will be assumed.

#### TYPE OF RATE TO BE PROJECTED

- 1      To indicate that the total fertility rate will be projected.
- 2      To indicate that the gross reproduction rate will be projected.

#### PROJECTION OF RATES

In this section of the screen the user indicates that in addition to the fertility structure by age an estimate of the level will be asked.

- 0 To indicate that prior to the projection of the age-specific fertility, by usage of a logistic curve, an estimate of the fertility level either in terms of the total fertility rate or the gross reproduction rate should be given by the program
- 1 To indicate that only age-specific fertility will be projected and that for this purpose a set of total fertility rates or gross reproduction rates will be provided for the projection period of the age-specific rates.

#### GENERATE COMMUNICATION FILE

- 0 Project fertility and generate a file with fertility data for later use in the National or Major Areas Modules.
- 1 Project fertility and obtain an immediate printing.

#### COMMENTS

In this section, in two lines the user can register a few observations related to the projection file to be created. These comments will appear in the output file. It is recommended not to use more than 64 characters per line since longer lines will appear incomplete on screen.

After completing the General Parameters data input and whenever in the Rates Projection option 1 was selected, i.e. "Provided by the user", pressing [PgDn] will display the following screen in which to enter the total fertility rates for each of the projection period manually:

```

PRODEM          FERTILITY PROJECTION          Time 19:56 Date 03/03/1992
FE01           FERTILITY LEVEL

LEVEL OF PROJECTED FERTILITY

1980-85 4.4100 1985-90 4.3382 1990-95 4.2418 1995-00 4.1541 null 0.0000

CAPS
F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

```

If in the General Parameters screen the Rates Projection option 0 was selected, i.e. "Projected using LOGISTIC", pressing [PgDn] will displays the following screen:

```

PRODEM          FERTILITY PROJECTION          Time 19:58 Date 03/03/1992
FE01           LOGISTIC METHOD

DATE OF FIRST RATE :1950.0
TFR or GRR (0)    :5.0000

DATE OF SECOND RATE :2025.0
TFR or GRR (t)    :3.7000

HIGHER ASYMPOTE   :7.0000

LOWER ASYMPOTE    :2.0000

CAPS
F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

```

**DATE OF THE 1<sup>st</sup> RATE**

Enter here the exact date of the total observed fertility rate for an initial moment.

**TGF (0)**

Enter here the value of the total observed fertility rate for the date indicated as DATE OF THE FIRST RATE.

**DATE OF THE 2<sup>nd</sup> RATE**

Enter here the exact date for the total observed fertility rate for a final moment.

**TGF (t)**

Enter here the value of the total observed fertility rate for the date indicated as DATE OF THE SECOND RATE.

**SUPERIOR ASYMPTOTE**

Enter here the value of the highest estimated total fertility rate and referring to a moment prior to that indicated as DATE OF THE FIRST RATE. Make sure this value is larger than TFR (0).

**LOWER ASYMPTOTE**

Enter here the value of the lowest estimated total fertility rate and referring to a moment later than the one indicated as DATE OF THE SECOND RATE. Make sure this value is lower than TFR (t).

After finishing entering the data to estimate the fertility level for each projection period, by pressing [PgDn] the System will automatically execute the calculations and presents the fertility rates screen with the results.

After providing the data on fertility level projection, pressing [PgDn] will cause PRODEM to request the information on fertility structure projection through the following screen:

PRODEM FE01		FERTILITY PROJECTION GOMPERTZ Method		Time 19:59 Date 03/03/1992	
Projection of Fertility Structure					
AGE	OBSERVED RATES	ST. RATES			
15 - 19	0.0066	0.0097			
20 - 24	0.2529	0.2327			
25 - 29	0.2870	0.2234			
30 - 34	0.2514	0.1849			
35 - 39	0.1885	0.1385			
40 - 44	0.0975	0.0667			
45 - 49	0.0266	0.0191			

CAPS

F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit

In this screen, provide a set of age-specific fertility rates for an observed moment (OBSERVED RATES) and for a standard (STANDARD RATES) to which the rates for each age group will tend.

After entering both series of rates, pressing [PgDn] will cause the System to internally calculate the total fertility rate, the gross reproduction rate and the alpha and beta parameters for each distribution. These results will be displayed on the following screen:

PRODEM FE01		FERTILITY PROJECTION GOMPERTZ Method	Time 19:59 Date 03/03/1992
	OBSERVED	STANDARD	
TGF	5.9526	4.7750	
R'	2.9837	2.3293	
$\alpha$	0.1284	0.0000	
$\rho$	0.9984	1.0000	
<p>NOTE : The obtained values of <math>\alpha</math> and <math>\rho</math> are related to the previously entered rates</p>			
			CAPS
F1-Help F3-Run F4-Print F5-Save F8-View Home-1stSCR Pg-NxtSCR F10-Quit			

---

## RESULTS

After entering the basic data for a Minor Areas projection, press [F3] for processing.

After the processing, PRODEM displays the results on screen and in order to view them without printing, use the keys as indicated at the bottom of the results screen. Press [F10] key to quit the edit mode.

When using any of the methods in the Tools Module, the user will always obtain the result described in this Section.

### Sum of Projections

#### POPULATION:

- Beginning population by sex, for 5 years age groups.
- Total population by sex.
- Total population aged 15 to 64.
- Female population aged 15 to 49.
- Relative distribution of the population by sex and age groups.
- Sex ratios for 5 years age groups.
- Dependency ratio.
- Sex ratio of the total population.
- Mean age of the population.

#### MORTALITY:

- Life expectancy at birth for both sexes and survival ratios by sex, and 5 years age groups, for each quinquennium of the period covered by the projection.
- Total deaths.
- Crude mortality rate.
- Life expectancy at birth, total and by sex.
- Total infant mortality rate and by sex.
- Total deaths of ages 0, 0-4 and 1-4.

#### FERTILITY:

- Gross Reproduction Rate for each quinquennium of the period covered by the projection.

- Age-specific fertility rates, for each quinquennium of the period covered by the projection.
- Births according to mother's age.
- Total births.
- Children-female ratio.
- Crude birth rate.
- Gross and net reproduction rate.
- Total and general fertility rate.
- Mean age of fertility.

**MIGRATION:**

- Net migratory balances by sex, according to 5 years age groups, for each quinquennium of the period covered by the projection.
- Net number of migrants and net migration rates.

**GROWTH:**

- Mean annual growth rate.
- Natural increase rate.

**GRAPHICS:**

- Pyramid of the initial and final population of the projection.
- Evolution of the life expectancy at birth and the total fertility rate for each quinquennium of the projection.

**Square Table**

- Total projected population for a group of Minor Areas, adjusted to the Major Area.
- Total population by age for a group of Minor Areas, adjusted to the population by age of the Major Area.
- Composition of the projected population by sex and age groups for a group of Minor Areas, adjusted to the Major Area.

**Mortality Projection**

- Abbreviated Life Table by sex for a Beginning moment.
- Abbreviated Life Table by sex for a Final (Limit) moment.
- Abbreviated Life Tables by sex for each period between the Beginning Table and the Limit Table.

**Fertility  
Projection**

- Observed and standard fertility rates according to mother's age.
- Projected fertility rates according to mother's age.
- Total fertility rates, gross reproduction rates, alpha and beta parameters by period, for each projection quinquennium.

---

## ALGORITHMS

In this Module, more than algorithms, each procedure has its own independent logical operation to obtain the desired results. In this section, the main characteristics of each procedure are described.

### **Sum of Projections**

Is an adaption developed by CELADE of The Population Projections Program of the United Nations Population Bureau, to project population by sex and 5 years age groups.

Enables the user to group population projections by sex and age groups through the "component method" and to obtain in addition to the population projections, the projection of each of the "components" of demographical growth for the group.

### **Square Table**

This is a procedure the authors usually call "multiplicational method" and through which, by means of consecutive "pro rata divisions" global population projections are separated for a group of Minor Areas, in population projections by sex, age groups and both simultaneously.

In this procedure, which can be used in combination with the Minor Areas Module (See Chapter 7, Minor Areas Module) or independently, once the populations to be projected are separated, the results are adjusted to a Major Area projection containing them.

### **Mortality Projection**

This is a procedure, which starts from an initial Abbreviated Life Table by sex, a limit one and a set of Life Expectancies at Birth for intermediate moments between each Table, develops a set of Life Tables, which reproduce the given Life Expectancies at Birth.

In addition to generating the Life Tables, this procedure enables the user to independently estimate the infant mortality, to select Model Life Tables, to interpolate and create a file with projected Survival Ratios, Life Expectancies at Birth (and infant mortality rates if they are assumed), which in turn all can automatically be loaded by PRODEM for use in a Module projecting the population through the "component method".

**Fertility  
Projection**

This is a procedure which, starting from a logistic function and the (modified) Gompertz' correlational model, enables the user to project total fertility rates or gross reproduction rates observed for two moments in time as well as age-specific fertility structures.

In addition to projecting fertility, PRODEM can generate a file with the results for automatic loading into one of the Modules which project the population through the "component method".

---

## Bibliographical References

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"Métodos para proyecciones demográficas", Serie E, N°1003, San José, Costa Rica, 1984.

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## APPENDIX 1: DISPLAY OF RESULTS

PRODEM provides two ways in which to display the results of a population projection on the screen:

- The first one is obtained by pressing the [F3] key after completing the data input. Once the processing has been completed, the System will automatically display the results on the screen. To quit viewing the results, press [F10].
- The second one is used when the an already processed projection is available and the user has returned to the data input screen. In this case, press [F8] to display the results on the screen.

In both cases, PRODEM will present at the bottom of the screen a set of function keys [Fx], whose operation in this context are different from those presented in Chapter 1, Section **Definition of the Use of the Keyboard** in PRODEM.

In the edit screens, use:

- [←→↑↓] to scroll a page of results.
- [PgUp PgDn] to move back or forward to a page of results.
- [Ctrl] [←→] to move a page of results to the left or to the right of the screen.
- [Home] to go to the first line and the first page of results.
- [End] to move to the last line and the last page of results.
- [F10] to exit the display of the results on screen and to return to PRODEM.

---

## APPENDIX 2: PRODEM FILES

This Manual is provided with three floppy disks which allow the installation of PRODEM. These disks contain in a compressed mode all the files required for the proper functioning of the System.

During the use of PRODEM a set of data, output and other files is generated. The use of these files is detailed in this Appendix.

### Installation Files

When reviewing the contents of PRODEM's installation disks, the following files are found (with an .ARC extension):

PRODEMPRODEM2 PRODEM3.

### Program Files

During the installation of PRODEM, the following program files with the (.EXE extension) with the methods that enable the user to carry out the population projections in each Module are copied to the hard disk of the computer:

INSTALL PRARMENO PRBROWSE  
PRCALCDC    PRCOMP00    PRODEM00  
PRPRINTF    PRPROYDC    PRRELCOH  
PRSET        UP            PRTABCUA  
PRTABMOR    PRURURAL

### Data Files

When projecting a population, each time the basic data are saved, the System creates files whose description refer to a name given by the user (\$\$\$\$), to a method enabling their processing (02, 03, 47, etc) and it indicates if it corresponds to basic data files (.INP extension).

A list of the data files obtained when installing PRODEM and who during the use of the System correspond to the "default" files is presented below:

PR\$\$\$\$02    PR\$\$\$\$03    PR\$\$\$\$05    PR\$\$\$\$06  
PR\$\$\$\$14    PR\$\$\$\$17    PR\$\$\$\$19    PR\$\$\$\$24  
PR\$\$\$\$27    PR\$\$\$\$37    PR\$\$\$\$47

Those files with an .INP extension correspond to the data files of the population projections in each Module.

**Screen Files**

In these files (.SYS extension) the screen designs are defined which during PRODEM's use enable the description of the projections as well as the data input:

PRMESSA2      PRSCREE0   PRSCREN0   PRSCRER1  
PRSCRER2      PRSCRER3   PRSCRER4   PRSCRET1  
PRSCRET2      PRSCREU0   PRSCREY0   PRSETUP

**Model  
Mortality  
Tables Files**

In these files the life expectancy at birth, the survival ratios and the infant mortality rate of the Coale and Demeny Model Mortality Tables and the United Nations Models are defined:

COALDEME.TABIFE.TAB    SRATIOS.DAT

The files with a .TAB extension correspond to the screens which allow the selection of a Model Life Table and the selection of those procedures using the "component method" of population projection.

**Operation  
Command  
Files**

These files in PRODEM allow the correct operation of the System once it has been installed:

PRODEM.BAT    VIDPOP.COMPKXARC.COM

**Communica-  
tion Files**

These files in PRODEM allow communication among the Projection Modules; they allow the file exchange between one Module and another:

LLAMA.EXE              LLAMAU.EXELAMAY.EXE  
LLAMPROY.EXELAMREL.EXE