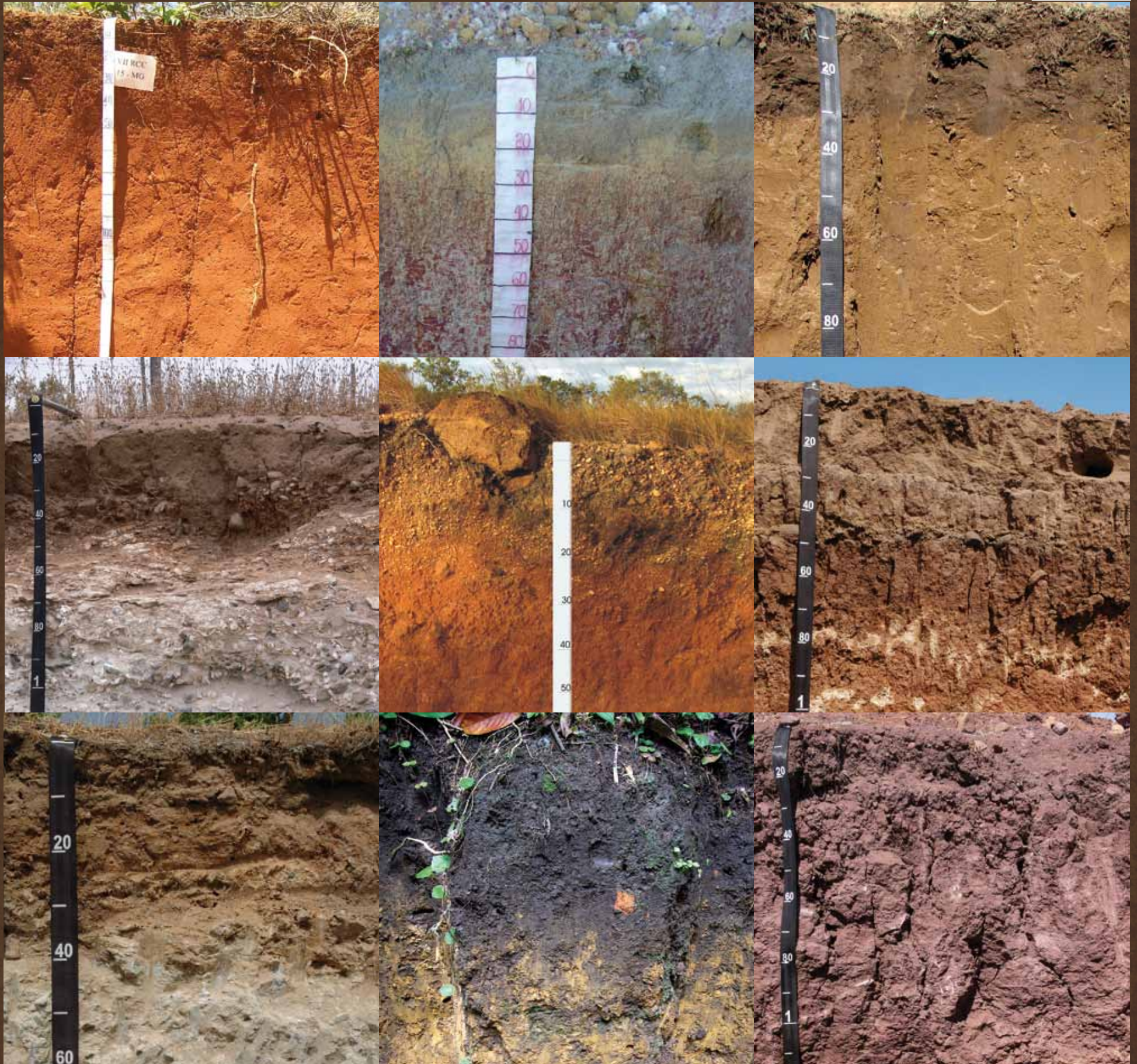


# SOILS of LATIN AMERICA AND THE CARIBBEAN

# 20 12



supporting the sustainable use of soil





Roosevelt Garcia

*In many people's minds, the typical soils of Latin America are red in colour, deeply weathered and under tropical rain forests. However, the truth is very different. South and Central America possess a tremendous range of soils that provide a variety of vital environmental goods and services to humans, and the planet as a whole.*

## Soil is one of the fundamental components for supporting life on the planet.

Plants and crops are dependent on soil for the supply of water, nutrients and as a medium for growing.

Soil stores, filters, buffers and transforms substances that are introduced into the environment. These capabilities are crucial in producing and protecting water supplies and for regulating the fluxes of greenhouse gases.

Soil is a provider of raw materials.

Soil is also an incredible habitat and gene pool – hundreds of millions of living organisms can exist in a hectare of arable soil.

Soil is a fundamental component of our landscape, ecosystems and cultural heritage.



M. L. Mendonça Santos

*Due to their age and the presence of a hot, humid climate, many tropical soils are deeply and homogeneously weathered.*

This calendar and the related **Soil Atlas of Latin America and the Caribbean** are initiatives under the EUroCLIMA Programme, which aims to encourage cooperation between Latin America and the European Union on climate change issues.

The main partners are the European Commission (Joint Research Centre and Development and Cooperation – EuropeAid Directorates-General), the Food and Agricultural Organization of the United Nations and scientists from soil science institutions from Europe, South America and the Caribbean. The calendar aims to bring the soils of the region to the attention of everyone who deals with this critical non-renewable, natural resource that is vital for food and fibre production, a range of ecosystem services and sustainable development.

The environment of Latin American and Caribbean is enormously diverse, from deserts and seasonally dry regions in the west to the vast tropical rainforests of the Amazon basin, and from coastal lowlands with mangroves to the high mountain ranges and volcanoes of the Andes. Southern parts of the continent are covered by extensive grasslands. As a consequence, the range of soils is tremendously varied.

Soil names and terminology used in the calendar are those of the World Reference Base for Soil Resources (2006), a cooperative effort of the Food and Agricultural Organization of the United Nations, ISRIC-World Soil Information and the International Union of Soil Sciences to arrive at a common language for describing soils.

This calendar highlights the diversity and richness of soil in South America and the Caribbean and should help the reader to better understand the characteristics and potential of various soil types in this part of the world.



*Soil characteristics depend on the nature of the underlying geological material, the vegetation, climate, position in the landscape, length of development and human interference. Soil characteristics can change significantly across the landscape and with depth.*

*Colour differences identify soil horizons reflecting variations in the distribution of diverse materials. In the above example from Mexico, a dark-coloured surface horizon containing high levels of decaying organic matter overlays a lighter-coloured horizon that has lower organic matter and shows the presence of clay and iron oxides. Below that, a white layer containing fragments of the underlying bedrock indicates the parent material from which this soil has formed. Such soils are typical for permanent grasslands in semi-humid climates.*



ferralsols

(from Latin ferrum, iron, and aluminium)



Ferralsols are formed by the breakdown of silicates over long periods of time in humid tropical climates. The subsequent leaching of silicon, together with calcium, magnesium and potassium, results in the formation and accumulation of stable kaolinitic clay. Iron and aluminium oxides give Ferralsols their strong red and yellow colour. Levels of calcium and magnesium ions are very low.

This profile from Brazil shows the typical reddish colouring of Ferralsols. It displays a darker and less red surface horizon where the organic carbon content is high but may have been lost due to deforestation and agricultural practices.

Ferralsols have a distinctive soil structure (weak macro-aggregates but strong micro-aggregates) that makes them fairly porous and less susceptible to erosion than other soils of the tropics. Because of their limited capability to hold nutrients, they have low fertility. If they are to be used for agriculture, lime and fertilizer must be added. Agroforestry can help to enhance the organic matter and nutrient contents.

JANUARY 2012



Ferralsols occur in a wide variety of landforms and climates. This photograph shows tropical rainforest in the Amazonian basin.



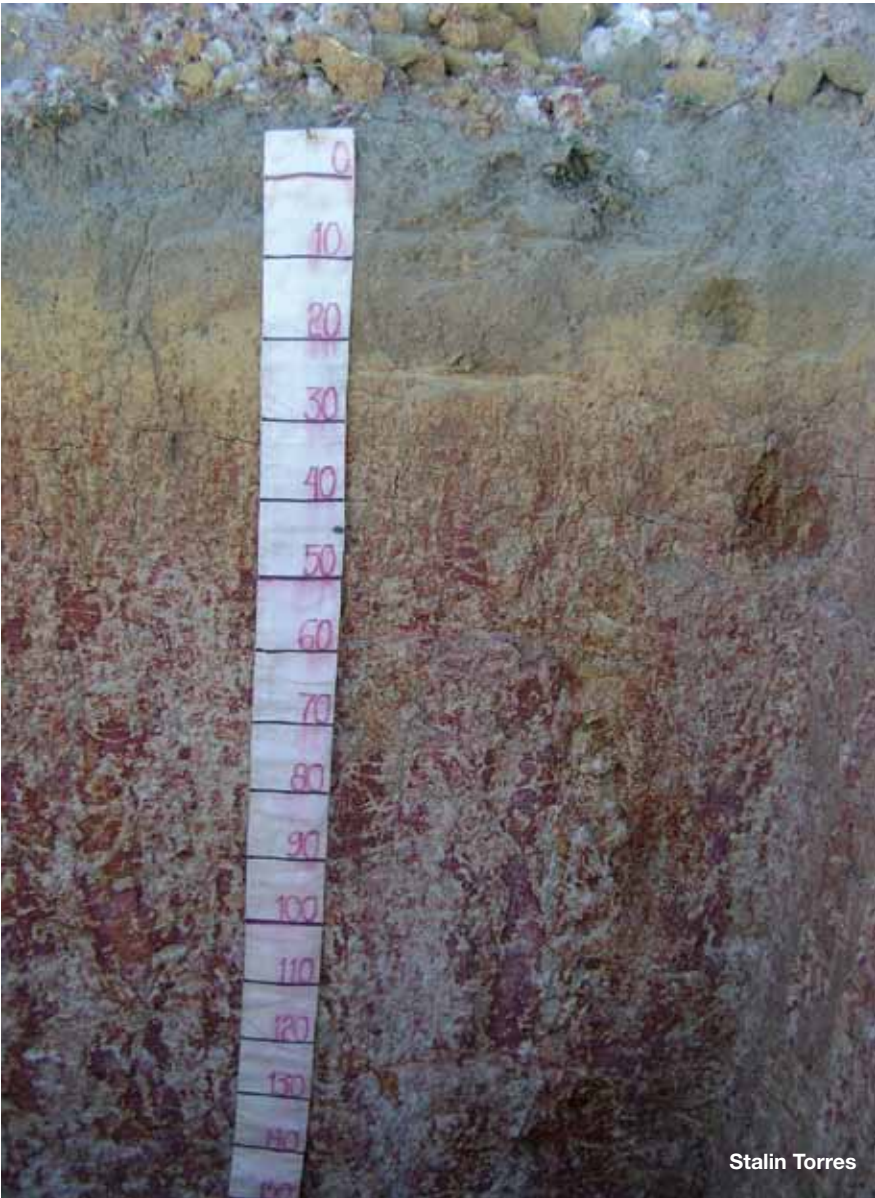
Ferralsols are relatively common in Latin America and are often associated with Acrisols: they cover around 20% of the area shown on the map.

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
						1 🌙
2	3	4	5	6	7	8
9 ☺	10	11	12	13	14	15
16 🌙	17	18	19	20	21	22
23 ☺	24	25	26	27	28	29
30	31 🌙					



# plinthosols

(from Greek plinthos, brick)



Plinthosols develop in kaolinitic materials that are rich in iron oxides. Chemical reactions caused by the presence of groundwater or stagnating water leads to a redistribution of the iron oxides in a reticulate or nodular pattern with light-coloured iron-poor spots in between. Such horizons are called plinthite. Plinthite hardens after repeated wetting and drying, resulting in a continuous hard sheet (petroplinthite, laterite, ironstone) or in discrete hard nodules (pisoliths).

The profile above from Venezuela shows a classic Plinthosol with characteristic red plinthite nodules occurring below 35 cm. In the upper part, iron has moved away under conditions of water saturation resulting in grey colours.

Petroplinthite and large amounts of pisoliths can restrict the use of these soils to grazing or forestry. Soft plinthite requires strong protection against the erosion of overlying layers in order to prevent its hardening.

# FEBRUARY 2012



Manoel Batista de Oliveira Neto

Sugar cane cultivation on Plinthosols in a gently undulating topography in northeastern Brazil.



The map shows the location of areas where Plinthosols are the dominant soil: they cover around 4% of the area shown on the map.

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
		1	2	3	4	5
6	7 ☺	8	9	10	11	12
13	14 ☾	15	16	17	18	19
20	21 ☺	22	23	24	25	26
27	28	29				



# andosols

(from Japanese an, black, and do, soil)



Andosols develop from materials rich in volcanic glass, such as ash, pumice or cinder. The weathering of the glass produces specific clay minerals, called allophanes and imogolites. In more humid or more acid conditions, large amounts of organic substances can accumulate to build up compounds with the aluminium released by weathering.

This profile from Chile has developed in ash deposits from volcanic eruptions. The soil contains fragments of volcanic glass and of lava ejected during the eruption. Subtle differences in colour can be partly attributed to the weathering of iron-rich volcanic deposits.

Andosols have a very low bulk density and a high plant-water and phosphate retention capacity. Although Andosols can be among the most productive soils on our planet, many of them need phosphate fertilisation.

# MARCH 2012



José Espinosa Marroquín

The volcanic regions of the Andes, as typified by this view of Cotopaxi in Ecuador, are typical Andosol landscapes.



The map shows the location of areas where Andosols are the dominant soil: they cover around 1.5% of the area shown.

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
			1 🌙	2	3	4
5	6	7	8 😊	9	10	11
12	13	14	15 🌙	16	17	18
19	20	21	22 😊	23	24	25
26	27	28	29	30 🌙	31	



phaeozems

(from Greek phaios, dusky, and Russian zemlja, earth or land)



Marta Fuchs

Phaeozems are characterised by a dark humus-rich surface horizon. They are mainly to be found in temperate regions that are neither very continental nor very oceanic. They are just humid enough to avoid the accumulation of carbonates or salt. Phaeozems have a high content of calcium ions that are bound to soil particles, resulting in a very permeable, well-aggregated structure.

In the above example from Chile the dark-coloured surface horizon overlies a well-structured, chestnut-brown subsoil.

Phaeozems are fertile soils that are found in the South American pampas, the North American prairies and the temperate steppes of Eurasia. While generally associated with grasslands, they also occur under forests, including tropical forests. Phaeozems are regarded as very productive soils for agriculture.

APRIL 2012



José Luis Panigatti

This picture shows a Phaeozem landscape in the Pampas of Argentina which is highly valued as agricultural land. The main source of the high organic content is the abundant grass vegetation.



The map shows the areas in which Phaeozems are the dominant soil: they cover around 6% of the area shown on the map.

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
						1
2	3	4	5	6 ☺	7	8
9	10	11	12	13 ☾	14	15
16	17	18	19	20	21 ☺	22
23	24	25	26	27	28	29 ☾
30						



acrisols

(from Latin acer, very acid)



Acrisols are acidic soils dominated by kaolinites with clay accumulation in the subsoil. They are typically found in the wetter parts of the tropics and subtropics. Acrisols are deficient in nutrients and require substantial applications of fertilizer to produce satisfactory crop yields.

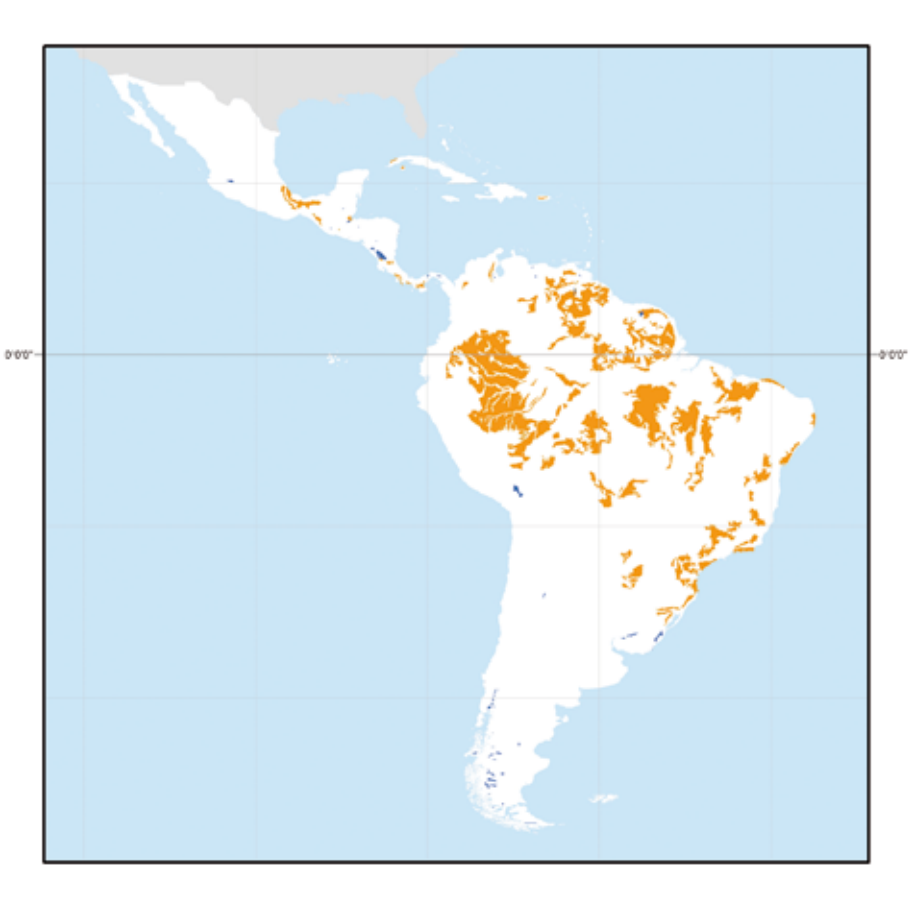
The photograph above of an Acrisol from Venezuela shows an upper, lightish coloured horizon from which the clay has been leached and redeposited in the lower, reddish coloured subsoil. The large amount of gravel in the topsoil denotes an erosional surface which implies that the upper part of the soil has been removed.

Because of their poorly developed structure, Acrisols are susceptible to drought stress, crusting, compaction and erosion. Many Acrisols are relatively hard when dry, which makes it very difficult to manipulate them with hand-held implements such as the hoe.

MAY 2012



Acrisols are naturally covered by (sub)tropical rainforests. Large areas of Acrisols are used for subsistence farming, partly under shifting cultivation. Pasture, as seen in the above photograph from Venezuela, is possible but highly dependant on appropriate land management practices.



The map shows the location of areas where Acrisols are the dominant soil: they cover around 13% of the area shown.

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
	1	2	3	4	5	6 ☹️
7	8	9	10	11	12 🌙	13
14	15	16	17	18	19	20 😊
21	22	23	24	25	26	27
28 🌙	29	30	31			



nitisols

(from Latin nitidus, shiny)



Nitisols are deep, well drained, red-coloured tropical soils. They display a clayey subsurface horizon with strong aggregates that break into flat-edged or nut-shaped elements with shiny surfaces, hence its name. Nitisols are the product of intensely weathered basic rocks (e.g. basalts) or hard limestone deposits which result in high levels of clay minerals (such as kaolinite and halloysite) and of oxides and hydroxides of iron and aluminium.

The red colour of this example from Cuba indicates the presence of significant amounts of iron oxides and the absence of carbonates, which have been leached from the soil. Note the lack of distinct horizon boundaries and the distinctive nut-shaped elements.

Compared to other tropical soils, Nitisols are more productive due to higher concentrations of organic matter and retention of water for plant roots. Nitisols are found under tropical rain forest or savannah.

JUNE 2012



Olegario Muñiz & Juan M. Pérez

As shown by this farm in Cuba, Nitisols are characterised by their productivity, despite a high capacity for fixing phosphates. They are in great demand by farmers for the production of sugar cane, tobacco, vegetables, root and tuber crops and coffee.



The map shows the location of areas where Nitisols are the dominant soil: they cover just over 1% of the area shown on the map.

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
				1	2	3
4 ☺	5	6	7	8	9	10
11 🌙	12	13	14	15	16	17
18	19 ☺	20	21	22	23	24
25	26	27 🌙	28	29	30	



calcisol

(from Latin calcarius, lime-rich)



Otto Spaargaren

Calcisol displays a substantial formation of calcium carbonates in the soil (secondary carbonates). The redeposited material may take the form of soft or hard nodules, root channels filled with fine carbonates (pseudomycelium) or even as continuous layers of soft or hard lime (calcrete).

This example from Chile shows a Calcisol that has developed in a shelly beach deposit. The primary calcium carbonates have been leached out from the uppermost 40 cm. Secondary carbonates were redeposited deeper in the soil and formed a cemented layer. Organic matter levels are very low.

Calcisol tends to develop in calcareous-rich sediments that have been deposited on slopes (colluvium) or by water (alluvium) or the wind (aeolian). They are widespread in arid and semi-arid environments. The natural vegetation is sparse and dominated by drought-tolerant shrubs, trees and grasses.

JULY 2012



Carlos Saracco

Agricultural activity on Calcisols is limited due to a lack of water and/or the presence of stones and shallow cemented horizons. Hilly areas with Calcisols, like this example from Mexico, are predominantly used for low stocking grazing.



The map shows the location of areas where Calcisols are the dominant soil: they cover around 3% of the area shown on the map.

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
						1
2	3 ☺	4	5	6	7	8
9	10	11 ☾	12	13	14	15
16	17	18	19 ☽	20	21	22
23	24	25	26 ☺	27	28	29
30	31					



cambisols

(from Spanish cambiar, to change)

AUGUST 2012



Cambisols encompass a broad variety of soils. They show at least some soil genesis in a subsurface horizon (formation of soil structure and of some oxides or clay minerals). However, they lack the horizons that are typical for advanced soil formation such as the redeposition of clay, organic matter or oxides.

This profile shows a Cambisol from Chile that has developed in unconsolidated deposits. Below the surface layer, a weakly differentiated horizon is present that has visible signs of iron oxide formation. Organic matter content is low.

Cambisols cover large surfaces across a broad range of landscapes (level ground to mountainous terrain), climates and vegetation types. Depending on organic matter content and pH, many of them can be fertile.



Cambisols, such as this example from the Andean Cordillera Oriental of Bolivia, can support various types of agriculture. However, erodibility, stoniness and shallowness may be limiting factors.



The map shows the location of areas where Cambisols are the dominant soil: they cover around 10% of the area shown on the map.

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
		1	2 ☺	3	4	5
6	7	8	9 ☾	10	11	12
13	14	15	16	17 ☺	18	19
20	21	22	23	24 ☾	25	26
27	28	29	30 ☺	31		



# solonetz

(from Russian sol, salt, for saline and alkaline soils)



Solonetz show a subsoil horizon with clay accumulation and a high proportion of sodium and/or magnesium. This leads to a strongly alkaline soil with a well developed columnar structure. Sodium may have accumulated through the evaporation of groundwater that contains high levels of sodium bicarbonate or through coastal deposits. In addition, some soluble salts may be present in the soil.

The above example shows a well-developed Solonetz in Chile consisting of a light brown surface horizon (0 – 40 cm) over a darker, clay- and sodium-rich horizon (40 – 80 cm). A calcic horizon is present below 80cm. The typical columnar or prismatic structure of Solonetz is clearly visible.

Solonetz are normally associated with unconsolidated materials (mostly fine-textured sediments) in flat lands in a climate with warm, dry summers. Most Solonetz subsoils are very hard in the dry season and sticky when wet. Ponding of water on top of dry soils during rain showers is a common problem.

# SEPTEMBER 2012



Solonetz are problem soils when used for arable agriculture. This picture shows a palm grove on a clayey Solonetz in Paraguay.



The map shows the location of areas where Solonetz are the dominant soil: they cover around 3.5% of the area shown on the map.

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
					1	2
3	4	5	6	7	8 ☾	9
10	11	12	13	14	15	16 ☺
17	18	19	20	21	22 ☾	23
24	25	26	27	28	29	30 ☺



# leptosols

(from Greek leptos, thin)



Leptosols are shallow soils overlying continuous rock or they are very gravelly soils. Many Leptosols have a humus-rich topsoil horizon and some even a shallow and weakly developed sub-surface horizon, but they all lack thick or well-developed subsoil horizons. According to traditional soil names, Leptosols on limestone belong to the Rendzinas, while those on carbonate-free rocks, such as granite, belong to the Rankers.

This profile from Peru shows a shallow, stony Leptosol. Solid bedrock occurs within 25 cm of the soil surface. There is virtually no subsoil development.

On a global scale, Leptosols are very extensive. They are found mainly in mountainous regions, deserts or in areas where the soil has been eroded. They store very little water. Leptosols tend to be used for extensive grazing or forestry.

# OCTOBER 2012



This hillside near Lima in Peru is dominated by Leptosols: Thin pockets with fine soil can be seen amongst the outcrops, and rocks are often close to the surface. The parent material is weathered as a result of high exposure and low temperatures.



The map shows the location of areas where Leptosols are the dominant soil: they cover around 11% of the area shown on the map.

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
1	2	3	4	5	6	7
8 ☾	9	10	11	12	13	14
15 ☺	16	17	18	19	20	21
22 ☼	23	24	25	26	27	28
29 ☺	30	31				



# vertisols

(from Latin vertere, to turn)



Vertisols are heavy clay soils containing a high proportion of swelling clay minerals that mix the soil particles during wetting and drying cycles. When they dry out, horizontal shrinking forms deep wide cracks from the surface downward, and vertical shrinking lowers the level of the soil surface. When they are wet again, the cracks close, and the soil lifts up in an irregular manner eventually leading to an irregularly shaped surface known as gilgai. Vertisols exhibit a clayey subsurface horizon with wedge-shaped structural aggregates tilted from the horizontal and polished, grooved ped surfaces (slickensides).

In the above example from Chile, a calcium carbonate-rich subsoil (as evidenced by the white flecks in the soil) has been churned through the expansion and contraction of the soil.

Most Vertisols occur in flat landscapes under semi-arid tropical and subtropical climates with a pronounced dry season.

# NOVEMBER 2012



IINPO-UCATSE

Vertisols become very hard in the dry season and are sticky when wet. Tillage is difficult but as in this Vertisol from Nicaragua, they can be productive soils if properly managed.



The map shows the location of areas where Vertisols are the dominant soil: they cover around 1.5% of the area shown on the map.

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
			1	2	3	4
5	6	7 ☾	8	9	10	11
12	13 ☺	14	15	16	17	18
19	20 ☾	21	22	23	24	25
26	27	28 ☺	29	30		



anthrosols

(from Greek anthropos, human being)



Etelvino Henrique Novotny

Anthrosols are formed through land-use activities such as the addition of organic materials, household wastes, lime, charcoal, lake sediments (as in the Chinampas of Mexico), sods (plaggen) or the sediment load of irrigation water. The added material was normally deeply tilled into the original soil. In most cases, a buried soil can still be found at some depth. Anthrosols also include the Paddy Soils where long-term cultivation of wet rice causes repeated lack of oxygen leading to unique soil characteristics.

The photograph above shows a very dark, fertile Terra Preta De Índio (literally “black earth” in Portuguese) from the Amazon Basin. It was developed by adding high amounts of charcoal, bone, manure and fragments of pottery to the relatively infertile kaolin-itic soil (yellow horizon) over a long period of time.

Soils consisting of significant amounts of artifacts (e.g. land fill, mine waste, construction material) belong to the Technosols, not to the Anthrosols.

DECEMBER 2012



Wenceslau Geraldes Teixeira

Due to the increased fertility, the importance of Anthrosols to indigenous food production is very high. Currently, the Terra Preta soils are being investigated to assess their potential use in mitigating the effects of climate change.



Carlos Cruz Gaistardo

The Chinampa is a particular Anthrosol developed by a pre-Aztec culture in Lake Texcoco, Mexico. Crops were grown on artificial islands created from layers of branches, mud, lake sediment and decaying vegetation. This picture shows the base of a new Chinampa.

Anthrosols do not appear on small-scale soil maps as their geographical extents tend to be limited. However, on a local level, their relevance is very high.

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY	SUNDAY
					1	2
3	4	5 <small>WORLD SOIL DAY</small>	6 ☾	7	8	9
10	11	12	13 ☺	14	15	16
17	18	19	20 ☾	21	22	23
24	25	26	27	28 ☺	29	30
31						



# SOIL ATLAS OF LATIN AMERICA AND THE CARIBBEAN

To raise awareness of the global perspective and importance of soil in Latin America and the Caribbean, the European Commission's Joint Research Centre (located in Ispra, Italy) is collaborating with soil scientists from Latin America, the Caribbean and Europe to produce the first ever **SOIL ATLAS OF LATIN AMERICA AND THE CARIBBEAN**. The atlas explains the diversity of soil from the tropics to the deserts through a series of maps supported by explanatory texts, high quality photographs and descriptive graphics illustrating their principal characteristics, the main processes behind their formation and how they are reacting to increasing levels of human activity.

The atlas presents the linkages between soil and land use (especially agriculture), ecological functions and climate change in a manner

that is easily understandable to the general public, policy makers and other scientists. A key message is the need for the sustainable use of soil and other natural resources that are so vital to human existence. The atlas also aims to promote the use of soil information while ensuring increased collaboration between soil scientists across Latin America and the Caribbean.

For more details, please see [http://eusoils.jrc.ec.europa.eu/library/maps/LatinAmerica\\_Atlas/index.html](http://eusoils.jrc.ec.europa.eu/library/maps/LatinAmerica_Atlas/index.html)



*Distribution of major soil types of Latin America and the Caribbean*

The map shows the dominant Reference Soil Groups according to the WRB classification and correlation system<sup>1</sup>. This new map produced by the JRC is an updated version of the SOTER database for Latin America and the Caribbean which was developed by FAO/ISRIC.

As a result of its geologic history, topography, climate, and vegetation, almost all major soil types can be found in the region.

Low natural fertility is a conspicuous feature of soils in the humid tropic regions. About half of the region consists of soils developed in unconsolidated or nutrient-poor sediments deposited in river basins; red soils leached of silica and containing residual concentrations of iron and aluminum; and acidic soils with a bleached upper horizon that are low in nutrients.

About one-fifth of the region is covered by arid soils of various types in which agriculture is problematic without irrigation or as the result of high salt content. For about 10% of the total area, waterlogging is common in poorly drained soils.

In mountainous areas such as the Andes, slopes are often steep, and shallow soils consisting of imperfectly weathered rock fragments abound, accounting for another 10% of the continent's surface. Nevertheless, organic soils can be found in the inter-Andean valleys and on some of the foothills, but these are often shallow and subject to seasonal flooding.

Soils developed on volcanic material can be found in many parts of the continent.

Naturally fertile soils, therefore, extend over only about 10% of the surface. The most important of these are the deep, dark-coloured prairie soils and the heavy Vertisols. The Argentine Pampas, one of the largest cultivated area on the continent, is uniformly covered with soils that have developed from fine-grained, calcareous, wind-borne sediments which are rich in nutrients. In urbanised areas and near large mines, Technosols (soils containing material derived from industrial processes) can be found. However, their extent is too small to be visible on the scale of this map.

[www.fao.org/ag/agl/agll/wrb/doc/wrb2006final.pdf](http://www.fao.org/ag/agl/agll/wrb/doc/wrb2006final.pdf)



Map produced by JRC based on SOTER LAC data (FAO/ISRIC, 2006)



Soil is our life-support system. It delivers food & fresh water, recycles wastes, stores carbon, etc. Decision makers need good baseline information about soils – for planning, investment, management and reducing land degradation. The **Sociedad Latinoamericana de la Ciencia del Suelo** is a network of national societies that aims to consolidate and promote knowledge on soils by enhancing the expertise of soil scientists (training process), lobbying political institutions for a better consideration of soil aspects by decision makers (soil protection and conservation) and ensuring widespread diffusion of soil-related information to both specialists and the general public. See <http://www.slcs.org.mx/> for further details.



The mission of the Joint Research Centre (JRC) is to provide customer-driven scientific and technical support for the conception, development, implementation and monitoring of EU policies.

As a service of the European Commission, the JRC functions as a reference centre of science and technology for the Union. Close to the policy-making process, it serves the common interest of the Member States, while being independent of special interests, whether private or national.

The Institute for Environment and Sustainability (IES) is one of the seven scientific institutes of the JRC that provide scientific and technical support to EU policies for the protection of the European and global environment.

<http://www.jrc.ec.europa.eu/>  
<http://ies.jrc.ec.europa.eu>

## THE EUROCLIMA PROGRAMME



The EUROCLIMA regional cooperation programme aims to encourage cooperation between Latin America and the European Union on the problems and consequences of climate change, particularly in view of integrating these issues into sustainable development strategies.

Funded by the European Commission's EuropeAid Development and Cooperation Directorate-General, the project investigates techniques for improved information and data sharing systems on scientific and socio-economic matters concerning climate change issues (and cross-cutting linkages) together with capacity building to strengthening the technical capacities of national and regional decision-makers and scientific community of Latin America and the Caribbean.

This calendar and the related Soil Atlas of Latin America and the Caribbean are initiatives to raise the awareness of the importance of soil to society and the overall environment while highlighting the consequences of climate change and the need for the sustainable use of soil resources.

## SOIL

Located in Ispra (Italy), the JRC's Soil Action provides scientific and technical support to European Union strategies for the protection and sustainable development of soil.

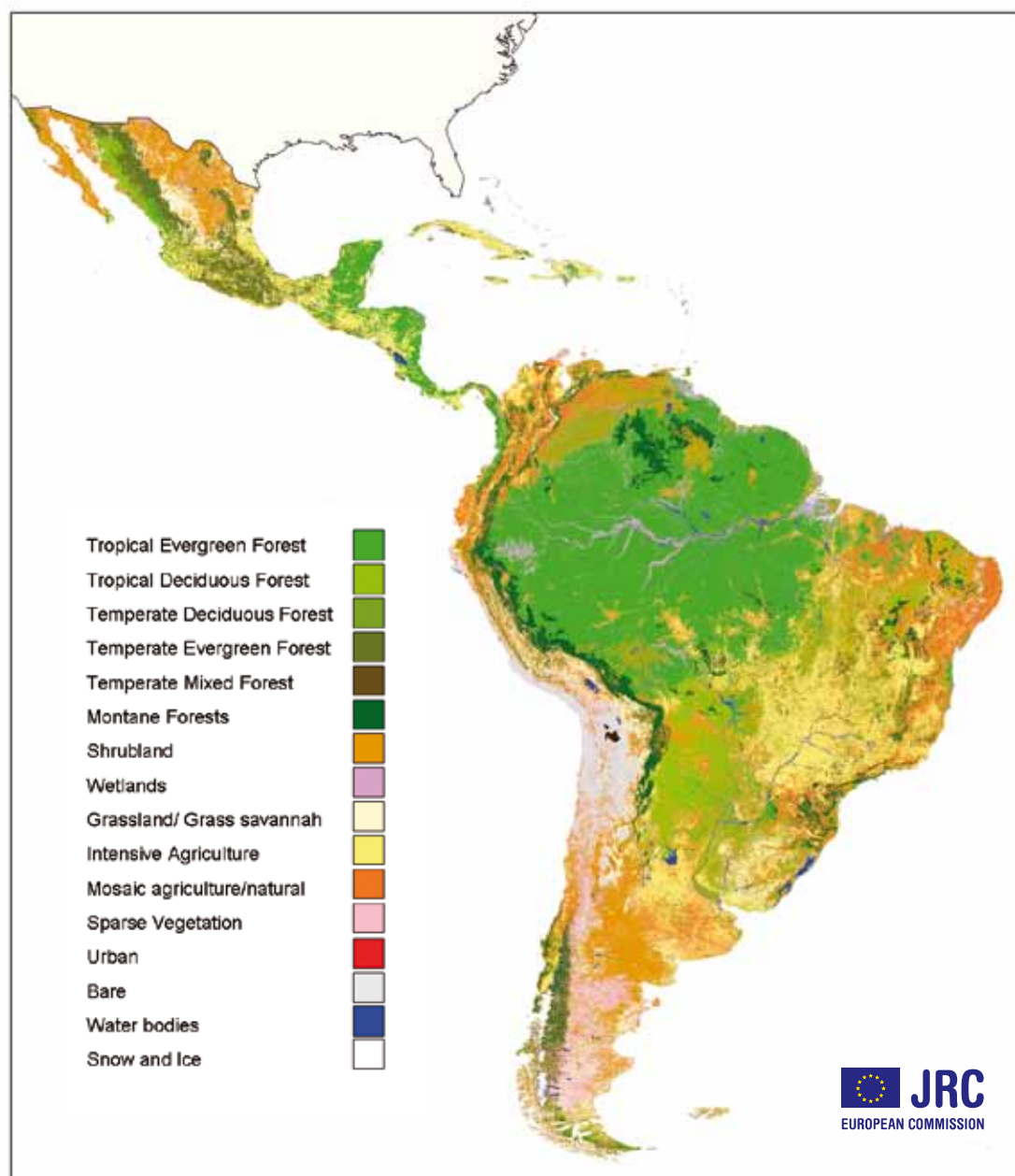
In line with the JRC mission, the Soil Action works in close collaboration with inter-governmental organisations, official laboratories, research centres, universities and industry within the EU and globally, and provides a single focal point for soil data and information for the Commission.

In combination with a sound scientific base, extensive data collection and modelling skills, the Soil Action is in a strong position to contribute to the implementation of the European Research Area and the sustainable management of soils.

SOIL Action  
European Commission Joint Research Centre  
Via Fermi I-21020 Ispra (VA), Italy

<http://eussoils.jrc.ec.europa.eu>

## LAND COVER MAP FOR LATIN AMERICA AND THE CARIBBEAN FOR THE YEAR 2000



The European Commission's Joint Research Centre (JRC) gratefully acknowledges all contributions to the making of this calendar.

Arwyn Jones, Sara Barceló, Ciro Gardi, Luca Montanarella, Peter Schad, Juan Comerma, Olegario Muñiz, Pavel Krasilnikov, Ronald Vargas, Arnulfo Encina Rojas, Carlos Cruz Gaistardo, Rodrigo Ortega Blu, Carlos Castilla, Marta Fuchs, Wenceslau Gerales Teixeira, Etelvino Henrique Novotny, GEM Unit-JRC, Instituto de Investigación y Posgrado – Universidad Católica Agropecuaria del Trópico Seco (IINPO-UCATSE), Julio Nazario, Otto Spaargaren, Patrocinio Alonso Jara, Maria de Lourdes Mendonça Santos Brefin, Alberto Hernández, José Espinosa Marroquín, Manoel Batista de Oliveira Neto, Juan M. Pérez, Julio Alegre, Roosevelt Garcia, Cristine Carole Muggler, Stephan Mantel and Grainne Mulhern.

The soil data displayed in this publication have been adapted from the Soil and Terrain Database for Latin America and the Caribbean (version 2.0) - scale 1:5 million, FAO/ISRIC.



Michela Merlo

Ancient terrace systems near Machu Picchu in Peru. Terraces are used to cultivate hilly or mountainous terrain in order to decrease vulnerability to erosion and surface runoff.