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# Yemenis soil features and its geographical distribution

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## **Introduction:**

This is a study in the field of investigation in the soil of Yemen and its specifications

And methods of formation are very rare because of the lack of specialists in this research shops, as conducted limited studies in the field of agriculture and water in some important areas, especially southern and western parts and some depressions (low Yarim, and Dhamar and crossing and Sanaa). And previous studies what Ondzath Food and Agriculture Organization Mission (FAO) study different dirt models in Yemen's southern highlands of the year (1970), The (Althoroharri.s. Diwan 1978), encompassing their studies on the specification of the soil in large parts of West and south and central Yemen. A team of US experts Kortell University has also completed a study on Yemeni soil included the southern and central regions of Yemen, so there was a big procedure need further studies on Yemeni soil in terms of its activity, characteristics, spread. The study came as it is in this direction.

## **Location**

The Republic of Yemen is located in the southwestern part of the Arabian Peninsul and in the south-west of the continent of Asia as it lies between latitudes (12-19 N) and the length of the lines (556-43 E) form of (1) from the topography side Yemen consists of series dry desert, , the middle part of Yemen cover a mountain range from the south to the north has included the study area. Tehama, mountainous western

region, the lowlands region of Central, Eastern Province

#### Aim of the study

The study aims to diagnose the type and geographical spread of the soil as study areas and determine the specifications for the possibility of drawing the soil distribution map in Yemen dependence on its type.

#### Method of study

they took this rectangular pits in the areas referred to in the study, was dug by hand through the drilling machine Statistics, to prevent deformation horizons and classes in every longitudinal section within the rectangular hole and front of the sun in order to be seeing horizon clearly and also distinguish colors. Then use the Gazetteer colors (Munsell) to see all the colors of the horizon accurately.

The study has two syllables in each region and compare the prospects jurist to prevent differences in each region. As used diluted hydrochloric acid (1N) to determine the proportion of carbonate in each horizon.

The height of each longitudinal section level ((Profil is uneven, has stopped drilling into the ground water level in each section and each region.

#### Geographical distribution

1. Tihama region: the region is located in the western part of Yemen and stretches the limits (500 km) and the width range between (20-60 km) and is a flat plain increasingly rising gradually toward eastward to the mountain blocks if rise up to (200-250 AD ) and the plain ends with large valleys like Moore and arrows and Srdod and Zabid and abandoned valleys. sandy terrain permeates the valleys like Kalprkhanat and Alyak rocky base consists of torrently dredgeds and windy specifications and generally consists of micro crumbs Lucy and semi Lucy, in the upper part but the water torrently dredgeds such as gravel, sand, mud and silt are deployed at the bottom. It was studying soil section in the main valleys of the region, which is the Model site in the section at Wadi Zabid in Bani example after (5 km) from the Red Sea region height limits (50 m) with a slight slope and is characterized by spread the dunes of sand , and the base consisting of torrently silt materials .soil is good drainage,the place is affected by windy rrosion place because of the small molecules.soil is rich in salts especially wich near the surface, in particular, see table (1) represents the descriptionof the soil section in Wadi Zabid.

the description	deeps
Wet brown, small grains, white salt crystals, sand color (with soft sand), sand (with soft sand	Alca O- 18cm
Derived block structure (semi-angle), a few rubber viscosity where cavities and Salk hollow and porous. The villages where the contract Karboneh harsh, and salt crystals.	O- 18 cm F 17
brown slightly damp, salt crystals minutes. Slimy texture, Lome with very fine sand is cracked. Masses brown, a little rubbery, crisp, hollow cavities and pathways, gooey, pores outstanding. Salt crystals spherical, very few of basalt gravel, white crystals of salt, contract, or not calcined, fine roots.	lcl Cl18- 78 cm F 18

. Umber, Wet, Greene, Lome, agglomerated, brown, slightly rubbery crisp, gooey, cavities, pores closed, basalt stones are very few, holding a saline spherical soft and small, accurate or not calcined roots at the end of the horizon.	IIC 2 78- 93cm F 19.
Brown, humid, holding salt, gray many proliferation, Lome mass fraction is found cracked, it was rubbery and the medical approach, crisp, hollow cavities and pathways. Nader basalt stones, Qatari, holding a white salt, calcium carbonate at the bottom	.111C3 93- 118cm F 12
Brown, a wet, sandy accurate masses, brown, crisp, porous, with very little gravel basalt no roots, calcium carbonate.	VC 5 135- cm F 22

There are other models have taken of the Tihama plain soils, including

fans flood soils : these types of soils are close to mountain masses wick overlooking the Tihama plain.

Since the torrent valleys formalize them

when they leave the mountains and the soils dont consists of coarse water dredgeds like pebbles medium and stones small like pebbles and coarse sand, as well as particles of clay and silt. Notably, these sections are not clear, because the annual water depositional processes accumulation, but with depths see some clusters of mud and salt deposits of calcium carbonate.

Section is located at the entrance of Tihama plain, on the road of Sana'a and Hodeidah, in the valley of Algsab the form of (1) section stationed above the thick, torrently dredgeds, and drainage is good, and the water nearly up to two meters and soil tapped agricultural, noted in Table 2.

Description prospects	Deep(cm)
sandy Lome And solid brown diagonal dark gray.	0-24
As the horizon Top	20-40
As the horizon Top	40-60
As the horizon Top	60-80
As the horizon Top	80-100
Sandy coarse	100-120

alluvium wind soil: the raw materials of the soil came from the mountains, and had come to light in the eastern parts of the Tihama plain, then influenced by the wind strongly, these soils occupies a large area of plain, especially next to the mountains, the soil so deep and has a jagged to moderately structure ,rich with karbonat.

Horizon advanced to some extent. Soils in these places used for grazing more than for agriculture, because of the drought, wind has covered the soil with a layer of sand, clay particles of up to 10 cm thick.

Section is located near Acharabi Valley and MAHOE KHALEFA Village, the site represents a bench old policy, good drainage and the water level is low, note the description section in Table 3

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The general characteristics of the horizons	Description section depth (cm)
.Dry horizon, brown, author of the blame sandy flour, and the loess, mass brown.	0-20
Dry horizon, Brown, Lome with Dezasat sand and Osah, Brown mass, dead roots minutes.	20-48
.Dry horizon, Brown LomeArini. Harsh to some extent. Mass fraction is found, Mtaktherh spots, and the roots of the dead.	48-88
.Dry horizon, dark brown, Lome, porous and the gaps, rigid mass fraction is found to some extent. Few of gravel, with mica, holding Mtaktherh roots small dead.	88-107
.Dry horizon, Brown Lome, mass fraction is found, cracked, small dead roots, stones and a few pieces many Mika.	107-1220

alluvial soils of the valleys: formed as a result of torrent dredgeds that coming from the nearby mountains. They are modern soils where the known soil sections no clear. outer surface exposed to severe carving, but in the summer wind cover them. The section is located in WadiZabid, just two kilometers from the AL krpa village and above the high place mother rock consists alluvial stuff like loess . Internal water is deep.note description section in the table (4

The general characteristics of the horizons	Description section depth (cm)
Dry the horizon, umber, Lome, slimy, which is located a few spaces from severe upheaval CaCo3.	15-AP
Approved a wet, brown, Lome, groups of rocky, crisp small, a few cavities, pulling	15-44
Approved a wet, brown, sandy, rocky categories, crisp small, a few cavities, severe upheaval, little roots.	44-63
Horizon hydrated umber, dark, Lome mud Lumpy (center) small cavities, with very little fizz located CaCo3 of dead roots..	63-75
Approved a wet, brown, blaming agglomerated, tough it is of CaCO3, brisk, and cavities.	75-87
Horizon humid, Brown tends to gray, sandy blame, Lumpy crisp consists of CaCO3, severe upheaval ..	87-114

Second — western mountain blocks region (western facade):

above said region has suitable natural conditions for the emergence and development of soil, high heat throughout the year, and this means that the effectiveness of microorganisms, can work at all times, as if there had been wet, but the rain is sufficient in a large measure of the region, especially if the high raise, generally ranging from (300 mm) at the bottom to more than (600 mm) at the top, in some areas (800-1000 mm) per year, like in lbb and Mahabsh area, so we can say that the soil formation processes,

taking from 7 to 10 months in year , and this explains spread the good soil in the regions. Rock fragmentation in its various forms, especially active chemical and organic, and this is due to last for the emergence of good soils. Vegetal cover has a clear role in the soil formation. In addition to the dense grass cover, especially in the days of precipitation, and as we know the degree of coverage no less here than (5) in more places.

Now we will review some dirt sections that represent the different types of soils in the regions.

The first section:

1. The following section is a section of the terraced soil rich with loess, some loess and Alcarbonatit Bahdat and spread with a capacity in the soil areas, Taiz, Ibb, and of course from multiple areas of the western facade of the mountains overlooking the Tihama plain. This is a good development of soils with containing clay layer accumulated from the horizon ((B and also see accumulations of calcium carbonate, the source of allosah material and \ belief 1970 AH Smith returns dry channels between the ice that the Yemen has passed through, since active wind work in these drought periods, it carried large amounts of fine, quartz, material and Alcarbonatit materials from al roh al khaly and tohama plain. the following section taken from a near place of Ab city and the rock basement consists of semi-Osah, Carbonate materials, good drainage pungent and groundwater has no impact, soil planted with damas corns maize and another crops. other Albelaah , rainfall is relatively heavy and often more than (800 mm) per year and the region moist relatively. Note table (5) represents the analytical data for him.

Depth / cm	The general characteristics of the horizons
AP, humid, color Dark Brown, author of alluvial and Lomé materials, Habibath coarse to medium, and is characterized by inclination of the harshness and the tubular gaps, and a little gravel basalt and a thickness of no more than 2 cm, the rich roots, and Abelith extraordinary upheaval.	220
B1 Wet, Dark Brown, author of the Lomé Garnier and materials, and kill the mud stains, and the little pebbles and roots is rich Earbonat CaCo3	22-47

Second section;

The second section is located (8 km) almost to the south-east of Algnnd and that does not stray too far from the city of Al-Qaeda. the place Consists of convex , slopes, slanted, covered with rocky dredgeds, composed of basalt and limestone, so the drainage is so good. the rocks and gravel appear on the surface often. the earth used in herding, it is noted that the section is poor of alkaline materials , and salts over the rocks, and we note that section is thick, less than meter however see the different horizons, and table 6 represents Description section.

horizons	Description horizons
<b>Horizon reddish-brown dark, damp, rich with stones and gravel to some extent, the color, and has a lumpy structure with low viscosity and rubber small incisions, when it is humid, but the crisp little cohesion, rich tract open and closed and gaps, in which the stones of volcanic and calcareous, you see where the roots plants, undulating borders.</b>	O-13CM F6

<b>Horizon reddish-brown, damp, rich with stones and gravel and blame, Lumpy cracked, and nutty brown, elastic and viscous to some extent, be wet, a fragile the cavities and pathways open, which is often a mixture of gravel volcanic and limestone, and the border is organized with a minimum horizon.</b>	<b>B 1Y-70CM F7</b>
<b>Horizon brown, dry, rich in stones, and blame the container on gravel, crisp little cohesion, his sons, granular, slimy and rubbery to some extent, when it is humid, the gestures and the paths are open and closed Gaalba see the stones and gravel. Of volcanic limestone and plant roots where few out and see Karboneh deposits, especially around the roots</b>	<b>CO3 70+1CM F8</b>

Third section

This section located outskirts of the Ab city near the agricultural school. the basement rocks are composed of silty water mud that covers a layer of loess wich deposite above gravel sediments with water assets. For underground water deep, and has no effect on the soil, though humidity is acceptable, in the soil, we do not find salts only in the deep horizons, soil is deep with a superficial horizontal, dark, fertile in good degree, note Description section Table (7)).

<b>horizons</b>	<b>The general characteristics of the horizons</b>
<b>Horizon dark red dark, damp to some extent, the author of the blame silty clay, Venetian lumpy textures, little viscosity and flexibility features, when it is wet, but the core of the drought, the cavities closed, and the little stones and retained almost the same angles, you see little of carbonate material, and there are a lot of plant roots medium and accurate, reducing down with wavy horizon.</b>	<b>AI O-49CM F11</b>
<b>Horizon gray, leaning dark red and the crystals of salt white, and the strength of the horizon blame slimy mud, (conglomerate structure, which is brittle when it is a little damp, but it is a viscous and elastic acceptable degree and when the humidity is high, and measured when it is dry, the cavities closed sticky, and a little stones generating non-calcareous, minimums to see the horizon of undulating thin roots as well..</b>	<b>B C A 47-77CM F12</b>
<b>Horizon, brown, dark, damp, and consists of silt and blame molecules, color and conglomerate fragile structure when it is wet, and measured in the case of drying, with that when increasing humidity becomes slightly viscous, it Messelaa (Mycelia) Carbonatih little roots..</b>	<b>CCA 77+1CM F13</b>

Fourth section

Section is located near Taiz city on the runways and the parent rock consists of semi micro rockier crumbs mixed with baziltic crumbs. drainage is good and the underground water so deep. and there is a simple effects of water and windy erosion. grown here wheat, corn, note description section in Table

<b>horizons</b>	<b>The general characteristics of the horizons</b>

<b>Horizon hydrated, color brown miniature Dark file from the alluvial mud, darling little cohesion severe upheaval, when many roots and lower boundaries clear Mtmarjh.</b>	AP 0-20
<b>Approved a wet brown mud Daktn agglomerated structure, tough when heartburn is extremely sensitive to drought and the little roots and its borders and Mtmarjh clear, viscous when it is wet..</b>	B 20-40
<b>Horizon humid color dark brown mud structure which is located agglomerated solid clay and basaltic stones which have sharp corners and are very furans and boundaries clear..</b>	B3 70-100
<b>- Wet agreed to dark brown in color composite of materials Lomé mud agglomerated, very little cohesion acids..</b>	C 100-1550

medium lows Region (dry region)

it Occupies a wide area of Yemen, but includes a medium lowland areas of Yarim almost from yrmt0 Saada, it has borders with Saudi Arabia, it also includes the neighboring heights to the basal eastern plateau, but can include the part of the eastern region where rainfall of not less than 250 mm and in the east of Radaa.

Of the most important characteristics of climatic regions is controlled by drought since this period extends to nine months and more, and the amount of rainfall modest range is usually between 250 and 400 mm, and as we head east contradict the rain, as a result, the role of vegetation is limited too much influence on the soil, and the coverage ratio range between 12 and -4. Ten of the summer and rises to — 5.

The amount of live are modest bloc as is usually up to 210 kg / h, in the middle As for what falls above the soil of organic material not usually more than 40 kg / h and the soil enters about half of the latter figure, but part of it just turns into humus because of the drought, thermal conditions here are characterized by Balaqarih, thermal Differences and daily specials too great. Which helps to control the physical forms of fragmentation As the rain so few highlights the role of the wind is stronger and it hurts us to some extent the spread of the large number of deposits in the depressions Allosah In terraces medicines.

Also explains the rich in these soils Baltodat carbonate, both in soil horizons, and because of the accumulation due to the lack of rain, if you can it afford melt domestic vehicle in question, stationed soil above the formations rocky variety on each Elmejrova water MahmullacSaliyah and Old Navy, as in a lot of bottoms and some limestone rocks above the stone and sand, that the similarity of climate and plant conditions within the region helped the emergence of types of soils, with similar characteristics of 8, they are all soils Xeiroviah and see some Alheidrofetah soils in some bottoms and medicines, a limited proliferation.

We distinguish here brown soil, in particular, ranging from brown reagent to dark brown, and especially over the rocky base lose losea and semi Allosah, brown soil oblique to the darkening or dark gray appear above Bazatih rocks, and over the limestone rocks and sandstone you see the yellowed brown rocks and brown oblique to the red under the the impact of chrmites or because of the high proportion of Algdharyh molecules that retain more water.

The advantage of this soils accumulation of material in the transitional horizon or in the lower part of the horizon, especially at top surfaces of inclination and above of moderate and low slope ones.

In the lower sections that represent a somewhat different climatic conditions and rocky in the region.

The first section:

The next section is located at the bottom of Jhran actually crossing near the mabar city in the plain area (plain between the mountains), where the tendency is very simple (1-2%). Rocky base consists of marine sediments and torrent water deposits. underground Water is deep. The section is dry generally. we saw layers of  $\text{CaCO}_3$  in it. We saw a dark soil horizon under a thick loess layer, the same thing we found in almost low Mediterranean region. The Table (9) represents Description section and analytical data for him

Horizons/cm	The general characteristics of the horizons
Horizon umber dry composed of consort and blame with a bit of gravel a little lumpy. Low viscosity and flexibility when it is wet it is brittle when it is dry, it slots hollow pipe, and appears in the bottom of a small volcanic rocks and gravel, where the roots of small plants well, rich in carbon materials that surround the roots normally..	AP 025 cm
Horizon color dark gray, dry with a white carbon contracts horizon author of blaming mud slimy with a little gravel, prismatic structure, Lumpy is a flexible gooey when it is wet and solid when it is dry, the cracks we see alluvial materials Binet Yeh lot of cavities relevant and where little gravel and the carbon-minute plant roots, but Alhdohd with poor sight down a regular basis..	Alb 25.58 cm F 24
Horizon color umber which held Karboneh, white to gray and the author of the blame mud, the little stones in which the structure is Milla and harsh when it is dry, the grit prismatic fragile, but it is flexible and sticky when wet and pores and cavities and holding a white Karboneh cruel and root vegetable minutes . .	Bbca 58-71 cm
Horizon brown dry the color at the top White nodes tend to gray carbonate material, mud-walled structure with a bit of gravel, prismatic structure lumpy, sticky and pliable when wet and hard when it is dry, the cavities and pores are closed and few volcanic gravel and a small holding harsh Karboneh roots rare.	Cbca 16 cm F 26

The second section:

Section is located in the plain of Imran Banai, who participated in the composition torrent water dridged and Allosah and windy materials. The plain has a low slope, soil is good drainage, and the climatic conditions are dry. based on data of nearby monitoring stations potential evaporation is much higher than the annual precipitation and probably three or four times higher, the effect of the Underground water is no clear. the windy sculpture affect abit on soil. ticeable effect and exposed soils here for a bit of sculpture Alriha, note Description section in the table 10.

horizons	The general characteristics of the horizons
Horizon humid color brown to dark brown, muddy Lome. Installation darling, crisp little cohesion severe upheaval when many roots..	Ap 10-0
Wet color dark brown normal, Lumpy is rich in small Baltjaoev severe upheaval in which little of plant roots in the lower limits undulating.	A2 10-29 cm



Wet color brown to dark brown, muddy, Lumpy the small cavities and very little fizz roots, the lower boundaries clear.	B 29-55
Approved a wet brown color detector, mud is a clear structure, a tough emotion strongly heartburn, you see some of the effects of the roots, and probably carried from the top..	C 55-90

Third section:

The next section is located above the rocky base made up of limestone, a place not far from Sana'a section, as it is located to the north-west to (8 km), the drain is good in section, and the underground water is deep and has no effect on the soil section, and the land has not yet been tapped, or she has used a long time ago, noted in table (11) is a description of section

<b>Pal cm depth horizon</b>	<b>The general characteristics of the horizons</b>
Approved dry red yellow sandstone author of blame and structure is clear and the rocky granules scattered Stone-mostly moderate influence acids, clear boundaries..	A1 0-20 cm
Dry prospects for the color red yellowish, lump structure easy to turn, the Stone-grit, moderate furans, and influence heartburn, undulating borders and clear, rich vegetation roots.δ.	A2 20-40 cm
Dry Horizon, Sand Lome, where agglomerated particles of quartz moderate interaction and furans in which a small plant roots. .	B 40-60
Dry the horizon, yellowish red color, composed of sand Lome, the structure is not clear, tough Ktlah which abound quartz stones, as well as its interaction average Foranh..	C 60-130

East region (dry — Desert

This region represents the plateauol east part of Yemen, and gradually descends to be related to the AL RBEH AL khale desert.

The region is considered the most cruelty region in Yemen. provinces in natural conditions, the climate is continental hot and scarce rainfall does not normally exceed (100-200 mm) per year. While annual latent evaporation up to more than (200 mm) per year, as a result we see large areas.

The author of base rocky hills, semi-barren, are not covered by only a thin layer of broken stones, and large gravel, mingle Sometimes these stones and gravel with particles of rock-minute, increasing the cohesion of coarse rock fragments and help denser plants emergence. accepted evolution and advanced stationed in the medium and small semi-closed soils lows, which lies between the rocky barren hills or in the valley bottoms, which cracked the plateau from the south to the north toward ramleat alsabateen and the AL RBEH AL khale.

Soils here as it watched after that our passage dirt in a low valley Yes near white to light brown soils often, it may turn into a dark sometimes, under the influence of basement rocks, so that was saturated grounds.

Conclusion Conclusions

The study to distinguish the following types of soils and by geographical location: -

1. Soils ARIDI SOLS includes (11) Model area (10,097,25) km.

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2. soils ENTI SOLS includes (68) Model area (20,222,22) km.
  3. Soils Soils INCEPTI SOLS includes (11) Model area (4,922,11) km.
  4. soils ROCK OUT CROPS it includes (14) Model area (2,809,24) km.
  5. soils ROCK OUT CROPS it includes (15) Model area (29,259,59) km.