Spain C II

International Soil Museum
Utrecht, Netherlands.

SOILS OF THE MERIDA REGION

1. ENTISOLS

These are primarily young soils in recent alluvium or on recently eroded slopes. Or they may be soils in older parent materials resistant to alteration.

In the Merida region Entisols are to be expected on the valley bottom of the Guadiana and Guadajira rivers. They may be sandy (Psamments) or loamy and clayey, showing stratification (Fluvents). Entisols may also be found on the slopes in the undulating areas on quartzite, gneiss and igneous rocks (shallow Orthents). Entisols on granitic rocks, producing great amounts of quartz grains on weathering are sandy (Psamments).

	Suborder	Great Groups	Subgroup
1.1	Fluvents	Xerofluvents	Typic
			Aquic
1.2	Psamments	Xeropsamments	Typic
1.3	Orthents	Xerorthents	Typic
			Lithic

1.1 Fluvents

These are well drained soils in stratified alluvial deposits. They lack diagnostic horizons other than ochric. Stratification is evident from the organic carbon content, which decreases irregularly with depth. Only Xerofluvents are recognized in the Merida region. The soils of the Aquic subgroup differ from those of the Typic in being saturated with water during some period of the year within 1.5 m of the surface.

1.2 Psamments

These are well drained sandy soils in alluvial deposits or in weathered granite or quartzite. Only Xeropsamments are recognized in the Merida region. The soils of the Typic subgroup are deeper than 50 cm, without evidences of clay illuviation or mottles.

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1.3 Orthents

These are primarily Entisols on recent erosional surfaces. They are frequent on slopes and they may have a great variety of parent rock. Only Xerorthents are recognized. The Typic subgroup has well drained, moderately deep soils. The Lithic subgroup has shallow soils, with a lithic contact within 50 cm of the surface.

2. VERTISOLS

These are the cracking clays, mostly montmorillonite, that shrink and swell over the seasons, and that have wide and deep cracks in the dry season.

In the Merida region extensive outcrops of calcareous Miocene clay deposits occur. X-ray analysis of this clay revealed the presence of 2:1 expanding lattice clay minerals, which determine the genesis of Vertisols.

It is thought that, after the incision of the valley system, great quantities of the Miocene clay in the form of mudflows have moved to the lower parts of the landscape, including great parts of the Guadiana and Guadajira valleys (Goosen, 1973). Consequently, Vertisols may be found in the uplands north and south of the Guadiana valley as well as in the lower parts of the landscape, which have been covered by mudflows.

Suborders of the Vertsols have been defined by the seasonal pattern of opening and closing of the cracks in the soil, which is closely correlated with the soil moisture regime. Considering the climate of the Merida region, it may be expected that the cracks open and close once each year and remain open for at least 60 consecutive days in the summer.

Suborder	Great Group	Subgroup
2.1 Xererts	Chromoxererts	Typic
		Entic
	Pelloxererts	Entic
		Aquic Entic
		Chromic Entic

2.1 Xererts

Two great groups are recognized. They are separated by colour differences, that are thought to be correlated with differences in the moisture regime.

Chromoxererts have moist chromas of 1.5 or more in the upper 30 cm. These generally have somewhat better drainage than the Pelloxererts, usually found on nearly level slopes or in depressions. The Typic subgroups have soils with low colour values, without mottles. Entic subgroups have higher values. Aquic subgroup has mottles within 50 cm of the surface. Pelloxererts with chromas of 1.5 or more at depth are Chromic.

3. INCEPTISOLS

These are soils with one or more diagnostic horizons that can form rapidly, such as an ochric epipedon and a cambic and petrocalcic horizon.

Although the Merida region has dry summers, there is appreciable precipitation in the cool season. Therefore it may be expected that many soils, in widely different parent materials, have developed beyond the stage of the Entisols. The most common horizon sequences which can be expected are an ochric epipedon over a cambic horizon or a calcic or petrocalcic horizon.

All Ochrepts in the Merida region are Xerochrepts. The Typic subgroup has thick well drained soils without calcic horizon unless at depth. Many Xerochrepts in the Merida region are thin or have shallow or very shallow clacic or petrocalcic horizons. Or they have some characteristics common to Vertsols. The following subgroups may occur: Lithic, Calcixerollic, Palexerollic and Vertic.
However , for mapping purposes an adapted classification has been introduced by ITC for these soils in recent years.

4. ARIDISOLS

These are the soils that have no water available to mesophytic plants for prolonged periods.

Although the Merida region has dry summers, the precipitation in the winter season is appreciable. It can therefore be expected that no Aridisols do occur.

5. MOLLISOLS

These are the soils with a mollic epipedon. They are usually formed in calcareous parent materials.

In the Merida region calcareous materials do occur. However, the climatic conditions are not optimal for the development of Mollisols. Only if the carbonate content of the parent material is high, the accumulation of organic matter may be sufficient to qualify the surface horizon as a mollic epipedon. Even then, man has been active in the region for many centuries, which has in many instances resulted in the erosion of the surface horizons.

Most Mollisols in the Merida region have a xeric moisture regime (Xerolls). Some are formed from limestone and have fragments of the parent material in the epipedon (Rendolls).

Suborder	Great Group	Subgroup
5.1 Rendolls		Typic
		Lithic
5.2 Xerolls	Calcixerolls	Typic
		Lithic
	Argixerolls	Aquic
		Vertic
		Pachic
	Haploxerolls	Aquic
		Pachic

5.1 Rendolls

These are Mollisols formed in highly calcareous parent materials; having a mollic epipedon not more than 50 cm thick. They have fragments of limestone in or directly below the epipedon. They have a udic moisture regime.

The Rendolls have not been subdivided into great groups.

The Typic subgroup has soils with a lithic contact deeper than 50 cm from the surface. If shallower than 50 cm the soil is representative for the Lithic subgroup.

5.2 Xerolls

These are the dry Mollisols that have a relatively thick mollic epipedon. Xerolls with a calcic horizon within 1.5 m from the surface are Calcixerolls. Argixerolls have an argillic horizon. Others are Haploxerolls.

Lithic subgroups have a lithic contact within 50 cm from the surface. Aquic subgroups have mottles within 75 cm depth. Pachic subgroups have a mollic epipedon thicker than 50 cm. Vertic subgroups have some characteristics common to Vertisols.

6. SPODOSOLS

These are the soils with a spodic or placic horizon. They occur in humid environments only. Although there is an appreciable precipitation in the Merida region, it is not sufficient for the formation of a spodic horizon.
Consequently, the occurrence of Spodosols is unlikely.

7. ALFISOLS

These are soils that have a horizon of accumulation of illuvial clay. The base saturation exceeds 35 percent throughout the soil or at depth.

The Mediterranean climate of the Merida region, resulting in a xeric moisture regime, is particularly effective for leaching, including the translocation of clay. It is therefore to be expected that Alfisols have a wide occurrence on a great variety of parent materials.

Alfisols showing characteristics associated with wetness are Aqualfs. All well-drained soils are Xeralfs.

Suborder		Great Group	Subgroup
7.1. Aqualfs		Ochraqualfs	Typic
		Umbraqualfs	Typic
7.2. Xeralfs	1	Haploxeralfs	Typic
			Aquic
			Calcic
			Lithic
			Mollic
			Vertic
	2	Rhodoxeralfs	Typic
			Lithic
			Vertic
	3	Palexeralfs	Typic
			Aquic
			Lithic
			Mollic

7.1. Aqualfs

These are the grey and mottled soils that have an aquic moisture regime. Ochraqualfs have an ochric epipedon and Umbraqualfs have an umbric epipedon.

7.2. Xeralfs

These are mostly reddish coloured Alfisols that are dry for extended periods in the summer, but in many of them moisture moves through the soil in the winter to deeper layers. If they have very red colours with hues redder than 5YR they are Rhodoxeralfs.
Palexeralfs either have a petrocalcic horizon, or they have a very thick argillic horizon, or they have an abrupt textural change from the overlying horizon to the argillic horizon. Haploxeralfs do not have such a strongly developed argillic horizon.

7.2.1. Haploxeralfs are the relatively thin reddish to brownish (but not dark or dusky red, see Rhodoxeralfs) Xeralfs that have a clear or gradual upper boundary to an argillic horizon or have a loamy particle-size throughout the argillic horizon. Parent materials may be acidic or basic, but are rarely as basic as limestone or basalt.
The Typic subgroup has freely drained soils that have little organic matter, are deep or moderately deep to hard rock, and have a high base saturation. The Aquic subgroup has mottles within 75 cm of the surface, the Calcic subgroup has a calcic horizon, the Lithic subgroup has a shallow lithic contact. The Mollic subgroup has dark colours and a high content of organic matter, but not sufficient to qualify the horizon for a mollic epipedon. The Vertic subgroup has soils with some characteristics common to Vertisols.

7.2.2. Rhodoxeralfs are the more or less dark red Xeralfs that form on limestone, basalt and other highly basic parent materials. As a group they are remarkably uniform in virtually all properties except the depth to rock. They have an argillic horizon that in all parts has colours in hues redder than 5YR and moist values of less than 4 and dry values no more than 1 unit higher than the moist values.
For the subdivision into subgroups the same criteria as for the Haploxeralfs are applied.

7.2.3. Palexeralfs are the reddish (but not dark or dusky red, see Rhodoxeralfs) Xeralfs with a thick argillic horizon. They are supposed to be very old soils.
Palexeralfs have a petrocalcic horizon or they have a very strongly developed argillic horizon that is characterized either by its thickness or by having an abrupt textural change from the overlying horizon to

the argillic horizon, or both.
For the subdivision into subgroups the same criteria as for the Haploxeralfs are applied.

8. ULTISOLS

These are soils that have a horizon of accumulation of illuvial clay, the base saturation is less than 35 percent and decreases with depth.

They generally occur in geologically old areas, with high precipitation. Since such areas do not occur in the Merida region, the occurrence of Ultisols is unlikely.

9. OXISOLS

These are soils that have oxic horizons - almost completely weathered residual concentrations of free oxides, 1:1 lattice clay minerals and insoluble minerals such as quartz.

They occur mostly on ancient or very old geomorphic surfaces. Since these do not occur in the Merida region, Oxisols cannot be expected.

10. HISTOSOLS

These soils are dominantly organic, such as bogs, moors, peats and mucks. Histosols are saturated or nearly saturated with water most of the year, unless they have been drained.

These soils do not occur in the Merida region.