3rd International Soil Judging Contest

August 8-11, 2018
Seropédica, RJ, Brazil

Preliminary Information about the Site

International Union of Soil Sciences

Sociedade Brasileira de Ciência do Solo

UFRRJ
UNIVERSIDADE FEDERAL RURAL DO RIO DE JANEIRO

Embrapa Solos

Universidade Federal de Santa Maria
1960

Preliminary Information about the Site

The Soil Judging Contest will be held at Seropédica municipality, Rio de Janeiro State. The meeting point will be at the main campus of Federal Rural University of Rio de Janeiro (UFRRJ), located next to the center of Seropédica. The campus is situated west of Rio de Janeiro city, between coordinates: 22 ° 44 '38 "S and 43 ° 42' 28" W. The landscape is a succession of low plains and small hills with an average elevation of 26 meters above sea level. The Figure 1 shows the UFRRJ main campus location and surrounding area.

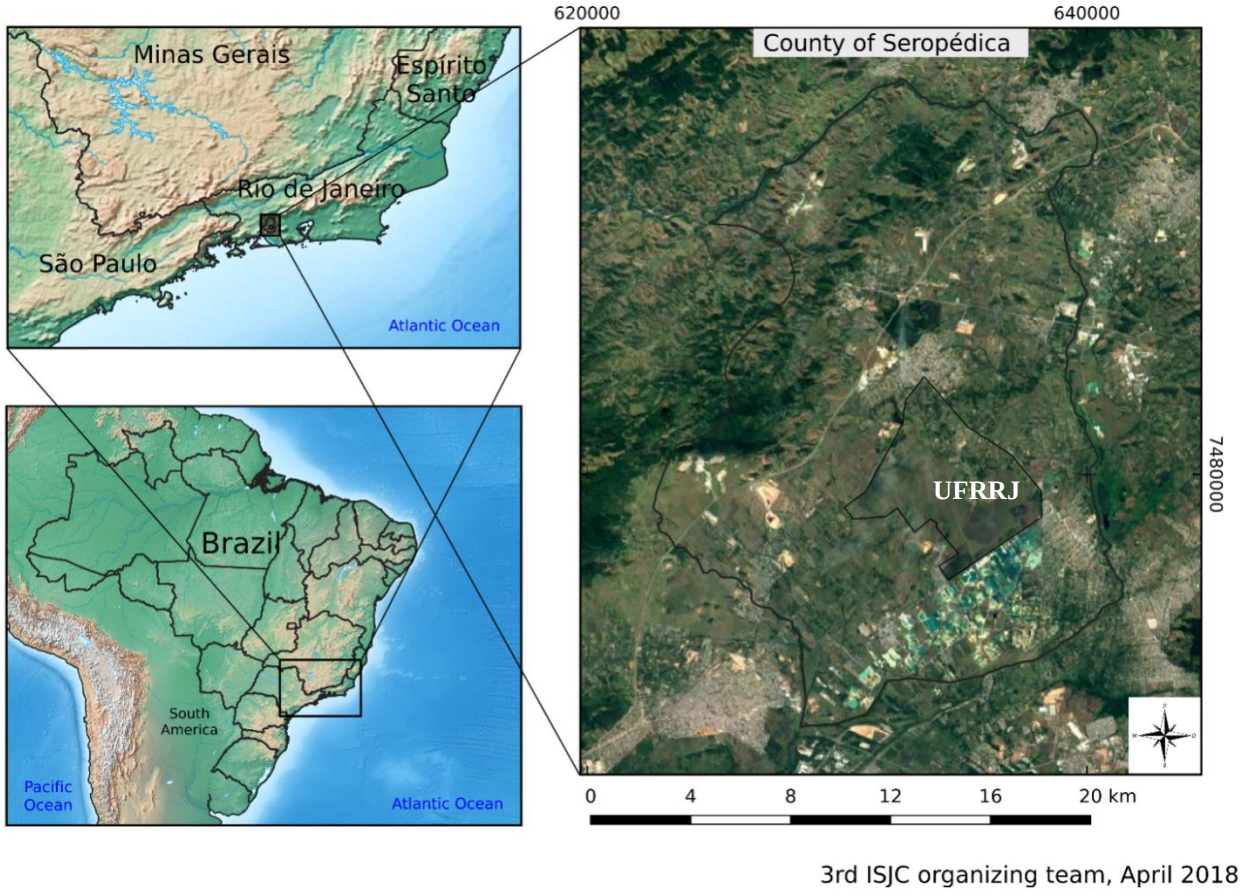

Figure 1. Location of Federal Rural University of Rio de Janeiro - UFRRJ, the site of the Soil Judging Contest, in Seropedica municipality, Rio de Janeiro State, Brazil.

Seropédica is part of the Metropolitan Region of Rio de Janeiro city, and the distance to Rio de Janeiro downtown is approximately 50 kilometers. In the past (around the year 1870s) most of the Seropédica area was a large farm, where one of the main products was cultivation of silkworms to produce silk. "*Seropédica*" is a neologism formed by the words "silk" (latin - *seris*) and "nutrition, creation, cultivation". Therefore, "Seropédica" means a "place where silk is grown".

The main access to Seropédica is through the federal highway BR-465, named *Presidente Dutra*, which cross the municipality from east to west. Other access is the state road RJ-099, connecting the city to the municipality of Itaguaí and to the south region of Rio de Janeiro State. The municipality economy is mainly based on the commerce, and services related to the large population of students and personnel from the UFRRJ and Embrapa Agrobiology, a federal research institution next to the University campus. Other activities are derived from sand mining for civil construction, and the industrial sector near the President Dutra highway. A few farms, mainly family size, and cattle ranch still operate in the region.

The climate is of tropical type Aw (Koppen classification), with a dry season and mild temperatures in the winter. The average annual temperature is of 22.7 °C and the average rainfall is of 1291.7 mm, concentrated in the summer. The temperature in August averages around 21 to 22 °C, approximately 70 °F.

Regarding the original vegetation, the area was covered by the semi-deciduous tropical forest (Atlantic Forest). Nowadays, the main cover, in the plain and slightly undulated areas, is pasture and grasses, including *Melinis minutiflora*, *Panicum maximum*, and *Imperata brasiliensis*. In the higher terrains secondary forest, Eucalyptus plantations and shrubs are found.

The relief at the university campus is mainly formed by slightly undulated to undulated hills, with relatively low altitudes, shaped as "half-oranges", and low plains. In the northwestern portion of Seropédica municipality, higher mountains and a few escarpments are present, where the exposition of intrusive igneous rocks (granites) and metamorphic rocks (gneiss), result in a steeply relief with colluvial ramps. The Figure 2 shows the maps of elevation and slope in the Seropédica region.

The massifs and escarpments on the northwestern portion of Seropédica are in part set as preservation areas, since the steep relief and shallow soils lead to high susceptibility to erosion, thus restricting agricultural usage. Some slopes are used with pasture where deeper soils developed from the parent material of gneiss and granites rocks.

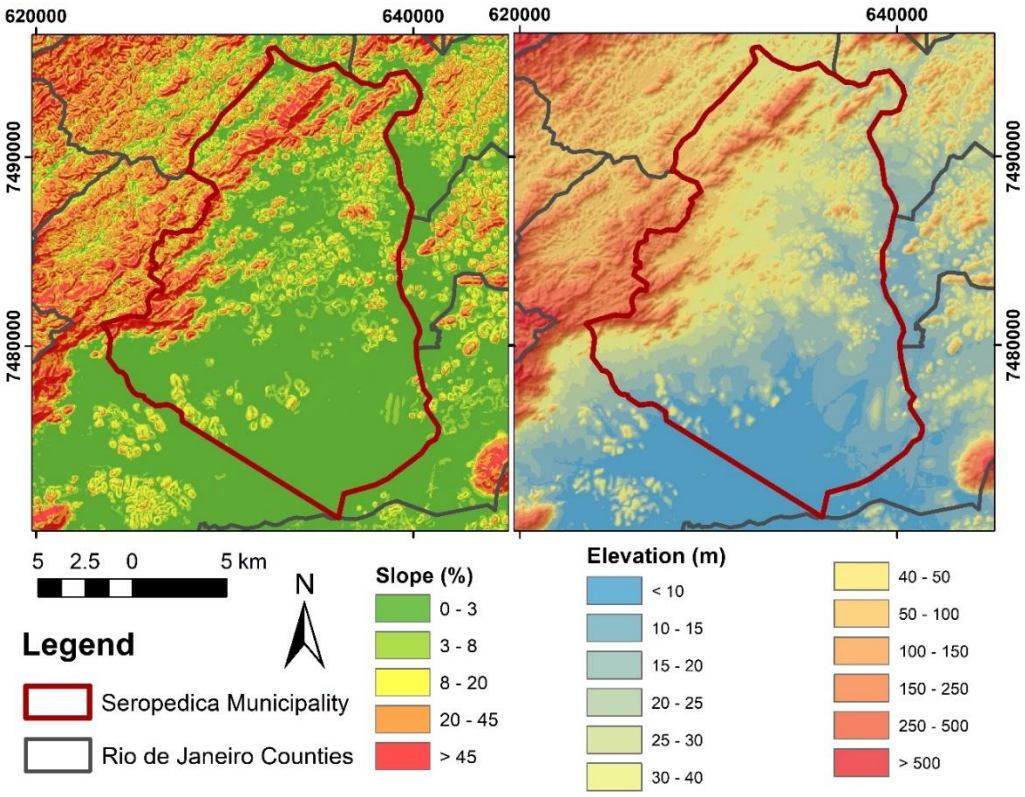

Figure 2. Maps of elevation and slope of Seropédica, with municipality limits marked by the red line (Source: IBGE RJ-25).

The hills, with rounded tops and concave-convex slopes, represent remnants of the crystalline basement (Precambrian rocks). This geological complex is formed by gneisses, charnockites and milonites, having as the main mineral constituents: quartz, alkali feldspars, plagioclases, biotite and grenade; in addition sillimanite, magnetite, ilmenite and cordierite frequently occur. In the transition between the hills and the valleys, there are coluvial deposits of sandy-clay material, which cover the hill regolith and are classified as colluvium ramps. These deposits are the result of mass movements of the "Serra do Mar" regolith. Following downwards, alluvial deposits of clayey or sandy-clayey nature fill the alveolar depressions, sheltered among the hills. The low plains are filled by alluvial and colluvial deposits of the Quaternary period, mainly Holocene. The Figure 3 shows maps of geology and geomorphology.

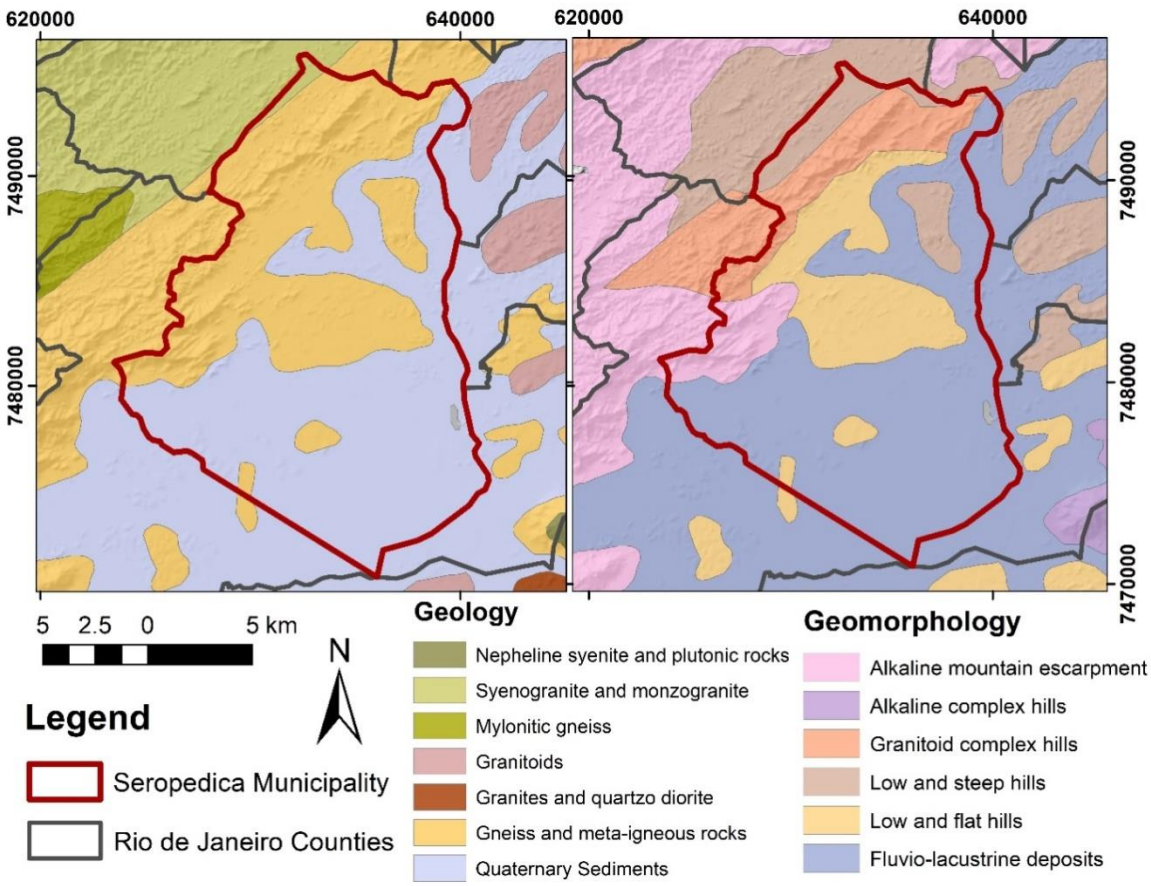

Figure 3. Maps of geology and geomorphology, with municipality limits marked by the red line (Source: SIGA-Guandu Database, 2018)

The main soil classes that occurs in the Seropédica region were classified according to the international systems: World Reference Base for Soil Resources - WRB (IUSS Working Group, 2015), and Soil Taxonomy - ST (Soil Survey Staff, 2014); as well as the Brazilian Soil Classification System - SiBCS (Santos et al., 2013).

The main soil classes are: Ferralsols (Hapludox - ST; *Latossolos Vermelho-Amarelos* - SiBCS); Acrisols or Alisols (Udults - ST; *Argissolos Vermelho-Amarelos* and *Argissolos Amarelos* - SiBCS); Planosols (Aquults or Fragiudults - ST; *Planossolos Háplicos* - SiBCS); Cambisols (Udepts -ST; *Cambissolos Háplicos* - SiBCS); Gleysols (Aquents - ST; *Gleissolos Háplicos* - SiBCS); Histosols (Saprists or Hemists - ST; *Organossolos Háplicos* - SiBCS); and Arenosols (Quartzipsamments - ST; *Neossolos Quartzarênicos* - SiBCS).

The Ferralsols (Oxisols - ST; Latossolos - SiBCS) have common occurrence in tropical rain forest, they are deeply weathered red or yellow, low clay increment in depth. They have mainly low activity clays, particularly kaolinite and oxides. At the area, their occurrence is limited to top of hills, and sometimes may

occur associated with Cambisols over gneisses formations, differing from each other by the quantity of weatherable minerals.

The Acrisols (Ultisols - ST; Argissolos - SiBCS) present an Argic (argillic) horizon with clay-enriched subsoil, low-activity clays and low base saturation. They are relatively deep and the internal drainage can vary since well to moderate. In accordance with nature of parental material, gneiss and granite rocks or sediments from them, occurring since the tops of hills until footslopes. At the backslopes and shoulder of hills it is typical the occurrence of Rhodic Acrisols (Haplustults - ST; Argissolo Vermelho-Amarelo - SiBCS;) associated with gneiss rocks and commonly at the footslopes are Acrisols with eluvial horizon ("E") over the Argic (argillic) horizon being classified as Haplic Acrisols (Paleustults - ST; Argissolos Amarelos - SiBCS), developed from coluvial sediments. The soil fertility and soil erosion comprises are the principal limitation of these soils to agricultural use.

The Cambisols occurs under wide landscape conditions, but usually greater slopes on summit and shoulder positions, developed from autochthone material; but also on areas artificially drained that were once poorly drained, and developed from colluvial-alluvial sediments. Regarding the classification, these soils are defined as Dystric Cambisols, respectively. Although, both presents low-activity clays and Incipient horizon, but regarding bases saturation, can be eutrophic or dystrophic (more common). The main limitations of these soils are the small depth for those formed from autochthonous materials, and the risks of flood and oxygen deficiency for those Cambisols that occurs at the flood plains.

The Haplic Planosols (Endoaqualfs - ST; Planossolo Háplico - SiBCS) are typically observed at the toeslopes occupying the lowlands associated with Gleysols sometimes. They are poorly drained with abrupt transition and remarkable textural difference between the eluvial horizon ("E") and the Argic (argillic) horizon with clay accumulation at the subsoil layer. The abrupt textural difference provides the formation of water table causing an oxygen deficiency related with vegetation, along the rainy periods. The Argic (argillic) horizon presents natural structures units like blocky medium to coarse, and sometimes structureless with a massive aspect, but not necessarily cemented. The colors are greyish or darkened, and can show redoximorphic features or not. The drainage condition and the low natural fertility are the main limitation to use this soil to agricultural purposes.

The Haplic Gleysols (Hydraquent - ST; Gleissolos Háplicos - SiBCS) are developed under hydromorphic conditions, presenting a subsuperficial gley horizon, with grayish colors, with redoximorphic features or variegate, but not necessarily. When these features are observed it usually have vivid colors, as red, orange or yellowish, showing the iron reduced conditions, which can be intensified with the presence of organic materials. These soils are relatively shallow, poorly or very poorly-drained, showing a weak structure or structureless, as massive. The Haplic Gleysols that occur in the area present low-activity clay (CTC less than or equal to 27 $cmolc.kg^{-1}$) and can be eutrophic (base saturation greater than or equal to 50%) or

dystrophic (values lower than 50%). The main limitation to agricultural use is regarding oxygen deficiency that intensify in the rainy periods.

The Histosols (Saprists or Hemists - ST; *Organossolos Háplicos* - SiBCS) are characterized due their thick organic layers, and mineral fragments, when present, have the interstices filled with organic material. It occurs in the region under humid climate and plain relief at the peatlands (turfs) developed due the litter accumulation particularly from grass types adapted to poorly drainage regime. They usually present the vegetal organic material well decomposed (sapric or humic) being difficult to identify the origin.

Arenosols (Quartzipsamments - ST; *Neossolos Quartzarênicos* - SiBCS) are soil with constitution of particle size prevailing sand. These soils are commonly associated with dunes, or coastal areas; and sometimes can present influence of water table on the bottom horizons. On the region, they occurs mainly associated with flat lands and old river terraces, which are nowadays, are used as sand extraction for construction business.

The following images illustrate some of the soils classes that occurs in the region (Figure 4).

		
Rhodic Acrisols (Hapludults - ST; *Argissolo Vermelho-Amarelo* - SiBCS;)	Haplic Acrisols (Paleudults - ST; *Argissolo Amarelo* - SiBCS),	Dystric Cambisols (Hapludepts - ST; Cambissolo Háplico - SiBCS),

		
Albic Planosols (Albaquults or Fragidults - ST; *Planossolo Háplico* - SiBCS)	Haplic Gleysols (Hydraquent - ST; *Gleissolo Háplico* - SiBCS)	Sapric Histosols (Saprists - ST; *Organossolos Háplicos* - SiBCS

Figure 4. Soil classes that occur in the Seropédica region; equivalent classifications in the WRB, ST, and according to SiBCS

References

IBGE - RJ25 Project. Brazilian Institute of Geography and Statistics. Continuous Cartographic Base of Rio de Janeiro State, at the scale 1:25.000.

IUSS WORKING GROUP WRB. 2015. World Reference Base for Soil Resources 2014, update 2015. International soil classification system for naming soils and creating legends for soil maps. World Soil Resources Reports No. 106. FAO, Rome.

SANTOS, H. G., JACOMINE, P. K. T.; ANJOS, L. H. C.; OLIVEIRA, V. A.; LUMBRERAS, J. F.; COELHO, M. R.; ALMEIDA, J. A.; CUNHA, T. J. F.; Oliveira, J. B. Sistema Brasileiro de Classificação de Solos. 3° ed. Rio de Janeiro. Embrapa Solos, Rio de Janeiro, Brazil.2013.

Soil Survey Staff. Keys to Soil Taxonomy. United States Department of Agriculture National Resources Conservation Service. Twelfth Edition, 2014.

SIGA-GUANDU Database. Available at: http://www.sigaguandu.org.br/map