

Soil Atlas of Africa

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Joint Research Centre - Soil Action



Aims of the atlas

Soil in Africa is generally undervalued – especially by policy makers.

To raise the awareness of the general public, policymakers and other scientists of the importance of soil in Africa – EC/JRC Soil Atlas Series

To provide educational material to schools & university.

To support EU policies and instruments for Development and Aid Assistance.



Specifications

High quality reference work on the soil of Africa

Written for general public, policy makers, environmental science, educationalists...

Not aimed 'primarily' at soil scientists.

Informative, easy to read, graphically stimulating

Lead to a better understanding and appreciation of the importance of soil in Africa



A collaborative initiative of the European Union to support and encourage the sustainable use of soil resources in Africa

Joint publication by JRC, AUC, ASSS, FAO, ISRIC and scientists from both Africa and Europe



Editorial Board



Approach: Maps

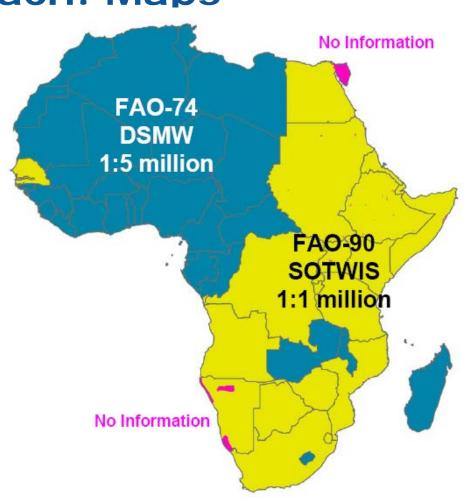
Harmonized World Soil Database (HWSD)

Soil mapping units – use of dominant soil types

FAO 74 and FAO 90 classifications 'translated' to WRB

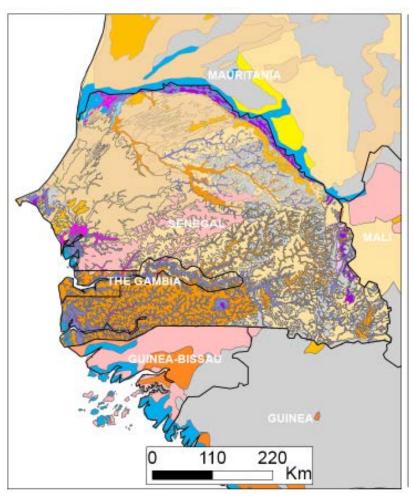
Key properties: texture, Ph, organic carbon, water storage capacity, etc for soil characteristics maps

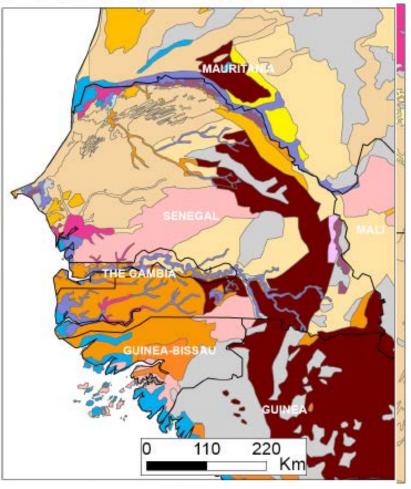
Additional updates

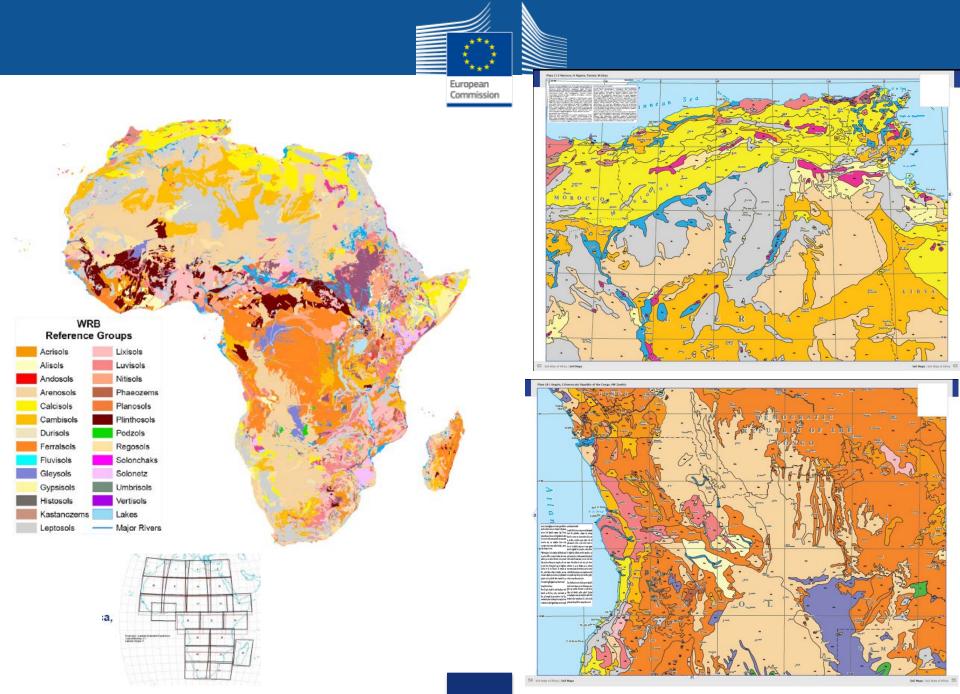




Mapping









More than just maps

Introduction

What is soil

The role and importance of soil

Soil forming factors and the African environment

Soil processes

Soil functions

Soil and Food Security

Soil assessment/land evaluation

Introduction to soil classification

Development of soil classification in Africa

Indigenous soil classifications

WRB: a harmonizing approach

Major soil types of Africa

African soil in a global context

GIS/African soil databases

Soil of the regions

• Soils of the Mediterranean region, deserts, Sahel, rainforest, highlands and mountains, south, wetlands and valleys

Case studies on African soil

- Strengths
- Weaknesses
- Opportunities
- Threats

Future perspective/challenges/conclusions

Additional information

Soil maps



The role and importance of soil

Sail or through record two but that recording our environment and responds to the pressures imposse upon is, ignored by the surjectly effull, and comes out a number of hig tanks (for a line special) to our wes-

Sal is the medium that enables us to grow our food,

One of the most widey recognised functions of soil is hamaterial in which plants grow. In term, many of these plants are used by people-directly as fixed (i.e. craye), as feed for enthale or fix fibro (energy). Foed security to a tery to also in Africa. Within many present have naturally productive dolls, many African famests puppersony marconed sol fertite by practising stirting cultivation or analyting chemical functions on then fields. However, economic and spicer car pools birrecent years have been a decline in seek published striting agriculture spatiers and income to accept and agre-chericate. Accidences, sony agent in Africa force enversi reliation of this seguing trassure they are: sholow, Lee wat and lasting in summing. Exercise stimute zumennen der brospusi estvic om tim analyzably of espectative remembers in the and recoaspellicands. In tros. dry engines, the mast, productive agricultural volta are to be found along the magic men velitos er arconol wellow como

But its a recurse filter and regulator of water fore

three of the time that the thirty of parties to be set up a parties. purfication system. Oversime, soil too the ability to the, absorbant constant autobacca. Chemical compounds that are dragged at only in \$ whoi. agenter with raceas a pra-off envision, carriers trapped. thus unwesting their fram reacting chair women suppress nutrativisty, consuminated can be deglated se actions de made unaviolades rapporta and animals Strough a rain perof terogradite micel processes. However, high levels of toxins or severe solidographic sanialist optioners processes beging to a top of this

But make a tre requirer of vecor flow district about much of the set that belt on it, but the amount vento eccostrio lo testure, a midure, caparacimente sentent and regelator caver. Next abusined on my selector grown or wordens and these secrept and serve book was much out 10 You'll be industry on write Set also acts like a tap, turning water flow on and all by alturnigant releasing water for plants when needed Urban planners now realise that the seating of set by manage such as concrete and applicit, ogether with compaction of the sebsor, is a significant Nober in floor covered. Any reduction in the capacity of soil influence will lead to increased oversed flow this topic canadier of a mini to river channels. Scopling and ergecon.



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A spring is a feature in the landscape whom the water table reached the surface. Oncordive tendlecharges han the soil to from the passeriew of streams and even doing by periods.

Soil protects our buried heritage of archaeological and historic remains from planage and depletos

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Secret provide their entitles on observable flustrations nimely and anytom point condition

Boll is the environmental engine more where dead portions solved theses and other require matter are decomposed to provide numbers for the growth of

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Directo files great death, and local new above. processes type and intensity, it is difficult to deprivately characteristic features of these values a single photograph. The graphic better states a shypathesises bootly warehoust profile. From the bess.

The latinships of the most harms front between the period material [4] and the regulative discontinued by the period of acquired [6] or delayly recolumn. bed solv. If showild be noted that on exerts had roots (such as irrestorie basels gabbits delecte), the sandle law is sensely assen.

If conditions allow, the copyright pay prode is to an nch plantife herzon 🖸 (see page 24) or. If the vestigenous very interest of evidence of the priorial rock shieters (blocks, joining wolling atc) will he. been abliterated to taris a horropereous matrix IDI.

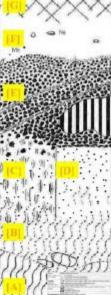
The sacrolle layer may be everlied by upper horizons of residual gravels for reaction plottere (some sines) retire will ruse belonitely excludes of incomplete or resisted quartif tragments from the power restaining

This mits on a presidented by construct soils or transported constanties deposited in the fact 1 million years [6]. This come toyon may continue store tools from the Stone Age (which allows har sechnertexion to see states) and is copped by a serious layer containing. proposition of the ICI.

Transfers of the notice of dispose, seems deads arraison or spill of the least-copy can give the to-torange of different secondary parent materials, hence different and types. Soits farmed in the cover or after align function in the gravet, show tensition changed at dice. True of the supporte remits in a payent numerial or right for the formation of Hackettovich, highly-acidic sole, where so desper truscelor, reading the lower exploits, exposes material wherethe evidence of soil development is sinually about

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A tapophysion share's enactional conjugate from the Couple nin. Zimez'nin (S. Gerosa, 1967) se penting/interasion. Zine Chepo (Minchesa). Zin oteopriston epian pentina. Hammori F.F. oc- 305



Fidingled processes

A sed as as key sail toming processes would not be semplate without some reference to the releast fluing separation. I for easingly, budged activity, expecially made, are been recognised to being an important factor in requiring soil procession and theesby soil profile development - ranging from the physicist breaks plot bedrook by costs, authiest cycling and biotorbation to the bacterial dediruction of day

to a bond serial meanth of organization the solice dowly linked to direct. Distagged actions in traffiabout in hist, day depart regions. In the temperatures te invanvest pandhara badteral absorras shoe is influent and organic matter accumulates. In the warm and well conditions of the trapics, bacterial and hinged

is compared to as its missing elements, bodinos es d Not no consulter delt a seat east errannel rac processes by tookiding the transfer of water and air dougherous and drawels. In the travers treates and arts play the major rate in extent racycling and the reduct districts of soil material. The movement of particles of subscript the suitage by families is used. hammen I potons recognisible for the homogenises profiles that are typical of tropical soils.

As excisi insects, leaniles low in colonies had carprint p transmit arise included: intopos soverness, termite coboles can be several metres fruit and display guite a complex interest introduce. Display have shown that the scientiation of the mounts is: existed to their managulation and the flow of air made the colony. These are named to so stear the board. The stage of the manufacturery detendent to species of termina in the manny in the wall provident desput frames of Word Africa, Services, inhabit mil times and instructions. In Process more, Troy is necessary submed motioned in the flucture submed flucpoole it on the walks or plug skill spitenes. Eventwally, a round of soil pertides builds up to cover he wood infer a, the wood decays to leave a landscape comening territor accepts which any possible cally have of territors on they have lift the next before the wood structure of legand

This secular divergespt stones at 8 once as one Analysis service resembles the break of DN Onego and James, Analysisal studen have clearly demonstrately that Erguagosky aredio to na geof Norman te etian of hospithonelle. Contented to firm specialists ianais, semile atuciose proceso a significanti; investe Nighera monte 27 day oriendo and a sum preste (AS), amino single value (act of young





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Commission

3. Climate

Sali formation depends enumerically on the climate as temperature and mointure levels affect weathering processes and biological activity.

With the equator name through its middle, Africa has the largest triplical area of any continent and about 10% of the land area lies within the triplica. In ocurries south of the equator, the pressure are appeals of those of countries that he north of the equator. The broad disserts pattern of Africa is driven by its position around the equator, the impact of cool scens currents and the absence of manufair chains centry as climate barriers. Seven main climate cover can be derived and

When hand some around the equator where annual middle exceeds 1,300 mm - covers 14% of Allian (To the north and the south is a sub-base) if anyways consensity around rainful between 600 mm and 1,200 mm, occurring 35% of the land area. The rainful is increasingly assessed in relation to distance from the

A semi-seld rappe zone with an exercise minist equating or been then 600 mm which falls in only in the mer mendia, covers \$50 of the total land area; A day desert power occupying nearly half of the Aldour land neer (47%). Amount mindel in empty with less than 100 mm presipitation - in some areas this is zero. Daily and seasonal removes of temperatures are greet with the everage number temperature greater than 20°C.

A Mediterranean climate in the extreme north and southwith high temperatures in the screener and ween materials and winter march swith rainful. In the highlands of eastern Africa, particularly in Kergerand Uponda, religial is well-distributed throughout the year and temperatures are equable. The high places of southern Alice has a comparete

On a few high managain promite, a polyantic dimencan be found, even on the equeue

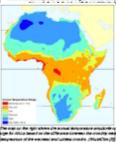
Annual Temperature Range Temperature and fluctuations in temperature have important bearings on soil forming processes. The map on the right shows the arroral temperature amplitude or range for Africa based on the difference een the monthly mean temperature of the warment and coldest months. This change depends or the annual sycle of incoming entermediation, which in turn-depends on the latitude, altitude and provincing of

What is show in that the continent of Abica solubins tremendous varietiens in annual temperature ranges. The map clearly shows an almost mirror art of consi nations either side of the equator. The differences in the extent of the patterns in controlled by the shape of the continent broad in the north while receive to a point in the south. The region with the least variation is the exceptodal some. While a significant gree displace a modest fluctuation of between 11 - 10°C, the range for the county bines of the Gulf of Guines and easter DR Congo is only around 5 - IPC. Traveling every from the equator. the more temperate climate of the the several regions, the Sahel, the Maghest and large parts of acathem African are steady evident. What may exprise many people is that the that the main desert regions display high temperature ranges with parts of the Sahara registering variations in more of 60°C. This is around by a set of compare high pressure cells over the tropic of Cancer which give rise to to cold wireons (c. 13°C) and hot occurrence (r-45°C). Secondal in wireon is commonphies in parts of the High Atlan Macresine of Marrocco.

The mogical denote the areas on the Earth where the Sun is directly overload at least once during the enter year. It is finited by the Tingle of Cancer, at chapters 20" 26" 26" M. and similarly by the Tropic of Capdoon at 29" 26" 16" S.



Material foliations are ment or the classes, and the hundring and particular interest the content of the owner in area. Again per and of Alban has a singular distance with 10 17 months of hundring. The remaining care appelments of the classes of white owners in the alban content of the classes of the content of the classes of the clas description, altitude and rathe timilated restricts produce disclosive regularitativation. Playmont, the climate can restor specially may provide a description or contains. Contain charge, expensibly included by prototyped charged in our of the sizes active laterals addressly the agreement source of the containing value must of the regular sout that for later actives across sources. Arms in the last IX years, where charges in considerate discussions of the instrument of proper (Albert IX). I "May allow these charge shows a continue of the charge in t



appe for Alice based on the Officians Learner the monthly me

respiral Convergence Zone The of the main defens of disease in Africa is a fundamental state of the Color of the main defens of disease in Africa is a fundamental state of TCE). Whole originating from high pressure cells in the notifiers and southern hamily have come together. over the equator, where they heated by the sun and driven speeds. This rising environment code the air. broking the moisture out, which falls as precipitation The now dry air sycles back toward the subroughts where it descends, producing and disnates at approximately 20 degrees notify and south of the equator, in Africa, the ITCZ is incested just neath of the Salvel at about 1974. Visilation in this position can result in drought conditions.



De restey of almost some in After given the in a censor directly of Ambinapes. Albeirs A flateres some use in classic while show both are an Rel common, large parts of Africa have a desay or constant allows when any use the a last than 200 mer and a offer, much from Pagelation is vary few or not actions. For the sing parents on an investigation Traylor throat is marked Conserved. e mater in promited and regarded come Economic. An province drugging, the exists of Community are different in these of



Sall provides the foundation upon which we construct our buildings, roads and other infrastructures

In addition to providing the exposs for the yest majority of framer infrastructure, and provides a range of one purposition such as alow, sands, minerals and peat. Clay is used for making bricks for construction pottery better (e.g. partherward and as the first writing medium (skey tabless)

Death is a building material that has been used for at least 0,000 years for making the walls of buildings. A weven betice of recoder, strips is daubed with a sticky material causely made from vertical, step, sand, animal dung and stress it is still an important of material in many parts of Africa and the technique is becoming popular again as a low impact correlation building technique.

Mad bridge, made of a minture of day, sitt, send and water entred with a binding material such as rice hosts. or store, are a common building material in countries. such as Niger and Mail. Dried in the sun for 25 days. they have a Metion of some 30 years.

Due to its impermedile properties, sky is used as a barrier to stop water excepting away which is very many

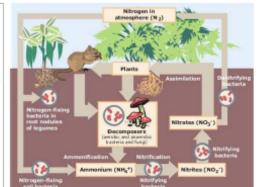
Speed and copyed deposits, half down by closes, are heavily used in the construction industry as aggregates in concrete making while send is the principal ingredient in place making and used in such bleading to show boildings and in sandhage to exce Scotley Like and gravelless countiess uses. For comple, in Africa, more reads have gravel earliests then concrete or applicable

While past can be added to sail by gardeness to improve structure and enhance and malesare reservice in some parts of ANIxa, peet is a source of fort. increasingly, people are become assure of the environmental impact of peet exploitation and are hoting for 'peasitiently' alternatives.



Above: The Class Mosque of Quartel, Max. is the largest

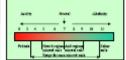
Autor Mais suit out of our brids and rech han no no манийни. Выстроизментом от того распраментом стадуру источных простооту из применя пользов. (по)



The rate of earlier the photol straiger spain.

Sols are nonetimes referred to as heavy or light. This refers to the ease with which they can be worked or Clied and depends on their testure (see borrow page 12). Heavy colls contain greater proportions of day o all particles and retain more moisture than solls with larger partition, each as eard. Consequently, they are heavier to diginto and turn than light sandy softs.

Sols are oben described as being sold or alkaline or having a certain pH value. The pH index is a number which indicates the degree of acidity based on the consentration of hydrogen ions in a solution. The pH of soil is county measured by mixing a sample of soil with delicational motors, KCI or CaCI. White the pH scale is from Cac 14, and a typically full between pH4 to pH4. with a naceral and having a pit of T. Albaire ands will range from pitfits pitfit (exergly albaires wide ngly anid nells will have a pit below t.



Soil as a regulator of the biogeochemical system

Staff place a proviet rate in a number of Measureables. neural biological and chemical cycles. Carbon, nitragen and a range of essential nutrients are referencedly recognized between the end and places. geological deposits, groundwater and the atmosphere

The intensity of these biomedianical evolutions (Name) varies from place to place and is regulated by soli characteristica fundicase and climate

The graphic below demonstrate realises systing in the rainforcest. The hot, damp possible to on the forcest floo above for the rapid decomposition of dead plant. meterial. This provides matrices to the sell that are these markets are in high demand from the nelaborate both vegetation, they do not remain in the sali for long and. Therefore, more nutrients must be supplied. This rapid consumption weens that nutrients is the soil are concentrated year to the surface. If the furnet regetation is removed, the Bow of nutrients from the respectation to the soil is interrupted and the entire quistly been their facility intertinent become extraorable to econion. The majority of steamed neinforces can only be used for agriculture if additional



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Sail the obal rate

The soli functions described on these pages are stat to life on Barth. However, not all soil types can carry them and to the same project and some are far more executable to fallow when attenues are placed an them. A clear understanding of the functional capability and parameter of different actifigms in their whether planning and managing the constraints
development of African resources.
Introduction | Soils African of African 1.1

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Next steps

Final product: hard back book of 174 A3 pages (Portrait)

Opens to A2 = Landscape spreads

Current status: advanced draft

Final review by summer 2012

Publication date: Autumn 2012

Launch event: Africa/Europe – late 2012

Low cost (€25)/Free

Format: Physical book/Downloadable (pdf / ebook / cd)

2013: Translation and publication of version Française

http://eusoils.jrc.ec.europa.eu/