

Soil Mapping and Advisory Services
Botswana

LABORATORY DATA BASE SYSTEM

USER MANUAL



FOOD & AGRICULTURE
ORGANIZATION OF THE
UNITED NATIONS



UNITED NATIONS
DEVELOPMENT
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LABORATORY DATABASE SYSTEM

USER MANUAL

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1. INTRODUCTION

The system starts with the registration of new samples. As soon as samples are received, their identification must be entered in the computer. The system assigns labnumbers starting with number 1 at the beginning of each year. The year of reception forms part of the labnumber.

Results of analysis are grouped by the type of analysis and the batchnumber for that type of analysis. Results are only accepted by the system if the labnumbers have previously been assigned by the system.

For each sample (labnumber), only 1 result per type of analysis is finally compiled. However per determination the results of all batches are registered. In this way it is possible to choose the best result among repeats for compilation. Once analytical results have been approved, they can be marked as final. The data then can no longer be changed by repeats. It is important to mark data as final in order to protect them from being changed accidentally.

Finally there is accommodation for the exchange of data with related systems :

- AAS
- Old database on diskettes (HP-computer)
- Botswana Soil Database

The labdata system consists thus of 7 functions :

- 1 Entry of results of analysis
- 2 Input/change/deletion of sample identifications
- 3 Print functions (also used for transfer of data by diskette)
- 4 Import functions
- 5 Data manipulation functions
- 6 Renewal of indexes on the database files
- 7 A subsystem for store management

When the user exits the system, he is asked if he wishes to make a backup. By typing "Y", a DOS backup of all the database files (extension .DBF) will be made. It is advisable to make a backup each time data have been added or modified. A number of historic backups should also be kept in a safe place, for example 1 for every of 4 preceding months.

2. INSTALLATION OF THE SYSTEM

In order to operate the laboratory database system you need an IBM compatible microcomputer with 640 kb internal memory and preferably a hard-disk.

On the system diskette you will find programs + database files as well as a batch file to start the system.

If you wish to use this batch file, you must have the DBASE III⁺ system in a directory C:\DBASE. You must create a subdirectory SOILLAB of the DBASE directory:

```
type :      cd dbase <enter>
          md soillab <enter>
          cd\ <enter>
```

put the system diskette into the disk drive a:

```
and type : copy a:\soillab\*. * dbase\soillab <enter>
```

This command transfers all the necessary files into the SOILLAB directory.

In order to start up the system, you need a batch file. You can copy the batch file from the diskette by typing :

```
copy a:ldb.bat <enter>
```

This places the batch file in the root directory.

The system can now be started by typing : `ldb <enter>`.

After the Dbase copyright screen, the main menu will appear on the screen. The first time you use the system, it is necessary to select function 8 : Renewal of indexes. This is necessary to create the indexes for the databases (they are **not** on the installation diskette). Once all the index files have been created, the system is operational.

The next time that you start the laboratory database, it will not be necessary to renew indexes. Renewal of indexes will never do harm to the system, it is a time consuming procedure however.

3. ENTRY OF RESULTS OF ANALYSIS

3.1 Input of pH water and pH calcium chloride

1. The system shows the batchnumber and date it is going to assign. It is advisable to leave the current date.
2. The system shows the last set of labnumbers for which results have been submitted. You can use these if you have analyzed exactly the same samples, otherwise you have to enter new labnumbers.
3. If you enter new labnumbers, do not forget to enter the correct year of reception.
4. The system asks if the labnumbers are sequential. If you enter yes, a first and a last number are asked. All numbers in this range appear on the screen. Those of these numbers that have not been analyzed can be removed by entering 0 as correction for the number. Otherwise separate labnumbers can be entered one by one.
5. If the screen is full or the rest of the samples analyzed are from a different year of reception, reply "Y" when the system asks if there are more samples to be entered. Make sure that all the samples analyzed in one batch are entered in the computer as one batch and in the same order as on the result sheet (to avoid errors).
6. If the standard sample has been analyzed, as is normal practice, the result should be entered. The value of the standard sample is recorded for eventual statistical analysis or fault finding.
If so wished, threshold values for the standard sample can be incorporated into the program in order to automatically reject batches with an unusual result for the standard sample.
7. The pH values measured for the samples are asked by the system in the order in which the batch has been defined (see 5.).
8. At the end of the batch or if the screen is full, the system asks if there are any corrections to be made. At this point the results displayed on the screen should be checked against the result sheet.
9. If there are any errors, enter the sequential number behind which the labnumber + result are displayed. This result is then presented for correction. Corrections can be applied until one is satisfied with all the results.
10. Enter 0 for the sequential number to stop correcting.
11. The system asks if the results have to be printed. Answer yes unless you do not want to store the results. The print is stapled to the result sheet and filed for backup purposes.
12. The system asks if the results can be stored.
The answer should be no if :
 - the analyses have not been carried out according to the routine procedure

- one or more of the sample numbers is wrong
- one or more of the results is wrong

13. Else answer yes.

The whole batch is added to the determination file. Subsequently each result in the batch is filled in the compiled data for that sample if there was not yet a result for pH.

If there was already a result, the system will ask if that result has to be replaced by the new result.

In general the answer to that question should be NO.

If an analysis has been repeated, the soil chemist will decide which result to accept in the compiled data.

14. If any of the compiled data was already marked final, the system can no longer replace the results with new repeats. The number of such cases is reported on the screen.

3. ENTRY OF RESULTS OF ANALYSIS

3.2 Entry of electrical conductivity

1. The system shows the batchnumber and date it is going to assign. It is advisable to leave the current date.
2. The system shows the last set of labnumbers for which results have been submitted. You can use these if you have analyzed exactly the same samples, otherwise you have to enter new labnumbers.
3. If you enter new labnumbers, do not forget to enter the correct year of reception.
4. The system asks if the labnumbers are sequential. If you enter yes, a first and a last number are asked. All numbers in this range appear on the screen. Those of these numbers that have not been analyzed can be removed by entering 0 as correction for the number. Otherwise separate labnumbers can be entered one by one.
5. If the screen is full or the rest of the samples analyzed are from a different year of reception, reply "Y" when the system asks if there are more samples to be entered. Make sure that all the samples analyzed in one batch are entered in the computer as one batch and in the same order as on the result sheet (to avoid errors).
6. When the complete batch has been defined for the computer, the system asks for some variables :
 - temperature during measurement
 - the extract in which EC was measured
 - in which unit the measured EC is expressed. This is normally milliSiemens per centimeter (mS/cm).
7. If the standard sample has been analyzed, as is normal practice, the result should be entered. The value of the standard sample is recorded for eventual statistical analysis or fault finding.

If so wished, threshold values for the standard sample can be incorporated into the program in order to automatically reject batches with an unusual result for the standard sample.
8. The EC values measured for the samples are asked by the system in the order in which the batch has been defined (see 5.).
9. At the end of the batch or if the screen is full, the system asks if there are any corrections to be made. At this point the results displayed on the screen should be checked against the result sheet.
10. If there are any errors, enter the sequential number behind which the labnumber + result are displayed. This result is then presented for correction. Corrections can be applied until one is satisfied with all the results.
11. Enter 0 for the sequential number to stop correcting.
12. The system asks if the results have to be printed. Answer yes unless you do not want to store the results. The

print is stapled to the result sheet and filed for backup purposes.

13. The system asks if the results can be stored.

The answer should be no if :

- the analyses have not been carried out according to the routine procedure
- one or more of the sample numbers is wrong
- one or more of the results is wrong

14. Else answer yes.

The whole batch is added to the determination file. Subsequently each result in the batch is filled in the compiled data for that sample if there was not yet a result for electrical conductivity.

If there was already a result, the system will ask if that result has to be replaced by the new result.

In general the answer to that question should be NO.

If an analysis has been repeated, the soil chemist will decide which result to accept in the compiled data.

15. If any of the compiled data was already marked final, the system can no longer replace the results with new repeats. The number of such cases is reported on the screen.

3. ENTRY OF RESULTS OF ANALYSIS

3.3 Entry of available phosphorus

1. The system shows the batchnumber and date it is going to assign. It is advisable to leave the current date.
2. The system shows the last set of labnumbers for which results have been submitted. You can use these if you have analyzed exactly the same samples, otherwise you have to enter new labnumbers.
3. If you enter new labnumbers, do not forget to enter the correct year of reception.
4. The system asks if the labnumbers are sequential. If you enter yes, a first and a last number are asked. All numbers in this range appear on the screen. Those of these numbers that have not been analyzed can be removed by entering 0 as correction for the number. Otherwise separate labnumbers can be entered one by one.
5. If the screen is full or the rest of the samples analyzed are from a different year of reception, reply "Y" when the system asks if there are more samples to be entered. Make sure that all the samples analyzed in one batch are entered in the computer as one batch and in the same order as on the result sheet (to avoid errors).
6. When the complete batch has been defined to the computer, the system asks for the method used :
 - for Olsens enter 0
 - for Bray-1 enter B
7. Subsequently the system asks to specify some variables :
 - grams of soil used
 - volume of extractant used
 - dilution of the extracts prior to the stage where extracts and standards get equal treatment
 - absorbance reading for the blank

The usual values for these variables can be accepted by pressing enter
8. The system asks if the values entered are spectrometer readings or concentrations. If the results are the output of the spectrophotometer (whether reading in absorbance or concentration mode), spectrophotometer readings should be chosen. The concentration option should only be used if the results were already calculated as a concentration in the soil.
- 8a. For spectrophotometer readings, the system asks for the standard samples used and their readings. After linear regression analysis, a correlation factor is given. The value of this factor should be higher than 0.9900 for a reasonable standard curve.

Subsequently a value is calculated for the slope of the standard curve
- 8b. When entering concentrations, it may be necessary to apply a factor, for example to convert ppm P_2O_5 into

- ppm P.
9. If the standard sample has been analyzed, as is normal practice, the result should be entered. The value of the standard sample is recorded for eventual statistical analysis or fault finding.
If so wished, threshold values for the standard sample can be incorporated into the program in order to automatically reject batches with an unusual result for the standard sample.
 10. The P values measured for the samples are asked by the system in the order in which the batch has been defined (see 5.).
 11. At the end of the batch or if the screen is full, the system asks if any of the samples had been diluted. The dilution factor should be entered at this point :
if instead of mixing 10 ml of extract with mixed reagent 5 ml is mixed, the dilution factor is 2.
if the sample is diluted an extra time with the dilutor (setting of dilutor is 1:15), the dilution factor is 15.
if the sample is diluted two extra times with the dilutor (setting of dilutor is 1:15), the dilution factor is 225.
 12. If there are any dilutions, enter the sequential number behind which the labnumber + result are displayed. The dilution factor for the sample can then be entered and the result is recalculated and shown on the screen.
 13. Enter 0 for the sequential number to quit dilutions.
 14. Subsequently the system asks if there are any corrections to be made. At this point the results displayed on the screen should be checked against the result sheet.
 15. If there are any errors, enter the sequential number behind which the labnumber + result are displayed. This result is then presented for correction. Corrections can be applied until one is satisfied with all the results.
 16. Enter 0 for the sequential number to stop correcting.
 17. The system asks if the results have to be printed. Answer yes unless you do not want to store the results. The print is stapled to the result sheet and filed for backup purposes.
 18. The system asks if the results can be stored.
The answer should be no if :
 - the analyses have not been carried out according to the routine procedure
 - one or more of the sample numbers is wrong
 - one or more of the results is wrong
 19. Else answer yes.
The whole batch is added to the determination file. Subsequently each result in the batch is filled in the compiled data for that sample if there was not yet a result for pH.
If there was already a result, the system will ask if that result has to be replaced by the new result.
In general the answer to that question should be NO.

- If an analysis has been repeated, the soil chemist will decide which result to accept in the compiled data.
20. If any of the compiled data was already marked final, the system can no longer replace the results with new repeats. The number of such cases is reported on the screen.

3. ENTRY OF RESULTS OF ANALYSIS

3.4 Entry of organic carbon

1. The system shows the batchnumber and date it is going to assign. It is advisable to leave the current date.
2. The system shows the last set of labnumbers for which results have been submitted. You can use these if you have analyzed exactly the same samples, otherwise you have to enter new labnumbers.
3. If you enter new labnumbers, do not forget to enter the correct year of reception.
4. The system asks if the labnumbers are sequential. If you enter yes, a first and a last number are asked. All numbers in this range appear on the screen. Those of these numbers that have not been analyzed can be removed by entering 0 as correction for the number. Otherwise separate labnumbers can be entered one by one.
5. If the screen is full or the rest of the samples analyzed are from a different year of reception, reply "Y" when the system asks if there are more samples to be entered. Make sure that all the samples analyzed in one batch are entered in the computer as one batch and in the same order as on the result sheet (to avoid errors).
6. Subsequently the system asks to specify some variables :
 - grams of soil used
 - volume of glucose standard used
 - absorbance reading for the blankThe usual values for these variables can be accepted by pressing enter
7. The system asks if the values entered are spectrometer readings or concentrations. If the results are the output of the spectrophotometer (whether reading in absorbance or concentration mode), spectrophotometer readings should be chosen. The concentration option should only be used if the results were already calculated as a concentration in the soil.
- 7a. For spectrophotometer readings, the system asks for the standard samples used and their readings. After linear regression analysis, a correlation factor is given. The value of this factor should be higher than 0.9900 for a reasonable standard curve. Subsequently a value is calculated for the slope of the standard curve
- 7b. When entering concentrations, it may be necessary to apply a factor, for example to convert % organic matter into % organic carbon.
8. If the standard sample has been analyzed, as is normal practice, the result should be entered. The value of the standard sample is recorded for eventual statistical analysis or fault finding. If so wished, threshold values for the standard sample

- can be incorporated into the program in order to automatically reject batches with an unusual result for the standard sample.
10. The OC values measured for the samples are asked by the system in the order in which the batch has been defined (see 5.).
 11. After the whole batch has been entered, or when the screen is full, the system asks if there are any corrections to be made.
At this point the results displayed on the screen should be checked against the result sheet.
 12. If there are any errors, enter the sequential number behind which the labnumber + result are displayed. This result is then presented for correction. Corrections can be applied until one is satisfied with all the results.
 13. Enter 0 for the sequential number to stop correcting.
 14. The system asks if the results have to be printed. Answer yes unless you do not want to store the results. The print is stapled to the result sheet and filed for backup purposes.
 15. The system asks if the results can be stored.
The answer should be no if :
 - the analyses have not been carried out according to the routine procedure
 - one or more of the sample numbers is wrong
 - one or more of the results is wrong
 16. Else answer yes.
The whole batch is added to the determination file. Subsequently each result in the batch is filled in the compiled data for that sample if there was not yet a result for organic carbon.
If there was already a result, the system will ask if that result has to be replaced by the new result.
In general the answer to that question should be NO.
If an analysis has been repeated, the soil chemist will decide which result to accept in the compiled data.
 17. If any of the compiled data was already marked final, the system can no longer replace the results with new repeats. The number of such cases is reported on the screen.

3. ENTRY OF RESULTS OF ANALYSIS

3.5 Entry of Cation Exchange Capacity

1. The system shows the batchnumber and date it is going to assign. It is advisable to leave the current date.
2. The system shows the last set of labnumbers for which results have been submitted. You can use these if you have analyzed exactly the same samples, otherwise you have to enter new labnumbers.
3. If you enter new labnumbers, do not forget to enter the correct year of reception.
4. The system asks if the labnumbers are sequential. If you enter yes, a first and a last number are asked. All numbers in this range appear on the screen. Those of these numbers that have not been analyzed can be removed by entering 0 as correction for the number. Otherwise separate labnumbers can be entered one by one.
5. If the screen is full or the rest of the samples analyzed are from a different year of reception, reply "Y" when the system asks if there are more samples to be entered. Make sure that all the samples analyzed in one batch are entered in the computer as one batch and in the same order as on the result sheet (to avoid errors).
6. Subsequently the system asks to specify some variables :
 - grams of soil used
 - volume of extractant used
 - aliquot titrated
 - titer of the acid used for titration
 - volume of titrant used for the blankThe usual values for these variables can be accepted by pressing enter
7. If the standard sample has been analyzed, as is normal practice, the result should be entered. The value of the standard sample is recorded for eventual statistical analysis or fault finding. If so wished, threshold values for the standard sample can be incorporated into the program in order to automatically reject batches with an unusual result for the standard sample.
8. The results of titration for the samples are asked by the system in the order in which the batch has been defined (see 5.).
9. At the end of the batch or if the screen is full, the system asks if there are any corrections to be made. At this point the results displayed on the screen should be checked against the result sheet.
10. If there are any errors, enter the sequential number behind which the labnumber + result are displayed. This result is then presented for correction. Corrections can be applied until one is satisfied with all the results.
11. Enter 0 for the sequential number to stop correcting.

12. The system asks if the results have to be printed. Answer yes unless you do not want to store the results. The print is stapled to the result sheet and filed for backup purposes.
13. The system asks if the results can be stored.
The answer should be no if :
 - the analyses have not been carried out according to the routine procedure
 - one or more of the sample numbers is wrong
 - one or more of the results is wrong
14. Else answer yes.
The whole batch is added to the determination file. Subsequently each result in the batch is filled in the compiled data for that sample if there was not yet a result for CEC.
If there was already a result, the system will ask if that result has to be overwritten by the new result. In general the answer to that question should be NO. If an analysis has been repeated, the soil chemist will decide which result to accept in the compiled data.
15. If any of the compiled data was already marked final, the system can no longer replace the results with new repeats. The number of such cases is reported on the screen.

3. ENTRY OF RESULTS OF ANALYSIS

3.6 Entry of Exchangeable Cations

1. The system asks for which of the cations data have to be entered.
2. The system shows the batchnumber and date it is going to assign. It is advisable to leave the current date.
3. The system shows the last set of labnumbers for which results have been submitted. You can use these if you have analyzed exactly the same samples, otherwise you have to enter new labnumbers.
4. If you enter new labnumbers, do not forget to enter the correct year of reception.
5. The system asks if the labnumbers are sequential. If you enter yes, a first and a last number are asked. All numbers in this range appear on the screen. Those of these numbers that have not been analyzed can be removed by entering 0 as correction for the number. Otherwise separate labnumbers can be entered one by one.
6. If the screen is full or the rest of the samples analyzed are from a different year of reception, reply "Y" when the system asks if there are more samples to be entered. Make sure that all the samples analyzed in one batch are entered in the computer as one batch and in the same order as on the result sheet (to avoid errors).
7. Subsequently the system asks to specify some variables :
 - grams of soil used
 - volume of extractant used
 - dilution of the extracts prior to the stage where extracts and standards get equal treatment
 - absorbance reading for the blankThe usual values for these variables can be accepted by pressing enter
8. The system asks if the values entered are spectrometer readings or concentrations. If the results are the output of the spectrophotometer (whether reading in absorbance or concentration mode), spectrophotometer readings should be chosen. The concentration option should only be used if the results were already calculated as a concentration in the soil.
- 8a. For spectrophotometer readings, the system asks for the standard samples used and their readings. After linear regression analysis, a correlation factor is given. The value of this factor should be higher than 0.9900 for a reasonable standard curve. Subsequently a value is calculated for the slope of the standard curve
- 8b. When entering concentrations, it may be necessary to apply a factor, for example to convert ppm into meq/100g of soil.

9. If the standard sample has been analyzed, as is normal practice, the result should be entered. The value of the standard sample is recorded for eventual statistical analysis or fault finding.
If so wished, threshold values for the standard sample can be incorporated into the program in order to automatically reject batches with an unusual result for the standard sample.
10. The values measured for the samples are asked by the system in the order in which the batch has been defined (see 5.). Even if the results of the AAS have been printed as concentrations, it is better to enter the absorbance values.
11. At the end of the batch or if the screen is full, the system asks if any of the samples had been diluted. The dilution factor should be entered at this point :
if the sample is diluted an extra time with the dilutor (setting of dilutor is 1:10), the dilution factor is 10.
if the sample is diluted two extra times with the dilutor (setting of dilutor is 1:10), the dilution factor is 100.
12. If there are any dilutions, enter the sequential number behind which the labnumber + result are displayed. The dilution factor for the sample can then be entered and the result is recalculated and shown on the screen.
13. Enter 0 for the sequential number to quit dilutions.
14. Subsequently the system asks if there are any corrections to be made. At this point the results displayed on the screen should be checked against the result sheet.
15. If there are any errors, enter the sequential number behind which the labnumber + result are displayed. This result is then presented for correction. Corrections can be applied until one is satisfied with all the results.
16. Enter 0 for the sequential number to stop correcting.
17. The system asks if the results have to be printed. Answer yes unless you do not want to store the results. The print is stapled to the result sheet and filed for backup purposes.
18. The system asks if the results can be stored.
The answer should be no if :
 - the analyses have not been carried out according to the routine procedure
 - one or more of the sample numbers is wrong
 - one or more of the results is wrong
19. Else answer yes.
The whole batch is added to the determination file. Subsequently each result in the batch is filled in the compiled data for that sample if there was not yet a result for this cation.
If there was already a result, the system will ask if that result has to be replaced by the new result. In general the answer to that question should be NO.
If an analysis has been repeated, the soil chemist will

decide which result to accept in the compiled data.
20. If any of the compiled data was already marked final, the system can no longer replace the results with new repeats. The number of such cases is reported on the screen.

3. ENTRY OF RESULTS OF ANALYSIS

3.7 Entry of Exchange Acidity

1. The system shows the batchnumber and date it is going to assign. It is advisable to leave the current date.
2. The system shows the last set of labnumbers for which results have been submitted. You can use these if you have analyzed exactly the same samples, otherwise you have to enter new labnumbers.
3. If you enter new labnumbers, do not forget to enter the correct year of reception.
4. The system asks if the labnumbers are sequential. If you enter yes, a first and a last number are asked. All numbers in this range appear on the screen. Those of these numbers that have not been analyzed can be removed by entering 0 as correction for the number. Otherwise separate labnumbers can be entered one by one.
5. If the screen is full or the rest of the samples analyzed are from a different year of reception, reply "Y" when the system asks if there are more samples to be entered. Make sure that all the samples analyzed in one batch are entered in the computer as one batch and in the same order as on the result sheet (to avoid errors).
6. Subsequently the system asks to specify some variables :
 - grams of soil used
 - volume of extractant used
 - aliquot titrated
 - titer of the hydroxide used for titration
 - volume of titrant used for the blankThe usual values for these variables can be accepted by pressing enter
7. If the standard sample has been analyzed, as is normal practice, the result should be entered. The value of the standard sample is recorded for eventual statistical analysis or fault finding.

If so wished, threshold values for the standard sample can be incorporated into the program in order to automatically reject batches with an unusual result for the standard sample.
8. The results of titration for the samples are asked by the system in the order in which the batch has been defined (see 5.).
9. At the end of the batch or if the screen is full, the system asks if there are any corrections to be made. At this point the results displayed on the screen should be checked against the result sheet.
10. If there are any errors, enter the sequential number behind which the labnumber + result are displayed. This result is then presented for correction. Corrections can be applied until one is satisfied with all the results.
11. Enter 0 for the sequential number to stop correcting.

12. The system asks if the results have to be printed. Answer yes unless you do not want to store the results. The print is stapled to the result sheet and filed for backup purposes.
13. The system asks if the results can be stored.
The answer should be no if :
 - the analyses have not been carried out according to the routine procedure
 - one or more of the sample numbers is wrong
 - one or more of the results is wrong
14. Else answer yes.
The whole batch is added to the determination file. Subsequently each result in the batch is filled in the compiled data for that sample if there was not yet a result for Exchange Acidity.
If there was already a result, the system will ask if that result has to be replaced by the new result.
In general the answer to that question should be NO.
If an analysis has been repeated, the soil chemist will decide which result to accept in the compiled data.
15. If any of the compiled data was already marked final, the system can no longer replace the results with new repeats. The number of such cases is reported on the screen.

3. ENTRY OF RESULTS OF ANALYSIS

3.8 Entry of Particle size data (hydrometer method)

1. The system asks if moisture contents have been determined.
2. If moisture contents have been determined, the entry program for this determination is called (see 3.10).
3. The system shows the batchnumber and date it is going to assign. It is advisable to leave the current date.
4. The system shows the last set of labnumbers for which results have been submitted. You can use these if you have analyzed exactly the same samples, otherwise you have to enter new labnumbers.
5. If you enter new labnumbers, do not forget to enter the correct year of reception.
6. The system asks if the labnumbers are sequential. If you enter yes, a first and a last number are asked. All numbers in this range appear on the screen. Those of these numbers that have not been analyzed can be removed by entering 0 as correction for the number. Otherwise separate labnumbers can be entered one by one.
7. If the screen is full or the rest of the samples analyzed are from a different year of reception, reply "Y" when the system asks if there are more samples to be entered. Make sure that all the samples analyzed in one batch are entered in the computer as one batch and in the same order as on the result sheet (to avoid errors).
8. Subsequently the system asks to specify some variables :
 - temperature at which the sedimentation was started
 - hydrometer reading for the blank
 - the pretreatment the samples have undergoneThe usual values for these variables can be accepted by pressing enter
9. The weight of soil and the volume of dispersion has to be given for the sample. If applicable, the organic matter-,

- moisture- and carbonate content will be subtracted from the weight. Make sure that these data have been entered in the computer before entering the particle size data.
10. The cumulative weights of the sand fractions and the hydrometer readings for the sample are entered.
 11. The particle size distribution and correction factor are calculated and shown on the screen. Any errors can now still be corrected.
 12. If the correction factor is not between 0.94 and 1.06, the result is not accepted and the determination will have to be repeated.
 13. Otherwise the system asks if the result is considered for storage. If there is anything irregular with the result you may not wish to store the data.
 14. The system asks if the results have to be printed. Answer yes unless you do not want to store the results. The print is stapled to the result sheet and filed for backup purposes.
 15. The system asks if the results can be stored.
The answer should be no if :
 - the analyses have not been carried out according to the routine procedure
 - one or more of the sample numbers is wrong
 - one or more of the results is wrong
 16. Else answer yes.
The whole batch is added to the determination file. Subsequently each result in the batch is filled in the compiled data for that sample if there was not yet a result for Particle size distribution.
If there was already a result, the system will ask if that result has to be replaced by the new result.
In general the answer to that question should be NO.
If an analysis has been repeated, the soil chemist will decide which result to accept in the compiled data.
 17. If any of the compiled data was already marked final, the system can no longer replace the results with new repeats. The number of such cases is reported on the screen.

3. ENTRY OF RESULTS OF ANALYSIS

3.9 Entry of Carbonates

1. The system shows the batchnumber and date it is going to assign. It is advisable to leave the current date.
2. The system shows the last set of labnumbers for which results have been submitted. You can use these if you have analyzed exactly the same samples, otherwise you have to enter new labnumbers.
3. If you enter new labnumbers, do not forget to enter the correct year of reception.
4. The system asks if the labnumbers are sequential. If you enter yes, a first and a last number are asked. All numbers in this range appear on the screen. Those of these numbers that have not been analyzed can be removed by entering 0 as correction for the number. Otherwise separate labnumbers can be entered one by one.
5. If the screen is full or the rest of the samples analyzed are from a different year of reception, reply "Y" when the system asks if there are more samples to be entered. Make sure that all the samples analyzed in one batch are entered in the computer as one batch and in the same order as on the result sheet (to avoid errors).
6. Subsequently the system asks to specify some variables :
 - grams of soil used
 - volume of acid used
 - aliquot titrated
 - titer of the hydroxide used for titration
 - volume of titrant used for the blankThe usual values for these variables can be accepted by pressing enter
7. If the standard sample has been analyzed, as is normal practice, the result should be entered. The value of the standard sample is recorded for eventual statistical analysis or fault finding.

If so wished, threshold values for the standard sample can be incorporated into the program in order to automatically reject batches with an unusual result for the standard sample.
8. The results of titration for the samples are asked by the system in the order in which the batch has been defined (see 5.).
9. At the end of the batch or if the screen is full, the system asks if there are any corrections to be made. At this point the results displayed on the screen should be checked against the result sheet.
10. If there are any errors, enter the sequential number behind which the labnumber + result are displayed. This result is then presented for correction. Corrections can be applied until one is satisfied with all the results.
11. Enter 0 for the sequential number to stop correcting.

12. The system asks if the results have to be printed. Answer yes unless you do not want to store the results. The print is stapled to the result sheet and filed for backup purposes.
13. The system asks if the results can be stored.
The answer should be no if :
 - the analyses have not been carried out according to the routine procedure
 - one or more of the sample numbers is wrong
 - one or more of the results is wrong
14. Else answer yes.
The whole batch is added to the determination file. Subsequently each result in the batch is filled in the compiled data for that sample if there was not yet a result for Carbonate content.
If there was already a result, the system will ask if that result has to be replaced by the new result.
In general the answer to that question should be NO.
If an analysis has been repeated, the soil chemist will decide which result to accept in the compiled data.
15. If any of the compiled data was already marked final, the system can no longer replace the results with new repeats. The number of such cases is reported on the screen.

4. SAMPLE IDENTIFICATION FUNCTIONS

4.1 Entry of new samples

1. The system asks for the year of reception of the samples
2. The system checks the database for the highest existing labnumber for that year. The next number is assigned to the new sample.
3. The labnumber that is assigned is displayed and the system asks for the new sample identification.
4. The profile number must consist of an area code
 - 2 letters or a letter followed by space
 - followed by the number
 - 4 figures (e.a. 0021 instead of 21)The system checks this.
5. The horizon indication must be a letter
6. The sample identifications that are accepted are displayed on the screen.
7. If the screen is full, or if you indicate that there are no more samples to enter by entering area code "ZZ" and any letter for the horizon, the system asks if there are any corrections.

At this point you should check the list of samples against the samples displayed on the screen.
8. If there are any errors, enter the sequential number behind which the sample identification is displayed. This sample is then presented for correction. You can apply corrections until satisfied with all the identifications.
9. Enter 0 for the sequential number to stop correcting.
10. The system checks if any of the sample identifications that were entered are already present in the database. These are then marked with *.
11. If any were already present, none of the new sample identifications is then added to the database. First the correctness of the identifications of the whole lot should be checked with the originators.
12. Else the sample identifications + the labnumbers assigned are added to the database.
13. The system asks if a print of the new samples is needed.
14. The samples + labnumbers should be entered in the sample register before embarking on sample preparation.

4.2 Deletion of sample identifications

1. After choosing this function the system asks for the password that gives access to it. If the correct password is not entered, you will return to the menu.
2. The system asks which sample identification has to be removed from the database.
3. If it is present and there are not yet results of analysis for the sample, the system asks for confirmation. In case there are already results of analysis a sample can only be deleted with function 7.3.
4. If confirmation is given the sample is marked for removal.
5. If there are no more samples to be marked for removal, the system embarks on the physical removal from the database, which may take some time.

4.3 Correction of sample identification

1. After choosing this function the system asks for the password that gives access to it. If the correct password is not entered, you will return to the menu.
2. The system asks which sample identification has to be corrected.
3. If it is present, the system asks for confirmation.
4. If confirmation is given the correct identification can be entered.
5. The system checks whether the new sample identification already exists.
If it does, the message "sample identification already exists; change abandoned" appears on the screen. The program abandons the change.
6. If the new sample identification does not exist, it will be registered with the labnumber and data of that sample.

5. PRINT FUNCTIONS

5.1 Print of complete analysis

1. The system asks if you want to print according to profile or according to labnumber.
2. The system asks you to choose where the data have to go :
 - on screen
 - to printer
 - to diskette (for transfer to other systems like Soil Database)and if you want to print the front page (only on printer)
3. For printing according to profile :
 - range of profiles
 - single profile
 - whole area
4. For printing according to labnumber :
 - range of labnumbers
 - single labnumber
 - whole year
5. once all the options have been chosen, the system asks which data have to be printed. If data have to be copied on diskette for transfer to the soil database system, an extra option is available : to copy the data for all samples on which a change has occurred after a particular date.
6. The data selected for printing are transferred to a separate file before they are printed. This may cause a little delay before printing starts.
7. After printing the system asks if there are more prints to be produced in the same mode.

5.2 Printing from determination files

1. The system asks if you want to print according to :
 - labnumber
 - batch
2. The system asks which determination you want to print
3. The system asks whether the data are needed :
 - on screen
 - on the printer
4. A batch is printed in order of labnumber.
5. A block of labnumbers can be printed :
 - in order of labnumber (the successive results of a sample grouped).
 - in order of batch (the samples of a batch grouped).
6. The system asks if more prints are needed in the same mode.

5.3 Sample identifications and their labnumber

A list of sample identifications and their labnumbers may be needed to identify the labnumbers of old samples for which repeats or additional analysis are required.

1. The system asks whether a screen display or a print on paper is needed.
2. The system asks if you want to print the labnumbers with a range of profile numbers or the sample identifications with a range of labnumbers.
3. The system asks for the range you want to print.
4. After printing, the system asks if you wish to print more ranges.

5.4 Missing results.

This function allows you to check whether any samples have been forgotten for a certain analysis.

1. The system asks for which determination a list of missing results is needed.
2. The system asks whether the list has to appear on the screen or on the printer.
3. The system asks for a range of labnumbers.
4. The labnumbers of the samples for which there is no result for the chosen determination are listed.
5. Particle size determination : an "*" indicates an organic carbon content of more than 0.3 %; a "?" indicates that there is no result for organic carbon in the database.
Electrical conductivity : an "*" indicates that the EC in the 1:2.5 extract is above 1 mS/cm and thus needs to be repeated in a saturated paste extract.
Available Phosphorus : an "*" indicates that the pH of the sample is below 5.5 ; a "?" indicates that the pH of the sample is not yet recorded in the database.

5.5 Print the results of the standard sample

This function displays for each batch what the result for the standard sample was. These data could be analysed statistically, and those batches for which the result of the standard sample deviates too much from the mean value should be subjected to scrutiny.

1. The system asks for which analysis the results of the standard sample have to be displayed.
2. After choosing between the screen and the printer as medium, the results are displayed in order of batchnumber.

5.6 The highest batchnumber and date per determination

For each determination file the highest batchnumber and the date it was assigned are shown on screen. This function can help to find the right batch for printing.

6. DATA MANIPULATION FUNCTIONS

6.1 Mark analytical results as final.

1. The system asks for the range of profiles within an area for which the analytical results have been accepted as final.
Marking results as final means that further repeats can not be updated on the compiled data of the samples concerned.
2. If the first sample exists, the range specified will be marked final.
3. The system shows the total number of samples that was marked as final.

6.2 Replacement of compiled results with selected repeats.

This function allows to compile the best fitting results for one or more samples when analysis have been repeated. It is advisable to first make a print of the determination files concerned in order to obtain the number of the right batch.

1. The system asks to choose from replacing with :
 - a number of profiles from a batch
 - a number of samples (labnumbers) from a batch
 - a complete batch
2. If replacement is by profile or sample, these have then to be entered in the system.
3. The system asks for which determination results have to be replaced.
4. The system asks the batchnumber from which the new results have to be obtained.
5. The system shows the batch (or the profiles/samples selected from it) that was specified together with the existing compiled results on the screen.
6. If the selected samples are not in the batch, an error message will be displayed.
7. The system asks if it should proceed with the proposed replacement.
8. After confirmation, the compiled results are updated with the selected results from the determination file.

6.3 Removal of profiles from the database

This function should only be accessible to the database manager, and is therefore protected with a password.

1. the system asks for the password. (The wrong password sends you back to the menu)

2. The system asks whether you wish to remove a single profile or a block of profiles.
3. The system asks for the profile number(s) and validates them.
4. Per profile the system asks if the profile should be removed. After confirmation all the samples of the profile are marked for deletion.
5. If there are no more profiles to remove the actual deletion takes place and the index files are renewed, which is a time consuming process.

7. RENEWAL OF INDEXES

The use of this function should be limited to the database manager.

The Dbase indexes can get corrupted by a number of causes. If you observe that the system cannot "find" certain data that should be there, corruption of index files may very well be the cause.

This function allows you to renew indexes per database file. This allows you to avoid wasting time if you know which index is causing the problem. Otherwise you should renew indexes for all the files.

8. STOCK KEEPING SYSTEM

8.1 Update of stocks

1. The system asks for the name of the item that you want to update. Enter "ZZ" if you wish to leave this function.
2. Please note that the system accepts for each item different grades and brands, but does not accept a second entry of the same grade and brand.
3. If the item is known to the system it will be shown, together with the supplier.
If the item is not known, such will be acknowledged, and the system will ask if you wish to add the item to the list.
If so, you have to specify the supplier and enter his address if it is not known to the system.
4. Please note that you can look for an item by entering its full name, but you can also just enter the first part. Any item which name is equal to that first part will be shown.
5. If there is more than one item that corresponds to the name entered, you will get the message : "there are more entries for this product". If the item you wish to update is not the one displayed, just press <enter> to confirm the existing stock and yearly consumption and the next entry for the item is displayed.
6. When you have come to the last item that corresponds to the name you entered, the system asks if you wish to add another grade or brand for this item.
If you answer "no", the system accepts the update of stock and yearly consumption.
7. If you wish to remove an entry from the list, you can do so by setting the amount in stock to zero. The system then asks if you wish to remove the item from the list.

8.2 Update of addresses

1. The system asks the name of the supplier, organization or person.
2. If the name is known, the address will be shown on the screen for updating.
3. If the name is not known, the system will ask if you wish to add the name to the list.
4. If you add a name to the list, you are only required to fill in an abbreviation if it concerns the address of a supplier.

8.3 Printing of lists

The system can produce five different lists :

1. a list of chemicals
2. a list of glassware.
3. a list of other items
4. a list of items per supplier
5. a list of addresses

The production of these list is fully menu driven.

9. DATABASE MANAGEMENT

In order to protect your data against mishaps, it is advisable to appoint a database manager.

Some tasks for the database manager are :

- to ensure that a set of historic back-ups is kept, for example a daily, a weekly and a few monthly. If necessary the database situation of a few months ago can thus be restored. This might be necessary because a database corruption could have progressed for some time unnoticed.
- To reorganise the hard-disk of the system. A data-entry system like the soil laboratory database builds up highly fragmented database files. When file fragmentation reaches a high degree, the DOS operating system will find it increasingly difficult to trace all those fragments (slower disk operations) and will eventually lose track of fragments.
- With time the files containing the results per type of analysis as well as the file with the compiled data per sample will grow. When the system is using so much disk space that it becomes a limitation for other applications, it is advisable to reduce the size of the files (and their index files). This can be achieved by storing that part of the determination files that is no longer very active on diskette. Proceed as follows :
 1. Decide up to which batchnumber (B) the different determination files are no longer very active.
 2. Prepare sufficient empty formatted diskettes.
 3. Load Dbase
 4. Put a diskette in drive A:
 5. Call the determination file from the dot prompt and copy data to diskette. Delete the same data from the determination file.

```
.USE PH <enter>
```

```
.COPY TO A:PH1 FOR BATCH < B <enter>
```

```
.DELE FOR BATCH < B <enter>
```

```
.PACK
```

6. Make a copy of the diskette for safety reasons.
7. Reindex the affected files
8. Keep a note with the diskettes from which it is clear what range of batch numbers is stored on the diskette (per determination file).

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