

Physical, Chemical and Mineralogical Characteristics of Soils with Anthropics Horizons (Terra Preta de Índio) in the Floodplains of Solimões River in the Central Amazon-Brazil

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In the Amazon has many reports about the occurrence of antropropic horizons formed in pre-Colombian Indian settlements, they are called Terra Preta de Índio (TPI) and are normally found in the uplands. TPIs show dark color and high carbon stocks, high levels of calcium, magnesium and phosphorus. The borders of the Solimões river that are annually flooded are called "varzeas" and has few report about the occurrence of TPI in those areas. The objective of this work was to characterize morphologically physically and chemically eight soil profile with buried antropropic soil horizons in the floodplains of the Solimões River in the Brazil in the Central Amazon. The results showed that silt fraction predominate in whole horizons and profiles. The chemical characterization (total and available mineral elements) shows that P, Zn, Cu, Ba and Sr were good indicator of antropropic horizons in the rich floodplain in the Central Amazon. The original high levels of Ca and Mg and low level of C do not permit to use them as indicators of antropropic activities in the floodplain environment. The presence of archeological ceramics and high level of P indicate that the buried antropropic horizon were in the surface in the past. The mineralogical composition of antropropic and non antropropic horizons were very similar (illite and muscovite) indicating the same mineral matrix. The wide of the buried horizon may be interpreted that large populations lived in those site in the past. The Fluvents enriched by the rich sediments from the Andean mountains in the Solimões rivers are naturally very fertile for agriculture activities. The natural high level of P, Ca, Mg are above the critical levels for response to the fertilization to corn and manioc cultivation. This fact may be a strong indicator that the enrichment of the soil in the TPIs was not for agricultural purposes, at least in the floodplains. In the Solimões River occur the phenomena called "terras caídas" that is a natural erosion process that collapse the border of many rivers in the Amazon and destroy the archeological sites. Moreover, the frequent flooding cover by new sediments the old antropropic A horizons that became covered and difficult to localize, with more soil surveys in the floodplains probably more paleosols will be found and may prove that large populations lived in those areas in the past.

Terra Preta and Terramare: Similarities and Differences

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The occurrence of banked and ditched villages of the Middle and Recent Bronze ages (c. 650–1150 BC) in Northern Italy (Po plain) is known to the archaeologists since a century. Those sites are called Terramare

adopting the same terminology that was used in the past to identify the organic rich earth "terra marna" of mounds quarried as fertiliser by the local farmers. About two hundreds Terramare sites have been found so far and are considered the archaeological remains of a complex society whose subsistence was based on agriculture, pastoralism, handicraft and long-distance trade. Settlements consisted of fortified villages surrounded by an embankment and a ditch. The socio-economic system of the Terramaras was based on a cooperative organisation and a complex territorial association of villages; the estimated number of people in the Terramara area around the 14th–13th century BC was about 150,000. At the end of the Late Bronze Age (ca. 1200 BC) this civilisation vanished, possibly through a combination of climatic, ecological and socio/economic causes. Every Terramare site is characterised by the occurrence of potent organic soil horizons (up to 3-4 meters depth) that were created by the inhabitants by mixing organic and inorganic residues and different types of waste. Charcoal, likely originating from wood fires, is an important component of the Terramare layer and is supposed to have played a crucial role in organic matter and nutrient protection, over millennial time scales and the extraordinary fertility of this type of soil is witnessed by the exploitation that was made for long periods by the farmer of the 18th and 19th century. This paper illustrates the most recent findings of Terramare research that link archaeology, soil science and agronomy. The fertility of the Terramare soils is also discussed in the light of new measurements made very recently. The hypothesis is raised of a stringent parallelism between the origin of the Terra Preta de Índios and Terramare, suggesting that soil fertility was in both cases an inadvertent result of landfilling activities involving organic waste, charcoal and ash from woodfires.

Chemical Characterization and Mineralogy of Three Anthropics Soils (Indian Dark Earth) of Central Amazon

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The aim of present study was to evaluate chemical attributes and mineral composition of the clay and the sand fractions from three soils with antropropic horizons locally called Terra Preta de Índio (TPI) and around soil. Samples were collected and analyzed chemically and mineralogically by X-ray diffraction (XRD). The TPI has moderate acidity and around soil has high acidity. The contents of changeable Al too is high in the around soil. Available and changeable nutrients show high contents, especially phosphorus and calcium, as well as, the contents of total organic carbon. The chemical fractionation of humic substances showed that the TPI, the highly humified fraction (humic acids) and higher for the more mobile fractions (fulvic acids). The mineralogical analysis shows that clay fraction of TPI isn't different of around soil. The kaolinite is the predominant mineral in the clay fraction, but was found in less amount the minerals goethite, gibbsite and anatase. The sand fraction has the quartz with predominant mineral.

Key words: site, XRD, goethite.