STATISTICAL OFFICE OF THE EUROPEAN COMMUNITIES

HARAMBEE SIMULATION EXERCISE

TRAINERS MANUAL

Munich Centre for Advanced
Training in Statistics
CDG Munich

Food Studies Group
International Development Centre
University of Oxford

Preface

The Harambee Simulation Exercise has been developed by the Munich Centre for Advanced Training in applied statistics for developing countries of Carl Duisberg Gesellschaft e.V. in Munich and the Food Studies Group at Queen Elizabeth House at the University of Oxford. It has been commissioned and financed by the Statistical Office of the European Communities (Eurostat) in Luxembourg. An earlier version of the exercise was prepared by the two organisations listed above together with INSEE in Paris.

The first version of the Exercise was designed for use in a series of seminars for the users and providers of statistics in the field of food and agricultural statistics which have been held in a number of sub-Saharan African countries. The second version has been prepared for continued use in these seminars, but also so that the Exercise can be made more widely available to training centres in Africa and elsewhere. Both English and French versions of the Exercise have been prepared and a Portuguese version is under development.

 Requests for further information about the Harambee Exercise and enquiries about distribution of the material should be addressed to:

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Section 1 Introduction

Harambee is a simulation exercise designed to provide participants with experience of the process of policy analysis and decision making and with the use of statistical data to support this. It is concerned with the management of the food and agricultural sector and with the achievement of objectives such as improving food security, promoting growth and ensuring equity. The Exercise itself is based on the fictitious country of Harambee which is located somewhere within sub-Saharan Africa. Participants make policy decisions in the food and agricultural sector for this country for a number of rounds which are each based on a period of one year. The results of these decisions are simulated using a computer based model which reports outcomes in the form of statistical tables. An important part of the Exercise is concerned with the selection of the appropriate set of statistical data from a menu of possible surveys and other enquiries. Participants are provided with a budget which allows them to specify priorities for data and to change these as the Exercise progresses.

This manual is intended for the use of trainers who will use the Harambee Exercise as part of a training course or seminar. The complete set of material required in order to undertake the Exercise is as follows:

-a floppy disk containing the program (an executable file called HARAMBEE.EXE) plus other files required by the program;

-a supplementary floppy disk containing a number of programs used to set up or alter the Exercise;

-the Participants Manual which provides background information on Harambee and instructions on how to carry out the Exercise;

-the Statistical Handbook which provides statistical data describing what has happened in the food and agricultural sector in Harambee for the ten years prior to starting the Exercise;

-the Work-Book in which decisions are recorded before they are entered into the computer.

The Exercise may be run as a Group activity or it can also be used by individuals and these two approaches are described in Section 2. It is recommended that each participant be provided with their own copy of the Participants Manual and the Statistical Handbook.

The computer program which forms the core of the Exercise is designed to run on any IBM PC compatible microcomputer which will run MS DOS or PC DOS version 2.11 or later. The program requires at least 384 Kbytes of core memory, a standard graphics board and two disc drives - either two floppy drives or a single floppy drive and a hard disk. In addition, if printed copies of results are required, a printer is also needed.

Where the Exercise is to be run in groups, it is recommended that each group have access to their own computer, although this is not essential. Since exercises can be saved and loaded quite easily, it is possible to run more than one exercise simultaneously on one machine.

The Exercise is aimed mainly at people from African countries already working in government departments, parastatal agencies or universities and other teaching centres who are concerned with and interested in food and agricultural policy generally. As such it is likely to find greatest use in in-service training courses and seminars, but it could also be relevant to university and college courses in economic development, agricultural economics or statistics.

Section 3 Objectives

.1 Uses of the Exercise

The Exercise has a number of objectives as a training tool and this should mean that it can be used in a variety of different situations. Among the potential uses are the following:

-to demonstrate the process of negotiation and policy making where there are potentially conflicting objectives;

-to illustrate the complex nature of food systems and the interrelationships between different aspects of food and agricultural policy;

-to help participants identify the role of statistical data in the policy process and to highlight the need to develop an integrated programme of surveys and other statistical enquiries;

-to provide a basis for discussing food policy and the development of statistical services in specific countries;

Where the Exercise is to be used by individuals, it is not possible to demonstrate the process of negotiation and policy formulation, but in all other respects the objectives remain the same.

No specialist knowledge is required from the participants, although some basic acquaintance with food and agricultural policy in African countries is certainly useful as is a background knowledge of official statistics and a limited amount of economic theory. No prior computer skills are required, although some competence in using a key board would certainly be an advantage.

.3 Use as a Group Exercise

The Exercise is designed to be used a group exercise, ideally with groups of five participants. Food policy in Harambee is made by a Food Strategy Committee which is made up of five individuals which means that with a group of five participants each person can take on one role. The roles are described in detail in the Participants Manual and are as follows:

Minister of Finance
Minister of Agriculture
Minister of Health
Director of the National Food Marketing Board
Director of the Central Statistical Office

Each role is ascribed a set of objectives which may be in conflict in some situations. The performance of each person may also be measured by reference to different sets of statistics. Although each member of the Food Strategy Committee has differing objectives, the Committee

is required to come up with an agreed set of policy decisions. An important part of the Exercise is to simulate the processes whereby policy is formed in government and where negotiation and argument are employed to arrive at a consensus. The rules whereby the Committee operate are deliberately not set out in detail and it is suggested that each group is left to determine how it is to work in practice. The only requirement is to arrive at a set of policy decisions and it is up to the trainer running the Exercise to determine exactly how much time should be allowed for this process. If consensus within the Committee is not possible, one member is assigned the role of President and this person has a casting vote.

If it is not possible to form groups with exactly five members, then some roles can be omitted or doubled up. With four people it is suggested that the role of Director of the Central Statistical Office be left out. It will not be possible to ascribe specific roles to participants if there are fewer than four people in a group, but with more than five, then some roles can be shared.

If more than one group undertake the Exercise at the same time, then is both informative and useful to be able to compare results at the end. In order to do this it is important that each group face the same values for the exogenous factors. The Exercise is set up so that some factors, such as rainfall and world prices are subject to random variation. Two alternative procedures are available to modify the process that generates the random numbers within the computer. The default procedure is that the series of random numbers will be repeated exactly each time the Exercise is run, starting from the initial year. This means that the same pattern of rainfall and other exogenous factors will be produced for each group.

The alternative procedure of full randomisation will produce a new random series each time the Exercise is run. In this situation new runs will result in different weather patterns and different levels for the other exogenous variables. The way that the randomization procedure is changed is described in Section 3.2.1.

.5 Use by Individuals

Although the Exercise is designed primarily for use by groups of participants, it can be used by individuals. In this case, the policy formulation and role playing aspects of the Exercise are excluded and the main objective will be to see what the effect of different policy strategies are and to explore the use of statistical data to support decision making. It is suggested that individuals use the Exercise in an interactive way. They will decide on a set of policy decisions for a particular year, enter the appropriate values and examine the results by looking at the output for the set of statistical enquiries they have selected.

When used by individuals, the Exercise can form part of a formal training course, or it could be used simply as an exercise that is undertaken by people in their own time and at their own speed. In the former case it is probably most appropriate for each individual to face the same set of exogenous variables and the default randomisation procedure should be retained. For the

latter situation, where one person may repeat the Exercise, then it is recommended that full randomisation be used.

.7 Limitations of the Exercise

It is important for both trainers and participants in the Exercise to understand the limitations of the model that generates the results and hence of the whole exercise. Harambee is a fictitious country with a very simplified, artificial economy and environment. As such, therefore, it should not be thought of as being representative of any real country in sub-Saharan Africa or elsewhere. The effects of policy changes are simulated by an economic model which forms the basis of the computer program. This model has been developed based on the experience and background knowledge of the authors. While it contains aspects of a number of different countries, it cannot be thought of as referring to the actual situation in any particular one. Relationships have been postulated and functional forms selected because they produce apparently realistic results. Parameters in the equations have not been estimated from real data, either independently or as part of a simultaneous system.

The results generated by the model, therefore, depend crucially on the specification of the various equations and on the values of the parameters as well as on the initial values of the exogenous variables. The result of a particular policy change, for example, an increase in the official producer price for maize, will result in an outcome which, in general, corresponds with economic theory as well as the experience from a number of countries. It should not be assumed, however, that the results produced by the Exercise will be replicated in the specific situation of a particular country. **Harambee is not a suitable vehicle for testing the effect of policy change in a real country**.

Because the various equations that make up the model have not been estimated from real data, it cannot be assumed that realistic or even believable results will be generated from all possible variations in the policy variables. The model has been tested for a range of policy variables that might be expected to occur in normal circumstances. Because of the non-linear nature of some of the equations, however, it may well be the case that there are some combinations of values that will result in unpredictable behaviour. In addition, the model may also behave unpredictably if extreme values are introduced for some or all of the policy variables. This may result in nonsensical results, which can include negative values, or values which are clearly not possible. It is also possible that the model will not be able to produce results at all in some cases. This is most likely to happen in the consumption stage.

When the model does produce results which are clearly not possible or even does not produce results at all, then the only course of action is to restart the Exercise from the point at which it was last saved and proceed with an alternative set of policy variables.

Section 5 Running the Exercise

.1 Installing the Program

In order to run the HARAMBEE simulation Exercise, you will need an IBM compatible microcomputer attached to a printer. The computer program which is used for the Exercise has been designed to operate on almost any computer which is IBM compatible and which runs the MS/DOS operating system. The requirements are summarised in Appendix A.

The program is simple to install and the procedure is outlined in Appendix A.

.3 Setting up the Exercise

Once HARAMBEE has been installed, it can be used in two ways: with partial randomisation which will produce a repeatable sequence of exogenous variables subject to random variation; and with full randomisation where the random exogenous variables will not be repeated.

.1 Changing the Randomisation Procedure

When the HARAMBEE Exercise is used as a part of a seminar, workshop or short course, it is usually being used by more than one group, and being run on more than one computer at a time. In this situation, it is desirable that each of the groups has the same sequence of rainfall and other exogenous factors such as world prices. It is then possible to make comparisons between groups.

It is therefore desirable that the sequence of values of exogenous factors is repeatable, that is, it will be the same on different computers, or at different times on the same computer.

When the HARAMBEE Exercise is being used by a single group or by a single individual who wishes to repeat the Exercise more than once for the same set of years, then it is desirable that the sequence of rainfall and world prices should be different each time. In other words, in this situation, the sequence of exogenous factors should be non-repeatable.

It is possible to change this aspect of the way in which the Exercise will run by making use of a program on the HARAMBEE supplementary diskette called RANDOMIZ. To run the program place the supplementary diskette in the a: floppy disk drive and type

a:RANDOMIZ and then press the ENTER key.

You will be asked the following question:

```
ON WHICH DISK DRIVE ARE THE HARAMBEE PROGRAM FILES LOCATED (B/C/D...) ? :
```

Enter the drive where the program is located, this will be B for a twin floppy drive computer and C (or D etc) for a computer with a hard disk drive. If you are using a twin floppy machine, you will then be prompted to put the Harambee program disk in drive b:. The following message will then be displayed:

```
DO YOU WANT THE RAINFALL AND WORLD PRICES TO BE REPEATABLE (Y/N) ? :
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Type a Y if you do, or an N if you do not, and press ENTER.

The RANDOMIZ program makes an alteration to a file called DESTIN.TXT, which is located in the HARAMBEE directory (or on the program disk). You can change this aspect of HARAMBEE whenever you wish by running the RANDOMIZ program.

.5 Running the Program

The HARAMBEE program operates through a system of "menus" which appear on the screen. The users of the program make selections from these menus by using the arrow keys on the keyboard, and the ENTER key. Participants should read Section 6 of the Participants Manual which provides a detailed description of all of the HARAMBEE menus, and an explanation of the logical sequence to follow when running the program.

.7 Saving and Loading an Exercise

If the HARAMBEE Exercise is being used as a part of a seminar, workshop or short course, it is often convenient to be able to interrupt the Exercise. For example, the participants may wish to take their tables away and think about the policies for the next stage, or even return on the following day. In the meantime, the computer could be used for something else.

The Exercise can be stopped and saved at any stage and then resumed later by using the SAVE GAME and LOAD GAME options on the FILE menu. The SAVE GAME option is used to make a copy of the Exercise on the disk. LOAD GAME is used to resume the Exercise at the point at which it was halted previously. Participants should be encouraged to save their exercises at regular intervals and especially before they QUIT. Instructions on how to use the FILE menu are given in Section 6 of the Participants Manual.

When an exercise is to be saved, it must be given a name. Names can be any combination of up to eight characters, either letters or numbers, but excluding any punctuation marks. For example:

GROUP3is a valid name
GROUP.3is not a valid name, because it has a "." in it

It is recommended that the trainer in charge of the Exercise specifies the names to be used by each group when loading and saving their results. This will ensure that only standard names are used and will enable the trainer to keep track of what each group is doing. When the Exercise is to be run over a number of days, then it is also recommended that the results for each group are backed up from the hard disk of the computer (where relevant) to floppy diskettes. This can be done

using the copy command from the DOS prompt as follows. Place a formatted diskette in the A drive and then type:

COPY C:\HARAMBEE\GAMES\<Exercise name>.* A: and then press RETURN.

At any time during the HARAMBEE Exercise, the LOAD GAME option can be used to return to a previously saved exercise. This can be done using the FILES menu as already outlined. The participants will be asked to select one name from a list of exercises that have previously been saved. If there are no previously saved exercises on the disk, then there will be a message saying "No old games were found".

.9 Producing the Complete Results

The statistical tables produced during the HARAMBEE Exercise are derived from the values of the outcome (or endogenous) variables that are obtained from the model. The values in the tables include an element of random variation, which varies according to the type of survey or enquiry (this is described in more detail in section 5.2 of this manual). Participants are also only able to see the results of enquiries which they have specified in their budget.

When several groups have completed the HARAMBEE Exercise for a number of rounds, it is very useful to be able to compare the results of each group. Because each group is unlikely to have selected the same set of statistical enquiries, the results they have generated will not be directly comparable. In order to generate a complete set of tables for each group, the trainer conducting the Exercise is provided with a special program called RESULTS.EXE which is located on the supplementary disk.

RESULTS can be used to generate a complete set of statistical tables, without the added random errors, for each Exercise which has previously been saved using the SAVE GAME option on the FILES menu. Where the Exercise has been run on computers with a hard disk, then REALITY will need to be run separately for each different set of results. First of all, the supplementary disk must be placed in the a: floppy disk drive

To run this program, simply type:

a:RESULTS and the press the ENTER key.

You will then see the following message:

```
ON WHICH DISK DRIVE IS THE SAVED GAME LOCATED (B/C/D...) ? :
```

Enter the drive where the saved game is located, this will be B for a twin floppy drive computer and C (or D etc) for a computer with a hard disk drive and then press the ENTER key. If you are using a twin floppy machine, you will then be prompted to put the disk containing the saved game into drive b:.

You will be asked for the name of the file where the Exercise has been saved:

```
TYPE IN THE NAME OF THE SAVED EXERCISE:
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Type the name which was used to save the Exercise and then press ENTER. When you type in the name, the program will calculate all of the true results, and write a set of tables to a file with the same name, but an extension of ".TXT". For example, if your exercise was called "GROUP3", then the tables will be in a file called "GROUP3.TXT". This file will be written to the supplementary disk in drive a:.

The program will ask whether you wish to print the results with the following message:

```
DO YOU WANT TO PRINT THE RESULTS (Y/N) ? :
```

Type Y or N as appropriate and press ENTER. If you ask for the results to be printed the program will prompt you to ensure that the printer is connected and ready and the tables will then be printed. Alternatively you can answer No, and then read the file into a word processing package which can be used to print the tables.

.11 Changing the Starting Year

The starting year for the HARAMBEE Exercise is the current year indicated by the internal clock of the computer on which the program is running. Where the Exercise is to be undertaken by more than group using different computers, therefore, it is important to ensure that each compute clock is registering the correct date. The historical tables all use the current year as indicated by the computers internal clock as the reference year. The historical data will always be reported for the ten years preceding the reference year. If the internal clocks in different computers register different years then the exercises will not correspond.

The internal clock of a computer can be checked by using the MS DOS command DATE. At the DOS prompt, type:

DATE and the press the ENTER key.

The current date will then be displayed and it can be altered if it is not correct.

On January 1 each year, the current date in the computer's clock will change automatically, which will change the reference year in the HARAMBEE Exercise. One consequence of this is that the printed tables in the Statistical Manual will no longer correspond to the tables of historical data which can be viewed on the computer screen. The years will all have increased by one, eg, 1978 will have become 1979 and so on. The historical data is always displayed for the ten years preceding the reference year.

A new copy of the Statistics Manual can be printed by using the HISTORY program on the supplementary disk. Place the supplementary disk in the a: disk drive and type:

a:HISTORY and then press the ENTER key.

The following message will be displayed:

```
ON WHICH DISK DRIVE ARE THE HARAMBEE PROGRAM FILES LOCATED (B/C/D...) ? :
```

Enter the drive where the program is located, this will be B for a twin floppy drive computer and C (or D etc) for a computer with a hard disk drive. If you are using a twin floppy machine, you will then be prompted to put the Harambee program disk in drive b:.

The program will create a file called HISTORY.TXT which will be written to the supplementary disk in drive a:. A message will then be displayed to ask whether or not the file is to be printed:

```
DO YOU WANT TO PRINT THE NEW HISTORICAL STATISTICAL TABLES (Y/N) ? :
```

If you wish to print the results type Y and press return. You will be prompted to make sure that the printer is ready and the tables will then be printed. The pages can then replace the existing pages of tables in the Statistical Handbook. If required, the file HISTORY.TXT can be read into a word processing package for printing.

The print out will consist of the pages in the Statistical Handbook containing the tables for the historical period. The corresponding pages in the Handbook can then be replaced.

Section 7 Using the Exercise as a Training Tool

.1 Timetable

When the Exercise is used as a training tool within a formal training course, then it will be important to allow sufficient time for the Exercise to be completed. The following activities need to be carried out for each separate implementation of Harambee:

-briefing the participants;

-setting policy and completing the Exercise for successive rounds;

-discussion of the results.

Harambee is a complex exercise and the participants are required to absorb a considerable amount of information before they are in a position to make policy decisions. Because of this, it is strongly recommended that a considerable amount of time be allowed at the beginning of the Exercise for briefing and general orientation. The contents of the briefing are discussed below and it is suggested that a period of at least half a day be allowed for this purpose.

The time required to complete one round of the Exercise, that is, to discuss the information available, set the policy variables, enter the values and obtain the results from the computer will vary considerably between groups and individuals. Experience with using the Exercise so far suggests that more time needs to be allowed for the first one or two rounds and that the process speeds up as the participants gain both confidence and practice. The first round of decision taking will inevitably take the longest because the participants will require some time to get used to the whole process and in addition will need to set their budget for statistics for the first five years.

In general, therefore, the timetable for running the Exercise is likely to be as follows.

-Round one, setting the statistics budget and completing the decision making and running the Exercise: three to four hours should be allowed.

-Subsequent rounds are likely to require between one to two hours each on average.

The number of rounds to be completed will depend on the purpose of the Exercise, although it is unlikely that most participants will be able to obtain much benefit from less than three. It is recommended, for most purposes, that between five and ten rounds or years be completed in any specific application. This will allow time for the participants to become familiar with Exercise and to be able to test out the effect of changes in strategies. If many more than ten years are attempted, there is a danger of boredom and it is also possible that the model may become unstable.

At the completion of the Exercise, it is recommended that a full discussion be held which will allow participants from different groups to compare results. Once again, the time required for this will depend to a large extent on the nature of the overall training Exercise, but at a minimum it is suggested that about two hours be allowed. An important objective of this de-briefing period is to provide the links between the Exercise and other parts of the course. To assist with the discussion, the trainer is provided with a programme which will allow the full results for each group to be obtained, regardless of which sets of statistics they have paid for. The use of this program (RESULTS) is described in section 3.5.

In summary, therefore, a typical application of the Exercise would be as follows:

a.briefing 4 hours

b.selection of statistics 4 hours
plus first round

c. seven further rounds 14 hours

d. discussion of results 3 hours

The total requirement, therefore, is about 25 hours time in a course, which represents between three and four days on a full-time basis. It is not essential for this time to be consecutive, provided that there is not a long delay between the briefing and the first round. Exercises can be saved and reloaded quite simply, so there is no problem about carrying out the Exercise concurrently with other training activities.

.3 Briefing

Even though the participants in the Exercise are provided with a manual (the Participants Manual) which provides a background both to Harambee and to the Exercise, it is recommended that a thorough briefing be provided before any decision making commences. It is suggested that the briefing cover the following areas:

a.introduction to Harambee, its geography, environment and economy;

b.the use of the statistical data and the surveys and administrative enquiries that are available;

c.food policy in Harambee and the history of the past ten years;

d.decision making in Harambee and the members of the Food Strategy Committee;

e.the Exercise and the decision making process, including the different objectives of the Committee members;

f.the use of the computers.

.5 Discussing the Results

In order to link the food policy exercise into other aspects of a training course, a period of time should be allocated to discuss the results of the simulation and to examine the performance of each of the groups or individuals. The RESULTS program provided on the supplementary diskette can be used to generate actual results for each group. These results provide data for each of the tables in the Statistical Handbook for each year and are the actual results as generated by the model without the addition of any random variation.

The Exercise is not designed to identify winners and losers. Since the objectives for individuals and groups can be quite different, it is not really possible to say that one group has done better or worse than another. What is useful, however, is to examine the strategies adopted by each group and to contrast the results in terms of different objectives. The participants should be encouraged to discuss their experiences during the Exercise, in particular, how they used the statistical data and how their decision making changed as the Exercise progressed.

The nature of the discussion will depend on the basic purpose of the Exercise. For example, if it is being used to examine the way that statistical data are used in policy formulation, then the de-briefing will need to concentrate on how each group chose their budget for statistics and how they used the information provided to them. This discussion could then be used to lead into a wider examination of the role of statistical data in policy processes in the country or region where the Exercise is being held. If the aim of the training is to improve the process of policy negotiation, then the performance of each role and the ways that conflicts were resolved in the committees would be central to the discussion.

.7 Potential Uses

The Harambee Exercise has been designed as a training tool to be used within a longer training course or seminar. The way that it will be used, therefore will depend on the aims and purposes of the training and it is not possible to generalise about this in advance. In this section, however, some suggestions are made of ways that Harambee could be used for different purposes. The list is not exhaustive.

.1 Improving the Use of Statistics for Policy Analysis

The original concept of the Exercise was as the central component of a seminar designed to improve understanding of the role of statistical data in policy making. In this context, the most important elements of the Exercise are as follows:

-the relationship between the statistical data and the policy decisions;

-the decisions concerned with which sets of statistics to select and why;

-the trade-off between accuracy, cost and timeliness in the statistical data;

-the use of statistical data to monitor the performance of policy makers;

-the links between food strategies and the priorities for statistical data.

Under this heading, Harambee may be found to be particularly effective in a training situation which includes both people who are involved in data collection and dissemination and those who are concerned with the use of statistical information for analysis. The Exercise provides a mechanism for helping to bridge the gap between data providers and data users, by showing how effective policy decisions require a good statistical base and also be demonstrating some of the constraints on the collection and publication of data. The results can be used to demonstrate the need for agricultural and food statistics and the discussion can then be moved on to talk about the actual situation in the country where the training is being conducted.

Using the Harambee Exercise as a means for stimulating discussion about a real situation can be done in a number of ways. One of the most effective is to extend the idea of the food system described in section 3 of the Participants Manual to the country itself. The food system can then be divided up into a number of components, such as production, distribution and consumption and these can be used to identify policy issues and information needs. For example, participants can be asked to draw up diagrams similar to those in section 3 which describe how different parts of the food system operate in the country.

One output of the training course could be a set of recommendations for the improvement of food and agricultural statistics in the country. Participants can be asked to prepare these in much the same way that they decided on a budget for statistical enquiries in the Exercise.

.2 Providing an Overview of Food Policy

The Harambee Exercise can be used as a training tool in courses that are concerned with food policy and its application in different countries. Because of the simplified nature of the economy of Harambee, the Exercise provides a good mechanism to illustrate the type of policy issues that typically fall within the ambit of food policy. It can help to demonstrate to government officials that a wide range of policy issues are involved and that there will usually be some trade-off between different objectives. For example, officials from a Ministry of Agriculture will understand that policy is concerned with marketing and consumption as well as production. Policies that are designed to increase production may have unforeseen and undesirable consequences in terms of the operation of markets and the maintenance of adequate nutrition. Similarly, the interaction between the need to generate foreign exchange and the requirement to maintain food security can be demonstrated.

Harambee can be used as a means of integrating concepts and of bringing together areas of analysis that have previously been discussed separately. It can be difficult, in a theoretical context, for example, to analyse the relationship between production support policies such as input price subsidisation and commodity price support and factors such as the management of a mixed marketing system. Without needing to go into involved theoretical discussions or become involved in complex analysis, the Exercise can help to demonstrate important concepts.

When using Harambee for this purpose, the emphasis will be on the policy strategies adopted by each group, on the policy decisions made and on the results obtained. A full discussion of the results for each group, produced using the program RESULTS on the supplementary disk will be an important part of this process. There is likely to be less emphasis on the use of statistical data and on the negotiation process, but both of these aspects will need to be included in the discussion at the end of the exercise.

While using Harambee and in the discussion that leads on from it, it will be important to stress that the results from the Exercise should not be used to develop policy prescriptions for any particular country. The general relationships included in the model are likely to be the same for many countries, but the results obtained depend on the detailed specification of a set of complex equations. There can be no guarantee that these equations apply to any other country and participants should not assume that because a policy has a particular effect in Harambee then that effect will apply elsewhere.

.3 Studying the Process of Policy Negotiation and Formulation

Harambee can also be used as a training tool to examine the processes whereby policy within government is formulated and how negotiation takes place between individuals and organisations with differing objectives. The Food Policy Committee in Harambee has five different roles of whom four have different objectives which may well be in conflict. The participants are required to come up with an agreed set of decisions, based on recommendations by each individual. The Exercise can be used to study how this process takes place and to provide training in understanding and improving the way that negotiations proceed.

Clearly this will only be possible if the Exercise is used as a group activity, since the role playing aspects are excluded when used by individuals. Time will need to be spent on briefing participants about each of the roles and extra material may well be needed on top of that included in the Participants Manual. The negotiation process will need to be observed and compared between groups, this may require a non-participant observer, or could be done through the use of video cameras.

Discussion of the results for each group will need to concentrate on the extent to which groups managed to achieve their stated objectives as a whole as well as examining how each individual role performed. Comparisons can be made as to which roles appeared to be dominant, both in the discussion and in the achievement of objectives.

.4 Providing an Introduction to Quantitative Policy Analysis

Although the computer program containing the model which simulates the results of policies is meant to be a "black box", it is possible to use the Harambee Exercise as a training tool to introduce people to aspects of economic analysis and modelling. When used in this way, the recommended procedure is to first of all run the complete exercise with the participants, providing them with the usual briefing, but not releasing any information about the underlying model. After a brief discussion about the results obtained, the aim would then be to go on to study specific parts of the Harambee food system to identify in depth what the relationships are and how the results were generated.

This process can start from the description of the food system in section 3 of the Participants Manual but will require more detailed information about how the relationships represented there have been modelled. This information is provided in section 5 of this manual and a specification of the equations that make up the model is provided in Appendix B.

Rather than attempt to discuss the model as a whole, it is recommended that the process be broken down into manageable parts, roughly corresponding to the division of the food system given in section 3 of the Participants Manual - production, distribution and consumption. In this way, the

mathematical representation of the relationship can be discussed, without making the process too complicated.

The discussion of the Harambee model can proceed in two main directions. The first is to discuss the representation of Harambee and to identify alternative ways of modelling existing relationships as well as possible extensions to the model. The second direction is to use Harambee as a simplified system and go on to discuss how the real situation in a country could be modelled, taking into account the need to cover more commodities, a finer population disaggregation and a more complex economy.

Section 9 How the Results are Produced

.1 Introduction

This section of the manual provides some information about how the results, which are presented in the statistical tables, are produced. Initially, a set of values for 15 policy variables are entered into the computer in two rounds for each simulated year. This process is described in section 6.3 of the Participants Manual. Outcomes are generated by a computer model and these are then translated into a set of statistical tables. Section 5.2 below describes how the model works and section 5.3 provides some information on how the various statistical tables are produced. Finally, section 5.4 indicates how the Exercise may be modified in order to change the way it operates.

.3 The Model

Appendix B provides a listing of the equations that make up the model, this section provides some explanation about what each set of equations is designed to do. The model is made up of a series of equations that describe relationships between:

-exogenous variables, which represent factors outside the control of the participants, but which can affect outcomes;

-policy variables, which are set for each round;

-outcome or endogenous variables, which measure the effect of the policy variables combined with changes in the exogenous factors.

The equations in the model describe the mathematical relationship between different kinds of variables. Each equation is defined in terms of three factors:

-the variables;

-the functional form of the relationship;

-the values of parameters in the equations which modify the outcomes and are used, for example, to set initial conditions.

The values of the parameters are listed in a file on the Harambee program disk and section 5.4 and Appendix C describe how these values may be altered.

.1 Exogenous variables

World prices, exchange rate, interest rate, landing costs and rainfall are all exogenous to the model. The values change from year to year, starting from a base value and, with the exception of rainfall are calculated as the product of three components. These are:

-a weighted moving average of the values in previous years;

-a random deviate drawn from the normal distribution with a given coefficient of variation;

-a constant annual growth rate.

The values for the last two components are as follows:

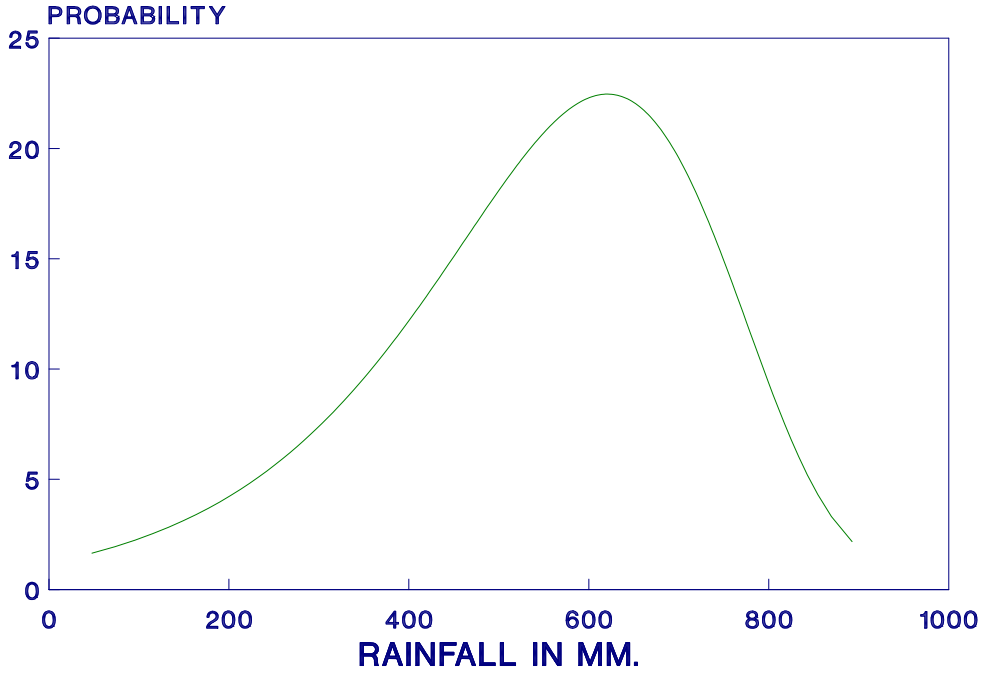
	Coefficient of Variation	Growth Rate
World commodity prices	10%	Zero
World fertilizer price	10%	Zero
Interest rate	10%	Zero
Exchange rate	5%	5% plus 0.01% of the cumulative balance of payments per annum
Landing Cost	5%	5% per annum

Rainfall is expressed as a random deviate drawn from the extreme value distribution rather than the normal distribution, and with a coefficient of variation of 40% in the East, approximately 20% in the West, and with means of 525 mm per year in the East and 900 mm per year in the West. The probability distribution of the rainfall in the East is illustrated in figure 5.1.

.2 The production stage

In the production stage of the model, the decisions made by farmers on how much of each crop to plant and how much fertilizer to use are modeled. Production is determined as a function of the area planted and the yield, which among other things is dependent on the level of rainfall. The production stage concludes with calculations of sales by farmers and the level of post-harvest stocks held by NFMB. Inputs to the production stage are the values for the seven policy variables and the values of the exogenous variables. The outputs are the production of each crop by each type of producer and the level of sales to NFMB and the Cotton Board.

Figure 5.1:Distribution of Rainfall in the East



a. Population and migration

The first thing to be calculated in the model is the level of the population in each of the different groups. The base year population is exogenous to the model and the annual growth rate is provided as a parameter. Pure population growth is then modified by migration. All migration is either to or from the urban low income group. The rate of migration into the city from any population group is assumed to be proportional to the population level of that group and to the difference between the income of the group and the urban poor. Thus, if rural incomes are below those of the urban poor, migration takes place into the city. A reverse migration occurs if rural incomes rise above urban levels. The model makes use of a three year moving average of income, rather than the current value, in order to stabilise the migration rates.

Migration is one of the factors that has a lag effect within the model; the level of migration in one year is dependent on incomes in previous years. The number of households is calculated on the basis of a constant household size. These data are contained in the parameter file PARMFILE.TXT which is reproduced in Appendix C.

b. Total land availability

It is assumed within Harambee that there is no overall constraint on the availability of arable land. The total land area available for crop production increases at a rate which is 90 per cent of the growth rate of the rural population for each of the rural groups.

c. Areas planted and use of fertilizer

Farmers decide on the area they wish to plant to each crop, depending on: their expectation of rainfall (based on an average of rainfall in the past four years); the average producer price (a weighted average of the NFMB producer price, fixed as a policy variable, and the private trader producer price as in d. below) and the price of fertilizer. Fertilizer allocation is decided on in a similar way, the effect is that farmers allocate fertilizer to crops to maximise returns, that is until the marginal return equals the marginal cost[1].

If the optimal allocation of area to all crops in total exceeds the total land availability, then the areas planted to each crop are reduced in proportion. Similarly, the fertilizer allocations to crops are reduced in proportion if the total use exceeds the availability of fertilizer, which is determined as a policy variable. If the quantity of fertilizer allocated to each producer group exceeds the amount that these farmers wish to use, then the excess will not be sold and the government will bear the loss. Fertilizer imported in one year cannot be held over for use in a subsequent year.

d. Producer price offered by private traders

The private traders producer price is calculated as the previous year's price uprated in the same proportion as the change in a three year moving average of the private market consumer prices. Rising consumer prices will therefore lead to rising producer prices with a one year lag. Because the private traders' producer price is fixed before the consumer price it is possible for traders to make a trading loss in any one year.

e. Production

Crop production is calculated as a function of the area planted, rainfall and fertilizer allocation, modified by a factor to represent differences in soil fertility. Production will increase as rainfall increases although at a decreasing rate.

f. Sales to the Government

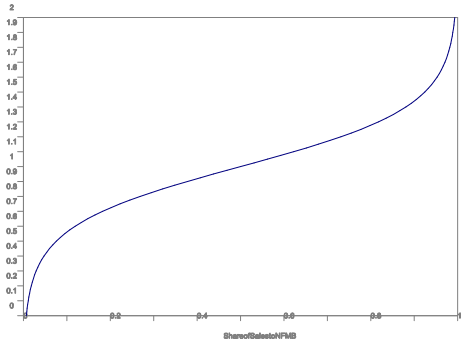
For cotton, all production is sold to the Government (Cotton Board), while for cassava, all production is sold to private traders and the Government is not involved in the cassava trade at all.

In the case of maize however, farmers can sell to either private traders or to the Government (the NFMB). The share of production sold to the NFMB is modelled as a function of the ratio of the prices offered by the NFMB (set as a policy variable) and the prices offered by private traders. The function takes a logistical form and is illustrated in Figure 5.2.

When the price ratio is very low (that is, the NFMB price is low compared with the private market price), then the share sold to the NFMB is close to zero. When the price ratio is very high, the share is close to one. In the figure, a price ratio of one (the NFMB and private traders producer prices are equal), gives a share of 0.5. In the model there is a parameter determining what the share will be for equal prices (representing market infrastructure), and another determining how steep the curve will be (representing price response by farmers).

[1] The model assumes that farmers will attempt to optimise their area planted and fertilizer use as if they were following a Cobb-Douglas type production function (this implies a constant elasticity of production with respect to either area or fertilizer).

Figure 5.2: Share of Sales to the NFMB as a function of the Price Ratio



In the model, retentions by farmers and sales to private traders are not treated separately. This is equivalent to valuing retentions at the private market producer price.

The production stage concludes with accounting equations which calculate the NFMB post harvest stock, including imports, which are considered as intake into the urban area. A small loss rate is applied to the stocks carried forward from the previous year. The post-harvest stock is equal to the stock carried over from the previous year (after allowing for losses in storage) plus imports where applicable plus purchases by NFMB. The total quantity held by the NFMB becomes the stock available for sale, storage or export in the consumption stage.

.3 The consumption stage

The consumption part of the model is operated after the second stage of policy decisions are entered. It is concerned with simulating the operations of the government and private markets and determining the level of food consumption of each of the consumer groups. The components of this stage are the formation of household income, the determination of demand for the two commodities, maize and cassava and an iterative procedure whereby price in the private market varies until supply and demand are equated. The price formation in the private market is determined by a simultaneous set of equations that equate supply and demand and ensure that this market clears.

a. Income formation

Household income has three components. The first is income from agriculture, which is the profit farmers derive from crop production (value of crops produced minus the cost of fertilizer). Clearly, only the rural farming population groups earn income from agriculture. Note that household retentions are implicitly included as income, valued at the private trader producer price.

The second component of income is the profit from private trade in maize and cassava. Since the private trader consumer prices are not known at this stage in the model, these are evaluated on the assumption of a constant markup over the producer prices. Trader income is then distributed between all of the population groups, using a constant set of proportions. This is a simplification of the process whereby trader income is formed. In effect, it assumes that household income derived from commodity trading is equal to the long-run average profit, rather than the actual profit or loss made in any one year.

The third component of income is from wage labour. The assumption is that all wages will vary in proportion to the policy determined Government Minimum Wage. The income from wage labour in each group is therefore calculated using a group specific multiplier (which is greater than one for wealthier groups).

b. Demand system (expenditure allocation by consumers)

The demand for maize and cassava for each household group is determined by a set of demand equations[2]. Expenditure on each commodity is a function of household income and relative prices. In the private market, price is altered to equate supply and demand.

The proportional change in expenditure on each commodity since the previous year is calculated as the sum of the (uncompensated) elasticities multiplied by the proportional changes in the income and prices respectively. Since this is a linear approximation, it is necessary to proceed with very small changes in incomes and prices. This is accomplished through an iterative technique which divides the income change into small steps. For each step of the income change, the algorithm searches for the equilibrium price using small price changes.

c. Consumer purchases from the NFMB and private traders

For cassava, all demand is directed towards the private market. For maize, however, consumers can purchase from either the NFMB or private traders. The share of demand between the NFMB and the private market is determined by a logistic function of the ratio between NFMB and private market consumer prices, similar to the function used to split producer sales of maize in Figure 5.2.

Thus, if the NFMB consumer price is high relative to the private market price, then consumers purchase very little from the NFMB. If the NFMB price is low, then most of the consumer demand is from the NFMB, subject to the availability of stocks. If the NFMB stocks are insufficient to meet

[2] The model uses a Constant Elasticity of Substitution (CES) demand system which preserves the properties of homogeneity and symmetry and which also adds up due to the presence of the large component of unallocated expenditure on "other" commodities.

the demand from consumers, then the remaining demand will "spill over" into the private market.

d. Private trader supply to urban areas

Private traders allocate their available supply in the West (that is, their purchases from farmers less losses) between rural and urban areas in the same proportion as the quantities demanded. Private traders are not allowed to transfer maize from the Eastern Region to the West (or vice versa) so that private supplies in the East cannot reach the urban area.

e. The equilibrium market price

The steps outlined above complete the calculation of both supply and demand in all of the regions. The equilibrium price is that price which equates supply and demand in the private market. The level of excess demand, therefore, is used to make a small adjustment to the price, which is then used to repeat the above steps, from the demand system to the private trader urban supply. The iterative procedure is repeated until an equilibrium price is found.

This completes the consumption part of the model. Once the equilibrium price has been found, a series of outcomes are calculated.

.4 Outcome equations

a. NFMB carry forward stocks

The level of NFMB carry-forward stocks is obtained by subtracting the level of sales in each region, as calculated above, from the post-harvest stocks, taking into account any movements in stocks set in the second round of policy making. Exports of maize are assumed to come from urban stocks where available. Similarly, any food security stocks set by the policy process are assumed to be held in the urban areas.

b. Internal Government budgetary balance

The internal government budget has six components. The first is the trading account on the two commodities: maize and cotton. For maize this is the revenue from sales (exports converted into Harambee currency plus sales to consumers) minus the cost of purchases (imports converted into Harambee currency plus purchases from farmers) minus the operating costs of the NFMB. For cotton it is the revenue from exports in Harambee Currency Units less the cost of purchasing the crop from the farmers. Note that the world prices are exogenously determined and are subject to some random variation.

The second component is the trade balance on fertilizer. This is the value of sales to farmers, less the cost of importing (converted into HARAMBEE currency) and the landing costs.

The third component is the trade balance on all other commodities. This is assumed to be a linear function of the "income base", or total income, in the economy. Higher income will improve the budget balance by generating revenue for the Government.

The fourth component is income tax. This is simply 15 per cent of total incomes. The fifth component, the Government wage bill, is 25 per cent of the total wages paid out in the economy (based on the assumption that 25 per cent of salaried workers work for the Government).

The final component of the internal balance is the interest on the cumulative internal balance, corresponding to Government borrowing. The current balance is then used to update the cumulative balance. The interest rate the Government faces is exogenously determined and is subject to some element of random variation.

c. External balance of payments

The external balance of payments has four components. The first is the trade balance on the two traded commodities: maize and cotton. This is simply the net value, in dollars, of exports minus imports. The second component is the cost of fertilizer imports, valued at the world price.

The third component is the contribution of all other commodities. This is assumed to be a linear function of the size of the urban population. In other words, the urban population is considered to be a net earner of foreign exchange, for example, by working in export oriented industries.

The final component of the external balance of payments is the interest on the cumulative balance. The interest rate used is the same as the one used to calculate the interest payments on internal borrowing. The current balance of payments is then used to update the cumulative balance.

d. Nutrition

The two main nutritional measures, stunting and wasting of pre-school children, are calculated directly from an estimate of the total energy gain of each population group derived from food consumption. This depends upon the average quantities of each commodity consumed, and the calorie content of the commodities. An assumption is made about the calorie content of the category of "other commodities" for each population group.

Both the mean weight for height, and the mean height for age are calculated as a quadratic function of the difference between the total energy intake, and a norm of 2200 calories per day per person. The standard deviations of these means are increasing log-linear functions of the same energy deficit. Both of the means are exponentially smoothed, using the previous year's values, in order to stabilise the time series. Mean height for age is smoothed more than mean weight for height.

The prevalence of wasting is calculated by assuming that weight for height is distributed as a normal distribution. The prevalence is calculated as the area of this probability distribution function below 80% of the mean, with the given standard deviation. The prevalence of stunting is calculated in a similar way, as the area below 90% of the standard mean height for age. Both the prevalences are exponentially smoothed in order to stabilise the series.

.5 The Statistics

The data in the statistical tables are derived from the results obtained from the model. Each of the statistical surveys or administrative enquiries generates one or more tables. Many of the tables

also have a corresponding graph, which can be viewed on the screen. Each enquiry has a cost and there is a time lag before the results are made available to the participants.

Depending on the enquiry, the data displayed in the statistical tables are subject to a level of random variation which is added to the values derived from the model. This is done so as to simulate the statistical process, particularly where results have been generated from a sample survey. The random variation is drawn from a normal distribution, with zero mean and a given coefficient of variation, which is different for each table and may well also be different for different variables in the same table.

Table 5.1 summarises the properties of the various statistical tables. The cost of each survey, the time delay before the results are made available and the accuracy of the variables can be altered. The next section and Appendix C provide instructions on how to do this.

.7 Modifying the Exercise

The way that the Exercise operates can be modified by making changes to the following:

-the model parameters;

-the screen messages;

-the factors which affect the way that the statistical data are calculated and presented, namely the costs of each enquiry, the time delays before the data are made available and the random variation added to the model outcomes.

Table 5.1: Summary of the Statistical Tables Available

Name of Survey	Cost	Delay	Name of Table	Coeff of Variation
a) Surveys				
Agricultural production survey	175,000	2 years	area planted	2.5%
			fertilizer use	2.5%
			production	2.5%
			sales to Govt.	2.5%
Household income and expenditure survey	150,000	2 years	income	2.5%
			maize expenditure	2.5%
			cassava expenditure	2.5%
Consumer price survey	25,000	None	prices	1.5%
Nutrition survey	40,000	1 year	stunting	1.5%
			wasting	1.5%
Meteorological report	10,000	None	rainfall	0.0%
Crop rapid assessment	30,000	None	production	15.0%
Population census	200,000	3 years	national	1.5%
			urban	1.5%
b) Administrative Statistics (Coefficient of variation = 0.0%)				
Records of Government policy	0	None	production stage	
			consumption stage	
Government budget	15,000	None	government budget	
Balance of payments	10,000	None	balance of payments	
World prices and exchange rates	5,000	None	world prices & exchange	
Cotton Board records	10,000	None	intake and sales	
NFMB records	20,000	None	intake and post-harvest stocks	
			sales and carry-forward stocks	

.1 Changing the model parameters

The values of the parameters used in the various equations in the model as well as the commodity and variable names are all contained in a file called PARMFILE.TXT which is located on the program disk. These names and values can be altered by editing this file prior to running the program.

The file can be edited using any text editor, such as EDLIN, which is usually supplied with copies of MS/DOS, or with most word processing packages provided they can write ASCII text files. For details of the file contents, and instructions on how to edit them, see Appendix C.
Considerable care needs to be taken when making changes to some of the parameters in the model. Some results are very sensitive to even small changes in the parameter values and it is by no means certain that the model will produce sensible results when changes are introduced. Users are recommended to make changes only when they have studied the structure of the model in some depth and when they have assessed the possible effect of the alterations proposed.

.2 The screen messages

The contents of the screen menus, and the messages which appear at the bottom of the screen, are all contained in two files called HEADFIL1.TXT and HELPFIL1.TXT which are also located on the program disk. Since neither of these files are ASCII text files, it is not possible to edit them with an ordinary text editor.

The supplementary HARAMBEE diskette contains a program called MESSAGES.EXE which can be used to make changes to these messages (or to translate them into another language). To run the program, place the supplementary disk in the a: disk drive and type:

a:MESSAGES and then press the ENTER key.

The following message will be displayed:

```
ON WHICH DISK DRIVE ARE THE HARAMBEE PROGRAM FILES LOCATED (B/C/D...) ? :
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Enter the drive where the program is located, this will be B for a twin floppy drive computer and C (or D etc) for a computer with a hard disk drive. If you are using a twin floppy machine, you will then be prompted to put the Harambee program disk in drive b:.

The program will display each of the messages, and then ask you to type in an alternative. For details of how to use this program, see Appendix C.

.3 The Cost, Delay and Accuracy of the Statistical Enquiries

The cost of each survey, as well as the time delay before tables are made available and the level of random variation that is added to the model results, is included as an entry in the file PARMFILE.TXT. To change the values you will need to edit this file as outlined in section 5.4.1 above. Further details are given in Appendix C.

APPENDIX A: INSTALLING THE PROGRAM

1. What you Need

In order to run the HARAMBEE simulation Exercise, you will need an IBM compatible microcomputer attached to a printer. The computer program which is used for the Exercise has been designed to operate on almost any computer which is IBM compatible and which runs the MS/DOS operating system.

The program does however require either a hard disk, or a computer with two floppy disk drives. In addition, it requires your computer to have at least 384K of RAM memory.

In summary, the requirements are:

-IBM compatible computer running MS/DOS

-A floppy disk drive (either 5.25" or 3.5") - called the A: drive

-Either a second floppy disk drive - called the B: drive

-Or a hard disk - normally called the C: drive

-At least 384K of RAM memory

In order to start the Exercise, you will also require:

-the HARAMBEE system disk in drive A:

-an empty formatted diskette in drive B: if you do not have a hard disk drive.

2. Installing the Program

Before you install the HARAMBEE program to run on your computer, you will need to make two decisions:

a)Where to install the program:

This decision depends on whether or not you have a hard disk. If you do, then the program runs much faster if it is first installed on the hard disk. If you do this, the program will create a directory called \HARAMBEE on your hard disk, and copy the files into it.

If you do not have a hard disk, then you can run the program from your copy of the HARAMBEE system disk in the A: floppy disk drive, or install it onto a floppy diskette in the B: disk drive.

b)Where to keep the copies of your exercises:

The HARAMBEE program will need some extra disk space in case you want to keep copies of your exercises. It is not possible to keep these copies on the HARAMBEE system disk, since this disk is almost full already.

Therefore, you need to decide whether you want to keep your copies on the hard disk (if you have one) or on a second floppy disk drive (usually called the B: drive).

If you decide to use your hard disk, the program will create a new directory called \HARAMBEE\GAMES (which is a subdirectory of the \HARAMBEE directory). This subdirectory will be used for the copies.

If you decide to use your B: drive, the program will use the root directory on it (called \).

Once you have decided where to put the program, and where to keep the copies of your exercises, you can start the installation by following these steps:

a. Put the HARAMBEE system disk into the floppy disk drive A:

b. If you are using a second floppy disk drive B:, make sure that there is an empty formatted disk in the drive

c. If you want to install on a hard disk, type the following two commands:

A: <Enter>
INSTALL C: C: <Enter>

Alternatively, to install on a floppy disk, type:

A:<Enter>
INSTALL B: B:<Enter>

d. In either case, the installation program will do the rest. The program will be installed in a directory called \HARAMBEE on whichever disk drive you specified. Note that if you have installed the program onto a floppy diskette in the B: drive, then you should use that diskette in the A: drive, with a second empty disk in the B: drive.

e. When the installation has finished, you will see the following message:

The HARAMBEE program has now been installed

f. In order to run Harambee, now type the word "HARAMBEE" and press the ENTER key

You are now ready to run the program.

APPENDIX B: THE MODEL EQUATIONS

1Notation

a)Model Variables:The model variables are represented by capital letters, eg WP for world price, or PPP for Private Producer Price.

b)Model Parameters:The model parameters are represented by lower case letters, or by greek letters. e.g. ss for the sales share, or α for an estimated constant.

c)Policy Variables:The policy variables are in italics. e.g. $\boldsymbol{GPP}_c$ for the Government Producer Price.

d)Model Equations:The model equations are classified into three groups, and numbered accordingly. The groups are:

-Exogenous equations, numbered as E.1, E.2 etc
-Behavioural equations (containing behavioural assumptions), numbered as B.1, B.2 etc
-Accounting equations (containing accounting definitions or defining new variables), numbered as A.1, A.2 etc

The model contains a total of 66 equations: 7 exogenous equations, 21 behavioural equations, and 38 accounting equations.

d)Subscripts:Subscripts are used to denote the disaggregation of the variables into commodities, population groups and regions, as follows:

- commodities:the subscript c, e.g. WP_c , the world price of commodity c. The values which c can take are:

mfor maize
cfor cassava
xfor cotton

- popn. groups:the subscript g, e.g. POP_g , the population of group g. The values which g can take are:

eseastern small farmers
eneastern non-agricultural
wswestern small farmers
wlwestern large farmers
wnwestern non-agricultural
uhurban high income
umurban middle income
ulurban low income

- regionsthe subscript r, e.g. R_r , the rainfall in region r. The values which r can take are:

eeast
wwest
uurban

e)Brackets:Brackets are used with variables to denote the time lags. A variable name with no brackets represents the current value, while brackets are used to represent previous years' values. e.g.:

XRis this year's exchange rate
XR(-1)is last year's exchange rate
XR(-2)is the year before last's exchange rate
etc.

2Exogenous Equations

E.1: World Price:

$$WP_c = \frac{3WP_c(-1)+2WP_c(-2)+WP_c(-3)}{6} * d(10\%)$$

where:d(x%) is a random normal deviate with a coefficient of variation of x%.
i.e. d = 1 + x.nra/100 , where nra is a random variable drawn from the standard normal distribution.

E.2: World Fertilizer Price:

$$WFP = \frac{3WFP(-1)+2WFP(-2)+WFP(-3)}{6} * d(10\%)$$

E.3: Interest Rate:

$$IR = \frac{3IR(-1)+2IR(-2)+IR(-3)}{6} * d(10\%)$$

E.4: Exchange Rate:

$$XR = \frac{3XR(-1)+2XR(-2)+XR(-3)}{6} * d(5\%) * \exp(CBP(-1)/10000)$$

where:CBP is the cumulative balance of payments

E.5: Landing Cost:

$$LC = \frac{3LC(-1)+2LC(-2)+LC(-3)}{6} * d(5\%) * 1.05$$

E.6: Rainfall (East):

$R_e = 525 * ed(40\%)$

where ed(x%) is a deviate from the extreme value distribution with coefficient of variation of x%. i.e:

$$ed = 1 + x * \{ 0.57721.\frac{\sqrt{6}}{\pi} + \frac{\sqrt{6}}{\pi} \ln[\ln(\frac{1}{1-ra})] \} / 100$$

where ra is a random variable drawn from the rectangular [0,1] distribution

E.7: Rainfall (West):

$R_w = 900 * \{1 + [(R_e/525)-1]*ra\}$

3Production Stage Equations

B.1: Migration:

$$MG_g = POP(-1) * ms_g * [1 - \frac{I_g(-1)+I_g(-2)+I_g(-3)}{I_{ul}(-1)+I_{ul}(-2)+I_{ul}(-3)}] \quad \text{for all g except ul}$$

where:ms_g = "migration speed" by group
I_g = Income by group
POP_g = Population by group

$MG_{ul} = -\sum_{g \neq ul} MG_g$ so that all migration sums to zero

A.1: Population:

$POP_g = POP_g(-1) * [1 + pg_g] - MG_g]$

where:pg_g = population growth rate of group g

A.2: Number of Households

$NH_g = POP_g / hhs_g$

where:hhs_g = Average household size of group g (constant)

B.2: Total Area Planted:

$$TA_g = TA_g(-1) * \left[1 + 0.9 * \frac{POP_g - POP_g(-1)}{POP_g(-1)} \right]$$

provided $POP_g > POP_g(-1)$, otherwise $TA_g = TA_g(-1)$]

B.3: Private Producer Price:

$$PPP_{cr} = PPP_{cr}(-1) * \frac{PCP_{cr}(-1)+PCP_{cr}(-2)+PCP_{cr}(-3)}{PCP_{cr}(-2)+PCP_{cr}(-3)+PCP_{cr}(-4)}$$

where:PCP_{cr} = Private Consumer Price by commodity and region

A.3: Average Producer Price:

$$PP_{cg} = \frac{GPP_c.SG_{cg}(-1) + PPP_{cr}.SP_{cg}(-1)}{O_{cg}}$$

where:$GPP_c$is the Government Producer Price
$SG_{cg}$is the sales to government by farmers
$PPP_{cr}$is the Private Producer Price
$SP_{cg}$is the sales to private traders by farmers
$O_{cg}$is the output by commodity and group

A.4: Mean Rainfall: (used as the expected rainfall by farmers)

$$MR_r = \frac{R_r(-1)+R_r(-2)+R_r(-3)+R_r(-4)}{4}$$

B.4: Optimal Area Planted:

$$A'_{cg} = \{ \alpha_{cg}.at_{cg}.(PP_{cg}/ap).MR_r^{\,br_{cg}} [(ft_{cg}/at_{cg}).(ap/fp)]^{ft_{cg}\,[1/(1-ft_{cg}-at_{cg}]} \}$$

where:α_{cg}= Production function multiplicative constant
at_{cg}= area technical coefficient
ft_{cg}= fertilizer technical coefficient
br_{cg}= rainfall technical coefficient
ap= area shadow price
fp= fertilizer price

B.5: Optimal Fertilizer Use:

$$F'_{cg} = \{ \alpha_{cg}.ft_{cg}.(PP_{cg}/fp).\ MR_r.\ [(at_{cg}/ft_{cg}).(\boldsymbol{fp}/ap)] \}^{\frac{br_{cg}}{[1/(1-ft_{cg}-at_{cg}]}} - \gamma_{cg}$$

where: γ_{cg} = fertilizer additive constant (representing soil fertility)

A.5: Area Constraint:

$$A_{cg} = A'_{cg}.TA_g/(\Sigma A'_{cg}) \text{ if } \Sigma A'_{cg} > TA_g$$
c c

A.6: Fertilizer Constraint:

$$F_{cg} = F'_{cg}.\boldsymbol{TF}_g/(\Sigma F'_{cg}) \text{ if } \Sigma F'_{cg} > \boldsymbol{TF}_g$$
c c

where: $\boldsymbol{TF}_g$ = Total Fertilizer Allocation to group g

B.6: Production (Output): - Modified Cobb-Douglas Production Function

$$O_{cg} = \alpha_{cg}.A_{cg}^{at_{cg}}.\ R_r^{br_{cg}}\ .\ [\gamma_{cg}+F_{cg}]^{ft_{cg}}$$

A.7: Value of Output:

$$V_{cg} = O_{cg}.PP_{cg}$$

A.8: Profit:

$$PF_{cg} = V_{cg} - F_{cg}.\boldsymbol{fp}_{cg}$$

A.9: Crop Yield:

$$YL_{cg} = O_{cg}/A_{cg}$$

B.7: Sales to Government:

$$SG_{cg} = \text{Logistic}[\ (GPP_{cg}/PPP_{cr}),\ ss_{cg},\ se_{cg}\ ] * O_{cg}$$

where: ss_{cg} =sales share to government at equal prices (1 for cotton and 0 for cassava)
se_{cg} =sales elasticity at equal prices with respect to price ratio

Logistic is a function of the price ratio in the first argument which takes the value zero for very small ratios (i.e. large and negative), the value 1 for very large ratios, and the value ss_{cg} when the ratio is equal to one. The price elasticity of the function is equal to se_{cg} when the price ratio is equal to one.

The form of the logistic function is as follows:

$$\text{Logistic} = \frac{ss}{ss + [1-ss]*\exp[-se.(pr-1)/(1-ss)]}$$

where:ss = sales share (as above)
se = sales elasticity (as above)
pr = price ratio (as above)

A.10: Government Intake:

$$GI_c = \sum_g SG_{cg}$$

A.11: Government Regional Intake:

$$GRI_{cr} = \sum_{g \in r} SG_{cg}$$

A.12: Sales to Private Traders:

$$SP_{cg} = O_{cg} - SG_{cg}$$

A.13: Private Trader Intake:

$$PI_c = \sum_g SP_{cg}$$

A.14: Private Trader Regional Intake:

$$PRI_{cr} = \sum_{g \in r} SP_{cg}$$

A.15:NFMB Post Harvest Stocks:

$PHS_{cr} = CFS_{cr}(-1)*[1-sl_c] + GRI_{cr}$ for r=e or r=w (rural areas)

$PHS_{cr} = CFS_{cr}(-1)*[1-sl_c] + \boldsymbol{IM}_c$ for r=u (urban area)

where:CFS_{cr}= NFMB carry forward stock
sl_c= rate of stock loss (proportion per annum)
$\boldsymbol{IM}_c$= imports of commodity c

4Consumption Stage Equations

A.16: Agricultural Income:

$AI_g = \Sigma_c PR_{cg} / NH_g$ (Profit / No. Households)

B.8: Trade Income:

$TI_g = \Sigma_c PI_c.(pm_c-1) * ppn_g / NH_g$

where: pm_c =Private trader markup on commodity c
ppn_g =Proportion of private trade earned by group g

A.17: Total Income:

$I_g = AI_g + TI_g + \boldsymbol{GW}.wm_g$

where: $\boldsymbol{GW}$ =Government Minumum Wage
wm_g =wage multiplier for group g

Start of Simultaneous System for Equilibrium Price

A.18: Average Consumer Price:

$$CP_{cr} = \frac{\boldsymbol{GCP}_{cr}.GD_{cr} + PCP_{cr}.PD_{cr}}{GD_{cr} + PD_{cr}}$$

where: $\boldsymbol{GCP}_{cr}$= Government Consumer Price
PCP_{cr}= Private Trader Consumer Price (to be solved for)
GD_{cr}= Demand from Government
PD_{cr}= Demand from Private Traders

B.9: Compensated Price Elasticity:

$CE_{ijg} = W_{jg}.se_g$ when $i \neq j$

$CE_{iig} = -\Sigma_{j\neq i} CE_{ijg}$

where: W_{jg}= share of total expenditure by group g on commodity j
se_g= substitution elasticity of group g

B.10: Uncompensated Price Elasticity (Slutsky Equation):

$UE_{ijg} = CE_{ijg} - W_{jg}.ie_{ig}$

where:ie_{ig} = Income Elasticity on commodity i of group g

B.11: Expenditure (expressed in terms of elasticities and proportional changes):

$$E_{ig} = E_{ig}(-1)*\{ 1 + ie_{ig}.\frac{[I_g - I_g(-1)]}{I_g(-1)} + \sum_j UE_{ijg}.\frac{[CP_{jr} - CP_{jr}(-1)]}{CP_{jr}(-1)} \}$$

A.19: Budget Share:

$W_{ig} = E_{ig}/I_g$

B.12: Demand from Government:

$GD_{cr} = \sum_g E_{cg}.NH_g.Logistic[(PCP_{cr}/GCP_{cr}), bs_g, be_g],$

where:Logistic is the logistic function of the price ratio (PCP_{cr}/GCP_{cr}), as in equation **B.7**.
bs_g =buying share: share of total demand from the government sector when the prices are equal (i.e. the price ratio is 1)
be_g =buying elasticity: price elasticity of the logistic function when the price ratio is equal to 1.

A.20: Demand from Private Traders:

$PD_{cr} = \sum E_{cg}.NH_{cg} - Minimum[GD_{cr}, (\boldsymbol{GS}_{cr}.\boldsymbol{GCP}_{cr})]$

where:$\boldsymbol{GS}_{cr}$ = Government supply: policy allocation to region r (cassava and cotton are zero)
$\boldsymbol{GCP}_{cr}$ = Government consumer price

B.13: Private Trader Allocation to Urban Area:

$$PRI_{cu} = PRI_{cw} * \frac{(PD_{cu}/PCP_{cu})}{(PD_{cu}/PCP_{cu}) + (PD_{cw}/PCP_{cw})}$$

End of Simultaneous System for Equilibrium Price

The equations **A.18** to **B.13** are solved as a simultaneous system for the private consumer prices PCP_{cr}. The algorithm used is Gauss-Seidel, i.e. the equations are repeatedly evaluated with an adjustment rule for the price until the supply and demand on the private market are equal. The adjustment rule for the price is of the form:

$PCP_{cr}' = PCP_{cr} * [1 + (demand-supply)/(demand+supply)]$

the demand is PD_{cr}/PCP_{cr}, and the supply is PRI_{cr}

5Outcome Equations

A.21:NFMB Carry-Forward Stocks:

$CFS_{cr} = \boldsymbol{GS}_{cr} - GD_{cr}/\boldsymbol{GCP}_{cr}$for rural areas (r=e or r=w)

$CFS_{cr} = \boldsymbol{GS}_{cr} - GD_{cr}/\boldsymbol{GCP}_{cr} + \boldsymbol{SS}_{c}$for urban areas (r=u)

where:$\boldsymbol{SS}_c$ = security stock (policy)

Internal Government Balance:

A.22: Internal Trade Balances:

$ITB_c = WP_c.XR.[\boldsymbol{EX}_c\text{-}\boldsymbol{IM}_c] - LC.[\boldsymbol{EX}_c+\boldsymbol{IM}_c] - GI.\boldsymbol{GPP}_c$

A.23: Internal Fertilizer Balance:

$IFB = \Sigma\Sigma F_{cg}.\boldsymbol{fp} - \Sigma TF_g*[\ WFP.XR + LC\ ]$
$_{c\ g}\qquad _{g}$

B.14: Other Internal Balance

$OIB = 0.02 * \Sigma_g I_g.NH_g\ -\ 165$

A.24: Income Tax:

$IT = 0.15 *\Sigma_g I_g.NH_g$

A.25: Wage Bill:

$WB = 0.25 *\Sigma_g wm_g.\boldsymbol{GW}.NH_g$

A.26: Internal Interest:

$IIT = IR.CGB$

A.27: Internal Government Balance:

$GB = \Sigma ITB_c + IFB + OIB + IT - WB + IIT$

A.28: Cumulative Government Balance:

$CGB = CGB(-1) + GB$

External Balance of Payments:

A.29: External Trade Balances:

$ETB_c = WP_c.[\boldsymbol{EX}_c\text{-}\boldsymbol{IM}_c]$

A.30: External Fertilizer Balance:

$$EFB = - \sum_g TF_g.WFP$$

B.15: Other External Balance

$OEB = [0.02 * (POP_{uh}+POP_{um}+POP_{ul}) - 300] / XR$

A.31: External Interest:

$EIT = IR.CBP$

A.32: External Balance of Payments:

$BP = \sum ETB_c + EFB + OEB + EIT$

A.33: Cumulative Balance of Payments:

$CBP = CBP(-1) + BP$

Nutrition:

A.34: Energy Gain from Commodities:

$$EG_{cg} = \frac{cal_c.E_{cg}}{CP_{cr}} * \frac{1000}{365}$$

where:cal_c = calories per kilogram for commodity c

A.35: Expenditure on Other Commodities (not in the model)

$$EO_g = I_g - \sum_c E_{cg}$$

A.36: Total Energy Intake:

$ENG_g = \sum_c EG_{cg} + EO_g$

B16: Mean Weight for Height:

$MWH_g = 100 - 0.00375.(2200-ENG_g) - 0.00000313.(2200-ENG_g)^2$ if $ENG_g<2200$
$MWH_g = 100$ otherwise

B17: Mean Height for Age:

$MHA_g = 98 - 0.004.(2200-ENG_g) - 0.000005.(2200-ENG_g)^2$ if $ENG_g<2200$
$MHA_g = 100$ otherwise

B.18: St. Deviation Weight for Height:

$SWH_g = 9 + 0.3.Ln(2201-ENG_g)$ if $ENG_g<2200$
$SWH_g = 9$ otherwise

B19: St. Deviation Height for Age:

$SHA_g = 5 + 0.5.Ln(2201-ENG_g)$ if $ENG_g<2200$
$SHA_g = 5$ otherwise

A.37: Weight for Height (exponential smoothing):

$WH_g = 0.4.MWH_g + 0.6.WH_g(-1)$

A.38: Height for Age (exponential smoothing);

$HA_g = 0.6.MHA_g + 0.4.HA_g(-1)$

B.20: Wasting:

$WST_g = 0.6*F[(80-MWH_g)/SWH_g] + 0.4*WST_g(-1)$

where F[x] is the area under the standard normal distribution below x

B.21: Stunting:

$STN_g = 0.6*F[(90-MHA_g)/SHA_g] + 0.4*STN_g(-1)$

APPENDIX C: MODIFYING THE PARAMETERS

1 The Parameter File (PARMFILE.TXT):

The model parameter values are held in a file called PARMFILE.TXT, whose contents are as follows:

```
_____________________________________________________________
Production Function constant term:
                        maize    cassava    cotton
eastern small           0.059    12.083     0.016
western large           0.078     0.001     0.088
western small           0.067    16.585     0.092

Technical coefficients for Rainfall:
                        maize     cassava    cotton
eastern small           0.75      0.25      0.70
western large           0.60      0.25      0.55
western small           0.75      0.25      0.70

Technical coefficients for Area Planted:
                        maize     cassava    cotton
eastern small           0.514     0.429     0.514
western large           0.274     0.274     0.274
western small           0.343     0.343     0.343

Technical coefficients for Use of Fertilizer:
                        maize     cassava    cotton
eastern small           0.236     0.171     0.200
western large           0.476     0.392     0.503
western small           0.407     0.257     0.371

Constant coefficients for Use of Fertilizer:
                        maize    cassava    cotton
eastern small           1.0       1.0       1.0
western large           1.0       1.0       1.0
western small           1.0       1.0       1.0

Rainfall and Area Price:
                        Rainfall  Area Price
eastern small            525.0    0.120
western large            900.0    0.120
western small            900.0    0.120

Parameters for sales to Government and Traders (Maize):
                        Normal Share   Elasticity
eastern small             0.250          1.250
western large             0.990          0.250
western small             0.250          1.350
```

Parameters for migration and population changes:

	Population growth rate	Migration speed	Household Size
eastern non ag.	0.034	0.04	5.0
eastern small	0.032	0.04	5.0
western large	0.005	0.00	4.0
western small	0.036	0.06	5.0
western non ag.	0.034	0.06	5.0
urban rich	0.005	0.00	3.0
urban mid. income	0.010	0.00	4.5
urban poor	0.030	0.00	5.5

Rate of Stock Loss 0.10

PARAMETERS FOR STAGE2

WAGE_MULT

EAST_NON_AGRI	0.00053
EAST_SMALL	0.00038
WEST_LARGE	0.00000
WEST_SMALL	0.00042
WEST_NON_AGRI	0.00057
URBAN_RICH	0.00320
URBAN_MID	0.00155
URBAN_POOR	0.00081

PROPORTION OF TRADER INCOME

EAST_NON_AGRI	0.05
EAST_SMALL	0.28
WEST_LARGE	0.00
WEST_SMALL	0.48
WEST_NON_AGRI	0.06
URBAN_RICH	0.03
URBAN_MID	0.04
URBAN_POOR	0.06

SUBSTITUTION ELASTICITY

EAST_NON_AGRI	1.50
EAST_SMALL	1.50
WEST_LARGE	0.25
WEST_SMALL	1.50
WEST_NON_AGRI	1.50
URBAN_RICH	0.25
URBAN_MID	0.50
URBAN_POOR	1.00

INCOME ELASTICITY

	MAIZE	COTTON	CASSAVA
EAST_NON_AGRI	0.20	0	0.10
EAST_SMALL	0.15	0	0.05
WEST_LARGE	-0.05	0	-0.15
WEST_SMALL	0.15	0	0.05
WEST_NON_AGRI	0.20	0	0.10
URBAN_RICH	-0.10	0	-0.15
URBAN_MID	-0.05	0	-0.10
URBAN_POOR	0.10	0	0.05

BUYING SHARE (EQUAL PRICES)

EAST_NON_AGRI	0.300
EAST_SMALL	0.300
WEST_LARGE	0.700
WEST_SMALL	0.300
WEST_NON_AGRI	0.300
URBAN_RICH	0.900
URBAN_MID	0.700
URBAN_POOR	0.500

BUYING ELASTICITY

EAST_NON_AGRI	1.500
EAST_SMALL	1.500
WEST_LARGE	1.500
WEST_SMALL	1.500
WEST_NON_AGRI	1.500
URBAN_RICH	1.500
URBAN_MID	1.500
URBAN_POOR	1.500

Trader Markup:	Maize	Cassava	Cotton
	1.50	1.50	1.50

```
Survey prices and delays              Price              delay
Agriculture production survey         175000               2
Income and expenditure survey         150000               2
Consumer price survey                  25000               0
Nutrition survey                       40000               1
Meteorological survey                  10000               0
Rapid assessment                       30000               0
Population census                     200000               3
Records of government policy               0               0
Government budget                      15000               0
Balance of payment                     10000               0
World prices and exchange rates         5000               0
Cotton board records                   10000               0
NFMB records                           20000               0

Initial statistics budget             995000

Crop Calorie Values
3600  maize
1490  cassava
   0  cotton
```

---

2 Editing the Files

The parameter values can be altered by simply editing PARMFILE.TXT, and replacing the existing values with any value which you may think is more appropriate. However, it pays to be cautious when doing this. In particular, note these points:

1)Make sure that the new values are in the same position as the old values, and preserve all of the blank lines.

2)Make sure that you keep a copy of the original file so that you can go back to it if you need to.

3)Make sure that you understand the effect of each parameter in the model, by studying the equations in Appendix B.

4)The model is very sensitive to the values of some of these parameters, particularly those which are used in the production function. Apparently small changes may well cause the model to behave in very strange ways.

3 Using the MESSAGES Program to Alter or Translate the Screen Messages

The MESSAGES program is on the supplementary HARAMBEE diskette supplied with the system. To run the program place the supplementary diskette in the a: floppy disk drive and type

a:MESSAGES and then press the ENTER key.

You will be asked the following question:

```
WHICH DISK DRIVE CONTAINS THE HARAMBEE PROGRAMS (B/C/D...) ? :
```

Enter the drive where the program is located, this will be B for a twin floppy drive computer and C (or D etc) for a computer with a hard disk drive. If you are using a twin floppy machine, you will then be prompted to put the Harambee program disk in drive b:.

The screen will appear as follows:

```
ENTER MESSAGE NUMBER (Pressing ENTER gives you number   1) :
```

Type in the number of the message which you wish to change and press ENTER. A full list of the messages used by HARAMBEE is given below. The screen will now appear as follows (the example given is message number 1):

```
MESSAGE NUMBER   1

ENTER THE HEADING AND HELP MESSAGE BELOW:
Press Esc to exit the program

    MENU HEADING |RUN GAME                          |
Max 34 characters|
```

The program is displaying the contents of the first heading, which is "RUN GAME". In fact, this is the heading in the first menu on the top left of the screen. Underneath is a colon. You can now type in any alternative heading, and press the Enter key. If you do not wish to change anything, simply press ENTER without typing anything. After you have done this, you will be asked to change the help message appearing at the bottom of the screen and corresponding to this heading:

```
MESSAGE NUMBER   1

ENTER THE HEADING AND HELP MESSAGE BELOW:
Press Esc to exit the program

    MENU HEADING |RUN GAME                          |
Max 34 characters|
    HELP MESSAGE |Pressing ENTER runs the model for the current year                    |
Max 60 characters|
```

The program is now displaying the help message at the bottom of the screen when the cursor is positioned in the RUN GAME box. You can now type in an alternative message and press the ENTER key. You will then be prompted for another message number (in this case number 2,

which is STATISTICS), and so on until you have gone through all of the messages in the file. If you want to stop at any time, simply press the Esc key, and the program will stop.

The messages used by the HARAMBEE program are listed below.

4 A List of the Messages used by HARAMBEE

```
MESSAGE NUMBER   1
    MENU HEADING |RUN GAME|
    HELP MESSAGE |Pressing ENTER runs the model for the current year|

MESSAGE NUMBER   2
    MENU HEADING |STATISTICS|
    HELP MESSAGE |Pressing ENTER allows you to select or view statistics|

MESSAGE NUMBER   3
    MENU HEADING |FILES|
    HELP MESSAGE |Pressing ENTER allows you to save or load a game|

MESSAGE NUMBER   4
    MENU HEADING |QUIT|
    HELP MESSAGE |Pressing ENTER ends the game and returns to the MSDOS prompt|

MESSAGE NUMBER   5
    MENU HEADING |PRODUCTION|
    HELP MESSAGE |Play the first stage of the game (production decisions)|

MESSAGE NUMBER   6
    MENU HEADING |SELECT|
    HELP MESSAGE |Select the statistics to be collected|

MESSAGE NUMBER   7
    MENU HEADING |SAVE GAME|
    HELP MESSAGE |Save the current game to a disk file|

MESSAGE NUMBER   8
    MENU HEADING | |
    HELP MESSAGE |The number is invalid please retype|

MESSAGE NUMBER   9
    MENU HEADING |CONSUMPTION|
    HELP MESSAGE |Play the second stage of the game (consumption decisions)|

MESSAGE NUMBER  10
    MENU HEADING |INSPECT|
    HELP MESSAGE |Inspect the statistical results|

MESSAGE NUMBER  11
    MENU HEADING |LOAD GAME|
    HELP MESSAGE |Load an old game from a disk file|

MESSAGE NUMBER  12
    MENU HEADING | |
    HELP MESSAGE |The available post harvest stock has been exceeded|
```

```
MESSAGE NUMBER  13
    MENU HEADING |- LOADING PROGRAM -|
    HELP MESSAGE |The food policy simulation game|

MESSAGE NUMBER  14
    MENU HEADING |NEW TABLES|
    HELP MESSAGE |View or print all of the tables with new data in them|

MESSAGE NUMBER  15
    MENU HEADING | |
    HELP MESSAGE |A program written by:|

MESSAGE NUMBER  16
    MENU HEADING ||
    HELP MESSAGE |Use 'STATISTICS' to look at the production stage results|

MESSAGE NUMBER  17
    MENU HEADING |SELECT POLICIES|
    HELP MESSAGE |Enter the production policies|

MESSAGE NUMBER  18
    MENU HEADING |SURVEYS|
    HELP MESSAGE |Select from a list of statistical surveys|

MESSAGE NUMBER  19
    MENU HEADING |NAME OF GAME|
    HELP MESSAGE |Enter a name for the game|

MESSAGE NUMBER  20
    MENU HEADING |Harambee Simulation Exercise|
    HELP MESSAGE ||

MESSAGE NUMBER  21
    MENU HEADING |SELECT POLICIES|
    HELP MESSAGE |Enter the income and consumption policies|

MESSAGE NUMBER  22
    MENU HEADING |AVAILABLE STATISTICS|
    HELP MESSAGE |"NEW" indicates that there is some new data in this table|

MESSAGE NUMBER  23
    MENU HEADING |SELECT GAME|
    HELP MESSAGE |Pressing "ENTER" selects the game|

MESSAGE NUMBER  24
    MENU HEADING | |
    HELP MESSAGE |Press any key to continue|

MESSAGE NUMBER  25
    MENU HEADING |Statistical Handbook|
    HELP MESSAGE ||
```

```
MESSAGE NUMBER  26
    MENU HEADING |VIEW|
    HELP MESSAGE |View on screen the tables with new data in them|

MESSAGE NUMBER  27
    MENU HEADING |Page|
    HELP MESSAGE ||

MESSAGE NUMBER  28
    MENU HEADING ||
    HELP MESSAGE |Use 'STATISTICS' to look at all of the statistical tables|

MESSAGE NUMBER  29
    MENU HEADING |RUN MODEL|
    HELP MESSAGE |Run the first stage of the model (production)|

MESSAGE NUMBER  30
    MENU HEADING |ADMINISTRATIVE|
    HELP MESSAGE |Select from a list of administrative records|

MESSAGE NUMBER  33
    MENU HEADING |RUN MODEL|
    HELP MESSAGE |Run the second stage of the model (consumption)|

MESSAGE NUMBER  34
    MENU HEADING |PRINT STATISTICS|
    HELP MESSAGE |Print out the new statistical tables on the printer|

MESSAGE NUMBER  35
    MENU HEADING |PRICE|
    HELP MESSAGE ||

MESSAGE NUMBER  36
    MENU HEADING |YES|
    HELP MESSAGE ||

MESSAGE NUMBER  37
    MENU HEADING |RES|
    HELP MESSAGE |                        |

MESSAGE NUMBER  38
    MENU HEADING |PRINT|
    HELP MESSAGE |Print out the tables with new data in them|

MESSAGE NUMBER  39
    MENU HEADING |NOT READY|
    HELP MESSAGE |Press Esc to continue|

MESSAGE NUMBER  40
    MENU HEADING ||
    HELP MESSAGE |Use 'STATISTICS' to select surveys for the next 5 years|
```

```
MESSAGE NUMBER  41
    MENU HEADING |NEW|
    HELP MESSAGE ||

MESSAGE NUMBER  42
    MENU HEADING |OLD|
    HELP MESSAGE ||

MESSAGE NUMBER  43
    MENU HEADING |NO GRAPH|
    HELP MESSAGE |There is no graph with this table.                          |

MESSAGE NUMBER  52
    MENU HEADING ||
    HELP MESSAGE |Use 'RUN GAME' to specify consumption policies for the game|

MESSAGE NUMBER  53
    MENU HEADING |PRODUCTION POLICIES|
    HELP MESSAGE ||

MESSAGE NUMBER  54
    MENU HEADING |SURVEYS|
    HELP MESSAGE ||

MESSAGE NUMBER  55
    MENU HEADING |SAVING:|
    HELP MESSAGE |Saving the game to disk|

MESSAGE NUMBER  57
    MENU HEADING |CONSUMPTION POLICIES|
    HELP MESSAGE ||

MESSAGE NUMBER  58
    MENU HEADING |VIEW TABLE|
    HELP MESSAGE |View the table on the screen|

MESSAGE NUMBER  59
    MENU HEADING |NO GAMES|
    HELP MESSAGE |No old games were found|

MESSAGE NUMBER  60
    MENU HEADING | |
    HELP MESSAGE |Enter the policies - Pressing ESC returns to previous menu|

MESSAGE NUMBER  64
    MENU HEADING ||
    HELP MESSAGE |Enter the policy values.  Esc returns to previous menu|

MESSAGE NUMBER  65
    MENU HEADING |RUNNING|
    HELP MESSAGE |Running the model|
```

```
MESSAGE NUMBER  66
    MENU HEADING |RECORD OF POLICIES|
    HELP MESSAGE |Records of past policies|

MESSAGE NUMBER  69
    MENU HEADING |RUNNING|
    HELP MESSAGE |Running the model|

MESSAGE NUMBER  70
    MENU HEADING |NOT READY|
    HELP MESSAGE |Press Esc to continue|

MESSAGE NUMBER  76
    MENU HEADING | |
    HELP MESSAGE |Use 'RUN GAME' to specify production policies for the game|

MESSAGE NUMBER  88
    MENU HEADING ||
    HELP MESSAGE |Use 'RUN MODEL' to run the consumption stage of the game|

MESSAGE NUMBER  89
    MENU HEADING |FERTILIZERS EAST: SMALL FARMERS |
    HELP MESSAGE |Fertilizer allocation by government|

MESSAGE NUMBER  90
    MENU HEADING |AGRICULTURAL SURVEY    |
    HELP MESSAGE |Survey of areas, inputs, production and sales|

MESSAGE NUMBER  93
    MENU HEADING |GOVERNMENT MINIMUM WAGE         |
    HELP MESSAGE |Minimum annual wage paid to government workers|

MESSAGE NUMBER  94
    MENU HEADING |PRINT TABLE|
    HELP MESSAGE |Print the table on a printer|

MESSAGE NUMBER  95
    MENU HEADING |LOADING:|
    HELP MESSAGE |Loading the game|

MESSAGE NUMBER  99
    MENU HEADING |ERROR|
    HELP MESSAGE |Select policies before running the stage|

MESSAGE NUMBER 100
    MENU HEADING ||
    HELP MESSAGE |Enter selects, Del deselects, Esc returns to previous menu|

MESSAGE NUMBER 101
    MENU HEADING ||
    HELP MESSAGE |Enter selects, Del deselects, Esc returns to previous menu|
```

```
MESSAGE NUMBER 102
    MENU HEADING |RECORD OF POLICIES|
    HELP MESSAGE |Record of past policies|

MESSAGE NUMBER 103
    MENU HEADING | |
    HELP MESSAGE |Run the production stage before the consumption stage|

MESSAGE NUMBER 104
    MENU HEADING |ERROR|
    HELP MESSAGE |Select policies before running the stage|

MESSAGE NUMBER 105
    MENU HEADING | |
    HELP MESSAGE |Run the production stage before the consumption stage|

MESSAGE NUMBER 108
    MENU HEADING | |
    HELP MESSAGE |Run the production stage before the consumption stage|

MESSAGE NUMBER 112
    MENU HEADING | |
    HELP MESSAGE |Use 'RUN MODEL' to run the production stage of the game|

MESSAGE NUMBER 124
    MENU HEADING ||
    HELP MESSAGE |Use 'STATISTICS' to look at the consumption stage results|

MESSAGE NUMBER 125
    MENU HEADING |FERTILIZERS WEST: LARGE FARMERS |
    HELP MESSAGE |Fertilizer allocation by government|

MESSAGE NUMBER 126
    MENU HEADING |HOUSEHOLD INCOME SURVEY|
    HELP MESSAGE |Survey of household income and expenditure|

MESSAGE NUMBER 129
    MENU HEADING |GOVERNMENT MAIZE SALES, EAST    |
    HELP MESSAGE |Allocate part of the quantity indicated in "SECURITY STOCKS"|

MESSAGE NUMBER 130
    MENU HEADING |VIEW GRAPH|
    HELP MESSAGE |View a graph of the statistics|

MESSAGE NUMBER 136
    MENU HEADING ||
    HELP MESSAGE |ENTER selects the menu, Esc returns to the previous menu|

MESSAGE NUMBER 138
    MENU HEADING |GOVERNMENT BUDGET      |
    HELP MESSAGE |Internal government surplus or deficit|
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MESSAGE NUMBER 161
    MENU HEADING |FERTILIZERS WEST: SMALL FARMERS |
    HELP MESSAGE |Fertilizer allocation by government|

MESSAGE NUMBER 162
    MENU HEADING |CONSUMER PRICE SURVEY  |
    HELP MESSAGE |Survey of prices on the private market|

MESSAGE NUMBER 165
    MENU HEADING |GOVERNMENT MAIZE SALES, WEST    |
    HELP MESSAGE |Allocate part of the quantity indicated in "SECURITY STOCKS"|

MESSAGE NUMBER 166
    MENU HEADING |PRINTING|
    HELP MESSAGE ||

MESSAGE NUMBER 174
    MENU HEADING |BALANCE OF PAYMENT     |
    HELP MESSAGE |Foreign exchange surplus or deficit report|

MESSAGE NUMBER 197
    MENU HEADING |OFFICIAL PRODUCER PRICE: MAIZE  |
    HELP MESSAGE |Maize price paid to farmers by the government|

MESSAGE NUMBER 198
    MENU HEADING |NUTRITION SURVEY       |
    HELP MESSAGE |Survey of percentage stunting and wasting|

MESSAGE NUMBER 201
    MENU HEADING |GOVERNMENT MAIZE SALES, URBAN   |
    HELP MESSAGE |Allocate part of the quantity indicated in "SECURITY STOCKS"|

MESSAGE NUMBER 202
    MENU HEADING |NO PRINTER|
    HELP MESSAGE |Turn the printer on|

MESSAGE NUMBER 210
    MENU HEADING |WORLD PRICES & EXCHANGE|
    HELP MESSAGE |Report of world prices, exchange rate, and landing costs|

MESSAGE NUMBER 233
    MENU HEADING |OFFICIAL PRODUCER PRICE: COTTON |
    HELP MESSAGE |Cotton price paid to farmers by the government|

MESSAGE NUMBER 234
    MENU HEADING |METEOROLOGICAL REPORT|
    HELP MESSAGE |Rainfall records|

MESSAGE NUMBER 237
    MENU HEADING |GOVERNMENT MAIZE PRICE, EAST    |
    HELP MESSAGE |Maize price paid by consumers to the government|
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MESSAGE NUMBER 246
    MENU HEADING |COTTON BOARD RECORDS  |
    HELP MESSAGE |Purchases, sales and exports of cotton|

MESSAGE NUMBER 269
    MENU HEADING |OFFICIAL SALES PRICE: FERTILIZERS|
    HELP MESSAGE |Price paid by farmers to the government for fertilizer|

MESSAGE NUMBER 270
    MENU HEADING |RAPID ASSESSMENT|
    HELP MESSAGE |Early warning estimates of crop production|

MESSAGE NUMBER 273
    MENU HEADING |GOVERNMENT MAIZE PRICE, WEST    |
    HELP MESSAGE |Maize price paid by consumers to the government|

MESSAGE NUMBER 282
    MENU HEADING |NFMB RECORDS          |
    HELP MESSAGE |Records of the National Food Marketing Board|

MESSAGE NUMBER 305
    MENU HEADING |TOTAL IMPORTS: MAIZE            |
    HELP MESSAGE |Imports of Maize|

MESSAGE NUMBER 306
    MENU HEADING |POPULATION CENSUS     |
    HELP MESSAGE |Numbers of people in each population group|

MESSAGE NUMBER 309
    MENU HEADING |GOVERNMENT MAIZE PRICE, URBAN   |
    HELP MESSAGE |Maize price paid by consumers to the government|

MESSAGE NUMBER 318
    MENU HEADING |BUDGET|
    HELP MESSAGE ||

MESSAGE NUMBER 341
    MENU HEADING |TOTAL IMPORTS: FERTILIZER       |
    HELP MESSAGE ||

MESSAGE NUMBER 342
    MENU HEADING |BUDGET|
    HELP MESSAGE ||

MESSAGE NUMBER 345
    MENU HEADING |MAIZE EXPORTS                   |
    HELP MESSAGE |Exports of Maize|

MESSAGE NUMBER 346
    MENU HEADING |east non agricultural|
    HELP MESSAGE ||
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MESSAGE NUMBER 347
    MENU HEADING |east small farms|
    HELP MESSAGE ||

MESSAGE NUMBER 348
    MENU HEADING |west large farms|
    HELP MESSAGE ||

MESSAGE NUMBER 349
    MENU HEADING |west small farms|
    HELP MESSAGE ||

MESSAGE NUMBER 350
    MENU HEADING |west non agricultural|
    HELP MESSAGE ||

MESSAGE NUMBER 351
    MENU HEADING |urban rich|
    HELP MESSAGE ||

MESSAGE NUMBER 352
    MENU HEADING |urban mid|
    HELP MESSAGE ||

MESSAGE NUMBER 353
    MENU HEADING |urban poor|
    HELP MESSAGE ||

MESSAGE NUMBER 354
    MENU HEADING |east|
    HELP MESSAGE ||

MESSAGE NUMBER 355
    MENU HEADING |west|
    HELP MESSAGE ||

MESSAGE NUMBER 356
    MENU HEADING |urban|
    HELP MESSAGE ||

MESSAGE NUMBER 357
    MENU HEADING |maize|
    HELP MESSAGE ||

MESSAGE NUMBER 358
    MENU HEADING |cassava|
    HELP MESSAGE ||

MESSAGE NUMBER 359
    MENU HEADING |cotton|
    HELP MESSAGE ||
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MESSAGE NUMBER 360
    MENU HEADING |production|
    HELP MESSAGE ||

MESSAGE NUMBER 361
    MENU HEADING |sales|
    HELP MESSAGE ||

MESSAGE NUMBER 362
    MENU HEADING |purchases|
    HELP MESSAGE ||

MESSAGE NUMBER 363
    MENU HEADING |stocks|
    HELP MESSAGE ||

MESSAGE NUMBER 364
    MENU HEADING |government balance|
    HELP MESSAGE ||

MESSAGE NUMBER 365
    MENU HEADING |cum. government balance|
    HELP MESSAGE ||

MESSAGE NUMBER 366
    MENU HEADING |current account|
    HELP MESSAGE ||

MESSAGE NUMBER 367
    MENU HEADING |cum. deficit/surplus|
    HELP MESSAGE ||

MESSAGE NUMBER 368
    MENU HEADING |world price|
    HELP MESSAGE ||

MESSAGE NUMBER 369
    MENU HEADING |fertilizer|
    HELP MESSAGE ||

MESSAGE NUMBER 381
    MENU HEADING |SECURITY STOCKS                |
    HELP MESSAGE ||
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