THE USE OF IDENTIFICATION KEYS IN DISTINGUISHING INDIVIDUAL SOIL CATEGORIES

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Many readers will be familiar with the use of botanical identification keys in floras for making precise determinations between plants of differing species. For those unfamiliar with this means for identification; a key consists of groups of a number (usually 2 or 3, sometimes more) of diametrically differing characters. Starting from the first group, the investigator is required to choose the particular character relating to the plant under investigation. The right hand column of the page opposite the appropriate set of characters indicates, either the number of the next group of characters to be consulted or, if differentiation is completed, the name of the plant.

The criteria used to specify plants are founded upon a genetic concept of evolutionary progress, closely related plants having similar floral structures. Thus plants may be distinguished by such features as the way the flowers are borne, the position of the calyx and the ovary, the shape of the corolla, the number of stamens, the nature of the style, and even such microscopic features as the number and arrangement of ovules in the ovary and the number of ovary cells. Often however, botanical keys are "artificial" in the sense that they are designed to facilitate identification using a minimum of 'proper' botanical characters.

In contrast to the specific discontinuities exhibited by plants, soil forms a geographic continuum with imprecise boundaries, one soil series merging into its neighbour as external circumstances alter (eg. drainage). The essential soil series is therefore purely conceptual and actual examples may differ from the modal concept by varying degrees. To differentiate soils therefore, it is vital that the soil individual has a precisely defined and exclusive permissible range of properties (parameters) to enable the observer to make a clear distinction between one unit of soil and another.

The "7th Approximation" Soil Classification (U.S.D.A.; 1960) may be regarded as being the most advanced at least in terms of comprehensive coverage. This scheme has sought to divide soils, in the lower orders, into Subgroups, Families and Series, based on observable or measurable soil properties: it may be regarded as showing a morphological bias, though the selected properties may themselves have a critical influence on genesis. The point is, though, that soils and plants differ in that soil material is a continuous and passive medium which is influenced in its development by external agencies subject to universal physical laws; whilst a plant is a discrete entity evolving haphazardly, as it were, by means of the natural selection of mutations, and is related to other plants by a variously remote but common ancestry.

Consequently, differentiation of soils by means of a key demands the employment of rigorously selected properties, each having an exclusive range of values. These parameters need not be complex: they may comprise easily observable morphological traits, such as depth, drainage, and texture; or properties that may be simply measured in the field (eg. sub-soil permeability).

The author (in the Press) has suggested some significant parameter ranges for grouping soils in East Africa. Provided that these parameter ranges are exclusive to the soil in question, a soil key may be readily constructed to facilitate identification. With this, a soil may be readily distinguished in the field by non-specialists.

The example given below is applicable to soils in Kwale District, developed within the Coastal climatic belt, on Maji-ya-Chumvi, Mariakani and Mazeras sandstones and siltstones, together with the varied and more superficial forms of the so-called Magarini "Sand" (Caswell; 1953). For ease of reference, a numerical classification was used in grouping these soils. We shall not embark upon a discussion of the character of the soils themselves, since the purpose of this paper is to illustrate the practical value of soil keys. For further details of these soils, the reader should refer to the relevant survey report (Makin; 1968). Suffice to note that a close correlation was found between the texture of the parent rock, the shape of the landscape and the nature of the soils, these latter being locally though profoundly modified by colluviation and by lateral acid seepage.

Only the well drained and the very poorly drained (nonsaline-nonalkali) soils are presented in the accompanying soil key.

REFERENCES

CASWELL, P.V. 1953 "Geology of the Mombasa - Kwale Area" Geological Survey of Kenya. Government Printer, Nairobi.

MAKIN, J. 1968 "The Soils in the Country around Shimba Hills Settlement, Kikoneni and Jombo Mountain." Soil Survey of Kenya. Dept. of Agric. Report.

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SOIL KEY

KEY NOS.		
(1)	Rock outcropping; or occurring frequently in the surface 90 cms.	(2)
	Rock absent; or rock present below 90 cms.	(3)
(2)	Sedimentary sandstone or siltstone present	SOIL 3
	Altered sandstone or agglomerate present, forming conical peaks or steep ridges	SOIL 13
(3)	Well drained soils and gravels of hilltops, ridges, hillsides and elevated terraces; also imperfectly drained soils of high lying situations where mottling is permitted below 45 cms. if unaccompanied by glei. Subsoils normally uniform red, brown, yellow or whitish. Surface organic matter less than 2½ %	(4)
	Seasonally poorly drained soils of hillsides, lower slopes and lower terraces; evidence for impeded drainage within the surface 90 cms. i.e. distinct mottling normally accompanied by glei below 45 cms. In sands, loamy sands and coarse sandy loams, mottling alone is evidence of this degree of drainage impedence.	SEASONALLY POORLY DRAINED SOILS
	Very poorly drained soils of lower slopes, lower terraces, valley basins and swamps; evidence for periodic standing water; or glei within the surface 60 cms. Topsoils may or may not be mottled. Sub-surface horizons prominently mottled. Surface organic matter exceeds 2½ %.	(13)

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KEY NOS.		
(4)	Sheet gravels present within the surface 60 cms. and persisting to depth; often overlying laterite.	SOIL 12
	Sheet gravels absent; or present below 60 cms.; or present in thin intermittent layers.	(5)
(5)	Slope exceeds 8°	SOIL 2
	Slope less than 8°	(6)
(6)	Surface texture of light clay	SOIL 6
	Surface texture of sand, loamy sand or sandy loam. Texture at 90 cms. not heavier than sandy loam. Soil does not normally become significantly heavier with depth. Subsoil hues are brownish, yellow or white.	(7)
	Surface texture heavier than Coarse loamy sand and lighter than clay. Soil becomes significantly heavier with depth (i.e. at least one textural grade heavier). If the topsoil is loamy sand, the subsoil (at 90 cms.) should be heavier than sandy loam unless subsoil hues are dominantly Red (i.e. 10 R or 2.5 YR).	(8)
(7)	Coarse whitish sands and loamy sands. Natural vegetation obviously subject to drought.	SOIL 14
	Reddish yellow to light brown sandy loams (some horizons may be loamy sand). Natural vegetation not obviously subject to drought.	SOIL 4.
(8)	Top soils of fine sandy loam, fine sandy clay loam; or more silty than this.	(9)
	Topsoils coarser than fine sandy loam.	(11)

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KEY NOS.

(9)	Imperfectly drained with distinctly mottled subsoil. Strongly acid silty soils highly susceptible to erosion. Only in certain major valleys in Shimba Hills. Not cultivated.	SOIL 8
	Well drained, with uniform or only faintly mottled subsoil. Not particularly susceptible to erosion. Fine sandy loam or sandy clay loam overlies fine sandy clay or clay subsoil.	(10)
(10)	Soils of relatively high base status derived from fine sandstone which may be encountered below 90 cms. Gravel layers often present below 60 cms. Subsoil otherwise uniform red or brown without mottling. Moderate fertility	SOIL 10
	Soils of relatively low base status derived from coarse sandstone. No gravel layers nor stones within the surface 150 cms. Subsoil normally red or brown with fine yellow mottles at depth. Low fertility.	SOIL 7
(11)	Topsoil of medium or coarse sandy loam of colluvial origin. Subsoil sand fraction fine grained (fine sandy clay loam, fine sandy clay or light clay). Often overlying gravel at depth.	SOIL 10
	Topsoil of medium sandy loam to coarse loamy sand. Subsoil sand fraction coarse grained. (Coarse sandy loam to coarse sandy clay). No subsoil gravel.	(12)
(12)	Topsoil of coarse loamy sand to coarse sandy loam. Subsoil dominantly red (10 R or 2.5 YR) coarse sandy loam to coarse sandy clay loam.	SOIL 5
	Topsoil of sandy loam. Subsoil red to yellowish brown (10 R to 5 YR) coarse sandy clay loam to coarse sandy clay.	SOIL 1

KEY NOS.

(13)	Open swampland, vlei and periodically flooded coarse textured and acid alluvium of steep valleys.	SOIL 80
	Very poorly drained, yet soil surface normally dry.	(14)
(14)	Acid profile dominated by the coarse sand fraction. Coarse sandy at surface, or in the subsoil or in layers throughout.	SOIL 80
	Fine textured profiles. Loam or heavier throughout with significant quantities of silt.	(15)
(15)	Acid to neutral gleied subsoils of clay loam or clay with abundant prominent red or brownish yellow mottles. Gravels may or may not be present	(16)
	Alkaline clay glei subsoils with common distinct brownish yellow mottles; and distinguished by concretions of Ca and Mn or by "Lime" spots; overlying some gravels below 90 cms.	(17)
(16)	With sheet gravels within the surface 90 cms.	SOIL 82
	Only a few pieces of gravel within the surface 90 cms.; or gravels absent.	SOIL 81
(17)	Topsoil of loam or clay loam.	SOIL 83
	Topsoil of clay.	SOIL 84