A COMPUTER PROGRAM TO DETERMINE THE SOIL TEXTURAL CLASS IN 1-2-3 FOR WINDOWS AND EXCEL

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ABSTRACT: Spreadsheets are now widely used for data entry and analysis. Therefore, **Texture AutoLookup (TAL)** is a computer program designed to work within 1-2-3 for Windows and EXCEL to determine the USDA soil textural class. TAL determines the textural class without having to repeat data entry because data is taken directly from the spreadsheet itself. Moreover, TAL works even with two particle size data or with imperfect data (that is, the sum of the three particle sizes being unequal to 100%). TAL is independent of the particle-size analysis method, and TAL allows textural class names to be modified or be translated into another language.

INTRODUCTION

Soil textural class is the relative proportion of the soil's three particle sizes: clay, silt, and sand. One of the most widely used textural classification systems is the USDA (United States Department of Agriculture) classification scheme.

Although the task to determine a soil's USDA textural class is simple, using computers to automate this task becomes justified when particle-size analysis becomes routine, or when one has to deal with many soil samples. Despite this, there are very few publications about the availability of such computer programs. Perhaps the only ones are those by van Rooyen and Visser (1976), Gent (1983), and Gee and Bauder (1986). These programs, however, are becoming obsolete (if not already) because computer technology has since developed rapidly.

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Today, an useful computer program to determine the textural class is one that works seamlessly within a spreadsheet. This is in view that spreadsheets are now widely used for data entry and analysis irrespective of data type or of one's research. To work seamlessly within a spreadsheet means this program appears "built-in" into the spreadsheet, hence, allowing this program to be used in the same way as one would use the spreadsheet's own commands or functions. Being "built-in" has two advantages: (1) the user can determine the textural class without having to re-enter or repeat the data entry, and (2) this program is independent of the particle-size analysis method. Because spreadsheets are a general purpose data entry and analysis program, they can be used to determine (or to calculate) the percentages of clay, silt, and sand whatever the method of particle-size analysis. In turn, this computer program uses these three calculated particle sizes to determine the textural class. Preferably, this program should also automatically re-determine the textural class if any of the three particle sizes changes its value; therefore, this program behaving similarly to that of a spreadsheet's functions.

Thus in this paper, we introduce such a computer program called **Texture AutoLookup**[1] (TAL) which works within two popular spreadsheets: 1-2-3 for Windows and EXCEL[2] to determine the USDA textural class.

MATERIALS AND METHODS
Program Description

TAL actually consists of two versions: a version written in 1-2-3 for Windows release 4.0 macro language, and another written in EXCEL 4.0 macro language. The former version works only in 1-2-3 for Windows release 4.0 and later, and the latter version works only in EXCEL version 4.0 and later.

TAL determines the textural class based on the USDA textural classification scheme as published by the Soil Survey Staff (1994). To determine the textural class, TAL needs at least two particle sizes. TAL also handles incomplete or imperfect data, that is TAL can determine the textural class even though the sum of TAL allows texture class names to be changed. For example, under the USDA classification, there are twelve textural classes, such as, clay, sandy clay, and loam.

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1. Although this paper is written by two persons, T. B. S. Christopher is the sole creator and programmer of Texture AutoLookup.
2. 1-2-3 for Windows is a registered trademark of Lotus Development Corporation. EXCEL is a registered trademark of Microsoft Corporation.

TAL allows the user to modify or to change these class names into a different format or name, such as changing clay into clayey sandy clay into sandy clay, or loam into a loamy soil. Because of this capability the user can also translate these textural class names into a different language. On-line help is available in TAL for a full description of all of TAL commands.

Using TAL

To use TAL, its macro (or code) file is open in 1-2-3 or EXCEL like any other files. Once loaded, TAL adds its menu called **Texture** on the main menu bar (Figure 1a and b). TAL is menu-driven, all of its commands are available from its **Texture menu.**

In EXCEL, TAL determines the textural class using its in-built function called **Texture ( ).** This function is used like any other of EXCEL's functions: the values or cell references for clay, silt, and sand are passed as parameters or arguments to the **Texture ( )** function. Using these parameters, **Texture ( )** then determines the textural class (Note: any one of the three particle sizes may be omitted). Also, when the value of any of the three particle size changes, the textural class is automatically re-determined.

The 1-2-3 version, however, works slightly different from EXCEL. Unlike EXCEL, the macro language of 1-2-3 does not allow user-defined functions. This means TAL in 1-2-3 does not determine the textural class using any function. Consequently, TAL does not automatically re-determine the textural class if any of the three particle sizes changes its value. However, TAL overcomes this problem with its command called **Pick up Arguments.** This command tells TAL that the values have changed and to re-determine the textural class. This command does not require the user to repeat data entry; only that TAL needs to be told that the particle size values have changed.

For both versions, TAL allows the user to change or translate the textural class names by using the **Modify Texture Class** command.

RESULTS AND DISCUSSION

Sample Data and Output

Figure 2 shows five various particle-size distributions and their textural classes. TAL determines the textural class of each sample and pastes the result in cell E4 to E8. TAL can work with only two particle sizes (Sample A and B) or with imperfect data such as Sample D and E where the sum of the three particle sizes is 95% and
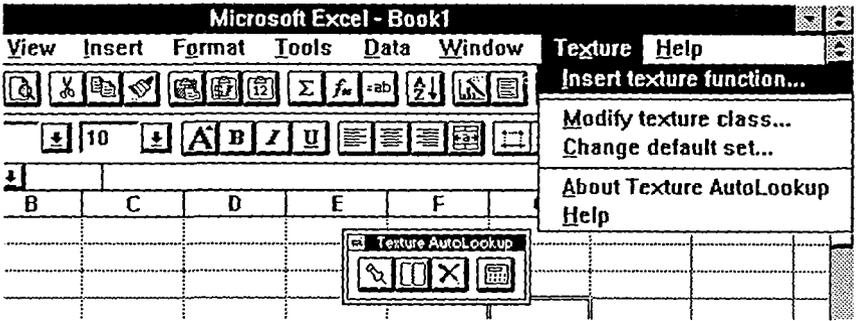
(a)
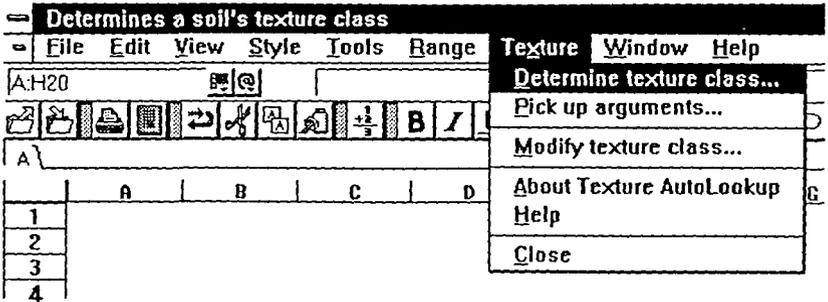
(b)

FIGURE 1. (a) Part of EXCEL's screen. TAL adds its Texture menu on EXCEL's menu bar. A floating toolbar is also added for faster access to TAL commands. (b) Part of 1-2-3 Windows' screen. TAL adds its Texture menu on 1-2-3's menu bar.

	A	B	C	D	E	F
1						
2						
3	Soil sample	clay	silt	sand	USDA Textural class	
4	A	20		50	loam	
5	B		20	30	clay	
6	C	35	40	25	clay loam	
7	D	20	35	40	loam	
8	E	10	30	50	{loam?} {sandy loam?}	
9						
10						

FIGURE 2. Part of a worksheet. Cell B5 and C4 are intentionally left blank to demonstrate the omission of clay and silt data respectively.

90%, respectively. Sample E has two possible textural classes: loam and sandy loam. This is because the sum of the three particle sizes is too far from 100% to stay within a boundary of a single textural class of either loam or sandy loam.

A copy of the computer program **Texture AutoLookup** (EXCEL version and 1-2-3 for Windows version) is available upon request from the authors.

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