

# Soil-Geographic Database of Russia: Database Management System Soil-DB

Sergey Shoba<sup>A</sup>, Irina Alyabina<sup>B</sup> and Varvara Kolesnikova<sup>C</sup>

<sup>A</sup>Faculty of Soil Science, Moscow State Lomonosov University, Moscow, Russia, Email: main@soil.msu.ru

<sup>B</sup>Institute of Ecological Soil Science, Moscow State Lomonosov University, Moscow, Russia, Email: alyabina@soil.msu.ru

<sup>C</sup>Faculty of Soil Science, Moscow State Lomonosov University, Moscow, Russia, Email: varvara@soil.msu.ru

## Abstract

The aim of development of the Soil Geographic Database (SGDB) of Russia is the provision of a scientific basis for the state strategy of sustainable rational land use, monitoring of soil cover, and soil conservation. The main blocks of the Soil Geographic Database are the Geographic Database and the Specialized Attributive Database. Relational Database Management System is used for data storage and processing. The Geographic Information Soil Database forms the cartographic basis of the State Soil-Geographic Database of Russia. The soil profile (attributive) database of Russia is based on the concept of representative soil profiles. The representative profiles should have an exact geographical location and be provided with a morphological description and a complete set of analytical data. A series of the profiles typical of a given soil type can be used for calculating averaged characteristics for this soil type. For filling the profile attributive database, a special software—Soil-DB (version 1)—was developed. This program allows a provider of information to login to the site, to create and fill the soil description card, and to send it through Internet to the central server of the System.

## Key Words

Attributive database, soil-information space, land use.

## Introduction

The aim of development of the Soil Geographic Database (SGDB) of Russia is the provision of a scientific basis for the state strategy of sustainable rational land use, monitoring of soil cover, and soil conservation. The major objectives are as follows:

- 1) Inventory and formalization of data on Russian soils. Most information on soil profiles is presently kept in hard copies: published articles, monographs, collections, dissertations, and field records. These data should be unified and prepared for collective use.
- 2) Information supply of research projects and educational programs.
- 3) Inclusion of Russia into the unified soil-information space of European Community and world, participation in global and regional soil programs.

The main blocks of the Soil Geographic Database are the Geographic Database and the Specialized Attributive Database. Relational Database Management System is used for data storage and processing. The Geographic Information Soil Database forms the cartographic basis of the State Soil-Geographic Database of Russia. It consists of two digital coverages in MapInfo Professional. COVERAGE 1 is a digital map uniting the Soil Map of the RSFSR on a scale of 1 : 2.5 M edited by Fridland (1988) (Corrected digital version, 2007), and the digital map of the soil-ecological zoning of Russia on the same scale at edited by G.V. Dobrovol'skii and I.S. Urusevskaya (2007). COVERAGE 2 is the digital map of the administrative division of Russia at a scale of 1 : 1 M. The soil profile (attributive) database of Russia is based on the concept of representative soil profiles. The database has a hierarchical structure ensuring soil description at several levels: SOIL–PIT–PROFILE–HORIZON–SAMPLE. The main object of the database is a specific soil profile with a set of soil horizons characterized by attributive data. The representative profiles should have an exact geographical location and be provided with a morphological description and a complete set of analytical data.

## Methods

The Program Soil-DB allows a provider of information to login in the site, to create and fill the soil description card, and to send it through Internet to the central server of the System. All necessary information on the properties and composition of soils is acquired by selecting representative soil profiles characterizing the main soil types in a generalized legend to the soil map on a scale of 1:2.5 M.

## Results

The main information element in the program is the card (description of a soil sample). Each user creates their own card file. Any card can be filled in or revised many times, and the changes can be saved on the disk. Because of the large volume and for the sake of convenience, each card is divided into pages (thematic fragments on the screen). The transition from one page to another is made using the menu, where the page titles are selected. Each page contains classified fields, which represent either a menu for selecting one or several items or a window for text or numeric data entry. The Soil-DB interface is shown in Figure 1.

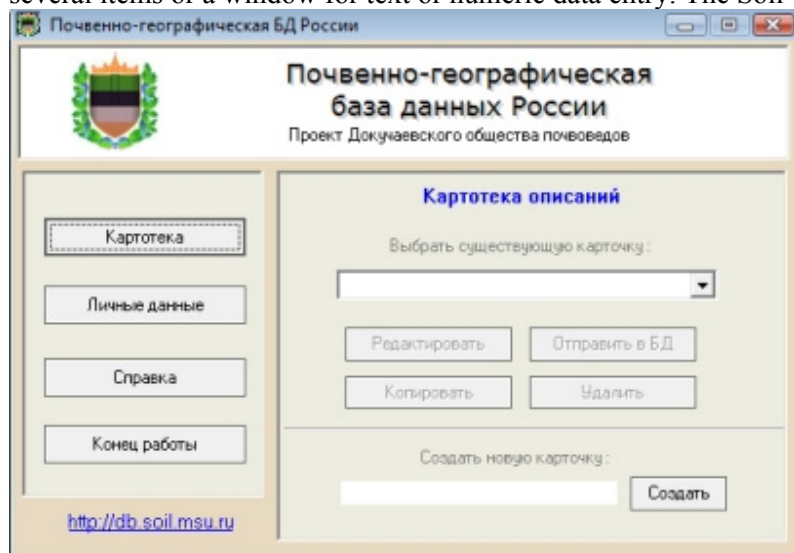


Figure 1. Soil-DB Interface.

The program allows different methods of information entry: type-in; copy–paste; option selection; multiple option selection; multistep option selection; additional windows for non-formalized data not conformed to the system developed; sending of separate files with additional information to the central server of the System (their names are indicated in the card).

The System operation scheme includes the following steps:

Individual specialists fill available information in standard forms (cards) on their local computers using the Soil-DB program; The program sends the filled cards to the central server through Internet; The received descriptions are examined and edited by experts, who consult with the authors, if necessary, and introduce the changes required; After the card is approved by the expert, it is included as an independent entry in the collective SGDB.

The program is designed for maximum user convenience and comfort of work; therefore, the predominant elements for information entry are pull downs containing the options to be selected by the user. The program contains simple and complex (hierarchical) menus. A simple menu consists of an option window; a complex menu consists of two or three windows with options of the same hierarchical level.

## Conclusion

The methodology of the Soil Geographic Database of Russia was developed and realized in the SOIL-DB software aimed at easing the input of individual data to the common database. This database is designed for a wide circle of users, including scientists, teachers, students, and practical workers.

## References

- Alyabina IO, Artyukhov VV, Kolesnikova VM, Shoba SA (2009) Soil-Geographic Database of Russia: Database Management System Soil-DB. Mosk. Gos. Univ., Moscow (deposited in VINITI Aug. 3, 2009, No. 512-B2009)
- Kolesnikova VM, Shoba SA (2009) Qualifiers for granting data in Soil Geographpic Database of Russia (description of soil profile). Mosk. Gos. Univ., Moscow (deposited in VINITI Aug. 3, 2009, No. 513-B2009).
- Shoba SA, Stolbovoi VS, Alyabina IO, Molchanov EN (2008). Soil Geographic Database of Russia. *Eur. Soil Sci.* **41**, 907-913.
- Fridland VM (1988) Soil Map of the Russian Federation, 1: 2.5 M scale. Moscow: GUGK, 16 map sheets. Soil Geographic Database of Russia., <http://db.soil.msu.ru>.