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Research Article

Introduction about soil taxonomy in Iran

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Abstract

Iran is mountainous with lots of features, Iran's Topographic map at 1:250,000 consist of 134 sheets the mean slope on 54% of the area is between 1 - 5% which consists of coastal plains, watershed beds, inland plains etc. Some 21% of the country has slopes of 5 -8 15%. Thus about 75% of the land area of the country has a mean slope of 0 - 15% (about 7º). In Iran, soil characterization and mapping are based on the standards given in the *Guide for Soil Survey and Land Classification for Irrigation*, prepared by the Soil Institute of Iran, affiliated to the Ministry of Agriculture, with the help of FAO experts. In accordance with the standards given in this guide, land areas were grouped into six classes, depending on their capabilities and limitations as regards the cultivation of annual crops under gravity irrigation, assuming that no land improvement is carried out which would remove the present limitations and improve the quality of the land. Iran with about 165 million hectares land area is located in the arid belt. Over 50 per cent of the land area which is mainly located in west and north of Iran is mountainous. About 30 per cent of the total land area, situated in the central part, is covered by a vast plateau with low rainfall. In this region the average annual precipitation is varying from 50-250 mm in average per year and in most parts does not exceed 100 mm in average per year. Only the Caspian Plain in the north receives more than 1,000 mm in average per year. The study areas are part of the Caspian Plain The Objective of this research was show Soil Taxonomy and classification of soils in Iran.

Keywords: Soil, Soil Survey , Land Classification

Introduction

Climate trend in IRAN

Iran is a mostly arid or semi-arid country, with a sub-tropical climate along the Caspian coast. Deforestation, , overgrazing, and pollution from vehicle emissions and industrial operations have harmed the land over the last few decades and hampered production. Other significant problems include poor cultivation methods, lack of water, and limited access to markets. Benefiting from land suitable for agriculture, the agricultural sector is one of the major contributors to Iran's economy. It accounts for almost 13% of Iran's GDP, 20% of the employed population, 23% of non-oil exports, 82% of domestically consumed foodstuffs and 90% of raw materials used in the food processing industry. Key data reflecting the potential of Iran's agricultural industry include access to 37 million hectares of productive land, 130 billion cubic meters of renewable water, wide spectrum of climatic conditions, 102.4 million hectares of forests and grasslands, 2700 kilometres of 11 water border, and diverse genetic reserves, which have led to the sector's considerable growth. In addition, in recent years, the construction of several dams in different parts of Iran has facilitated the irrigation of agricultural lands. Therefore, it is estimated that the production volume of agricultural products in Iran will increase from currently 90 million tons to an estimated 200 million tons within the next decade. This will enable Iran to enter some lucrative markets in the world, especially in the European Union countries, with strategic products

such as pistachio, saffron, cumin, citrus fruits, pomegranate, sugar cane, and oil seed. Both irrigated and rain-fed farming are used in Iran. In 2005, some 13.05 million hectares of land was under cultivation, of which 50.45% was allocated to irrigated farming and the remaining 49.55% to rain-fed system. Though the country provides about 90% of the total agri-food products, still Iran is a large importer of agricultural products, in addition to the technology and equipment required for this sector. The main products imported, related to this sector activity, include refined sugar, rice, soybean, sunflower oil, corn, palm oil, barley, processed food, fish, animal feed, additives, fertilizers and fertilizer raw materials and agricultural equipment. Pistachio, raisins, dates and saffron are the first four export products, from the viewpoint of value. In addition to the above-mentioned products, Iran also exports some other important agricultural products such as medical and industrial plants, decorative flowers and plants, as well as livestock products. At the end of the 20th century, agricultural activities accounted for about one-fifth of Iran's gross domestic product (GDP) and employed a comparable proportion of the workforce. Most farms are small, less than 25 acres (10 hectares), and thus are not economically viable, which has contributed to the wide-scale migration to cities. In addition to water scarcity and areas of poor soil, seed is of low quality and farming techniques are antiquated.

Soil survey and land classification studies during the past 50 years reveal that the majority of land resources possess various degrees of limitations, either individually or in combination, related to soil properties, salinity and alkalinity, topography, erosion and drainage. Therefore, the production capacity of soil resources of the country depends not only on the degree of soil salinity but also on other soil deficiencies that hinder sustainable crop production. The actual plains of central of Iran that have become desert and barren, used to be big and small lakes in the past, this is shown by fossil of fishes and sweat water oysters that are left on the plains, and even on the higher parts of the region (Karimi, 1997). Moisture regime prevalent in central of Iran is aridic regime. Aridisols are soils of the aridic moisture regime which occur normally in arid climates (Khresat and Qudah, 2006). Aridisols occupy more than 18% of the earth's land surface and are the most common soils in the world, Aridisols is the dominant soil order in the Middle East, While 65% of Iran has an aridic soil moisture regime (Khademi and Mermut, 2003). Aridisols have a cambic horizon, or an argillic horizon or natric horizon, or a calcic or petrocalcic horizon or a gypsic or petrogipsic horizon or a duripan horizon, or a salic horizon (Khresat and Qudah, 2006). Solonchaks are Reference Soil Groups in WRB. Based on WRB solonchaks having a salic horizon starting within 50 cm of soil surface.

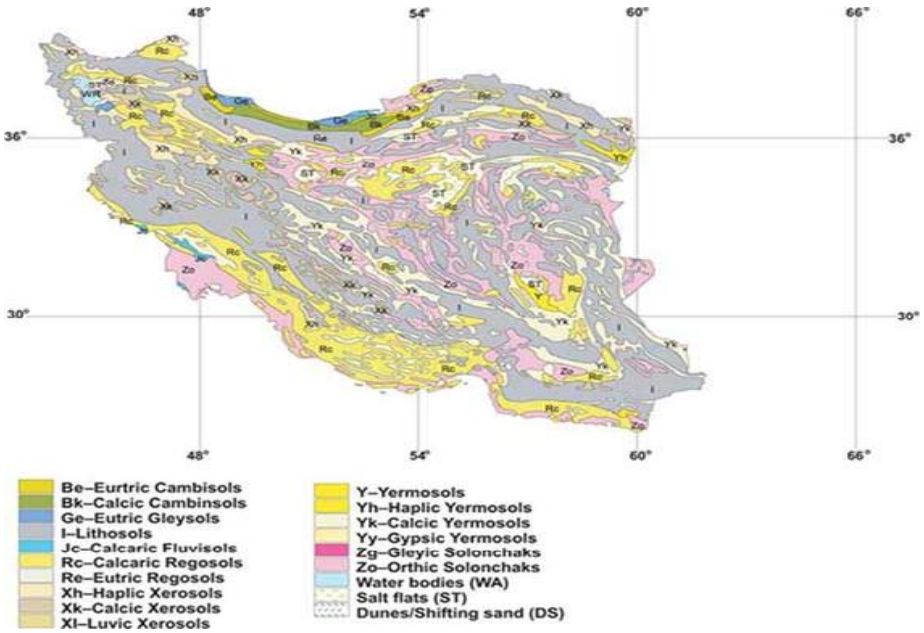

Fig 1: Map of agro-ecological zones of Iran

Moazallahi and Farpoor (2009) researched about Soil Micromorphology and Genesis along a Climotoposequence in Kerman Province, Central Iran. This research showed Soils of Kerman plain (aridic part of the transect) are Typic Haplocalcids that change to Petrocalcic Calcixerepts and Calcic Haploxerepts toward the upslope positions. Soil processes, gypsum and calcite micromorphology, and soil classifications were different during the gradient that showed role of topography and climate in soil formation. Owliaie *et al*. (2006) examined Pedogenesis and clay mineralogical investigation of soils formed on gypsiferous and calcareous materials, on a transect, southwestern Iran, this result showed Gypsiferous soils showed more pedogenic palygorskite as compared to calcareous soils. Three morphological forms of palygorskite, related to degree of weathering, were identified in the studied pedons. New great groups and subgroups of Ustepts (Aridic Gypsiustepts and Aridic-calcic Gypsiustepts) are suggested to be included in Soil Taxonomy based on the properties of some of the studied pedons.

Significance to Soil Classification in Iran

Any continuous horizon that impedes movement of water and the growth of roots is important to soil classification, particularly for interpretations of soils for plant growth and for engineering manipulations. Water stands above the pan in a level soil and moves laterally along the top of the pan in a sloping soil. Even though the processes that produce fragipans are imperfectly known, these pans are restricted in their climatic range and natural vegetation and are believed to be
text.

Soils of the dissected slopes and mountains in Iran

Soils of the dissected slopes and mountains are, in general, stony soils, shallow over bedrock, without a definite profile development. These soils consist largely of unweathered rock fragments, and though they may have some initiation of weathering, and accumulation of organic matter, yet little or no profile development has taken place.

Table 1: Surface of Type of land in Iran

Type of Land	Area (ha)
Mountains	46,036,179
Hills	22,027,499
Plateaux and Upper Terraces	23,004,259
Plain Mountain Slope	7,794,319
River Sedimentary Slope	4,022,892
Lower and Saline Lands	5,565,823
Torrential Plain	8,608,070
Alluvial Fan	10,568,120
Mixed Lands	4,978,319
Other Lands	5,211,466
Alluvium with Gravel (stone)	1,074,320
Sedimentary Slope	227,600

Table 2 : Provinces in the agro-ecological zones

	Agro-ecological zone	Provinces
1	Central Zone	Markazi, Qazvin, Qom, Semnan, Tehran
2	Caspian Coastal Plain Zone	Gilan, Golestan, Mazandaran
3	North-Western Zone	Ardabil, East Azarbaijan, Kordestan, West Azarbaijan, Zanjan
4	Central Zagros Zone	Hamedan, Ilam, Kermanshah, Lorestan
5	Khuzestan Zone	Khuzestan
6	Arid Central Zone	Esfahan, Yazd
7	Southern Zagros zone	Chaharmahal and Bakhtiyari, Fars, Kohkilooyeh and Boyerahmad
8	Southern Coastal Plain Zone	Bushehr, Hormozgan
9	Arid Southern Zone	Jiroft, Kerman, Sistan and Baluchestan
10	Khorasan Zone	Khorasan

Fig 2: Agro-climatic zones

Agro-ecological zones in Iran

Iran has been broadly divided into different agro-ecological zones in accordance with their similar conditions of climate and the type of crops grown

Zone 1 - Central zone: The southeastern part of the zone is situated in dry climatic conditions while the vast western part has seasonal dry conditions. This zone has sedimented soils, calcareous Lithosols and saline swamps.

Zone 2 - Caspian Coastal zone: With wet and humid conditions this expanse covers the coast of the Caspian Sea.

Zone 3 - Northwestern zone: This zone covers the north west part of country. It has seasonal dry periods, moderate summers and extreme winters.

Zone 4 - Central Zagros zone: With good rainfall in winter, this region is characterized by dry, warm winds in May-June.

Zone 5 - Khuzestan zone: Extreme transpiration, very hot and humid, this zone in winter has temperatures which can go below 0°C.

Zone 6 - Arid central zone: To the east of this zone is the dry Dasht-e-Kavir desert. But there are parts to the west which receive good rainfall.

Zone 7 - Southern Zagros zone: The average rainfall crosses 270 mm. This region is characterized by extremely warm springs.

Zone 8 - Southern coastal plain zone: The average temperature rarely goes below 15°C and the rate of evapotranspiration is high in winter. This region has seasonal dry conditions.

Zone 9 - Arid Southern zone: With cold winter and warm summers, this zone has similar climatic conditions to zone 8 in that the temperature rarely falls below 15°C.

Zone 10 - Khorasan zone: This zone has an average rainfall between 240-270 mm per year. It is characterized by long cold winters and late rainfall.

Table 3: Slope classes of the country

Slope classes of the country.		
Slope (Percentage)	Area (Square Km)	Percentage of total land area
1%	352,044.9	25%
1 - 3%	281,457.1	20%
3 - 5%	134,794.1	9%
5 - 10%	171,847.1	12%
10 - 15%	126,197.2	9%
15 - 30%	15,2619	11%
30 - 50%	89,239.5	6%
> 50%	118,268.3	8%
Total	1,426,467.2	100%

Genesis

Duripans occur mostly in soils with a xeric or aridic moisture regime (defined later), that is, in soils that are seasonally dry or are usually dry. Most soils that have a duripan have a moisture regime in which soluble silica might be expected to be translocated into lower horizons but not out of the Iranian soils.

Iranian soil Fragipan

A fragipan (modified from L. *fragilis*, brittle, and pan; meaning brittle pan) is an altered subsurface horizon, 15 cm or more thick, that restricts the entry of water and roots into the soil matrix. It may, but does not necessarily, underlie an argillic, cambic, albic, or spodic horizon in central Iran in desert aeria.

Conclusion

Iran's agricultural sector is especially dependent on changes in rainfall, and although the government has attempted to reduce this dependence through the construction of dams, irrigation and drainage networks, agriculture remains highly sensitive to climate developments. Still, the agricultural sector accounts for about one-fifth of the GDP and employs one-third of the workforce. The country's most important crops are wheat, rice, other grains, sugar beets, fruits, nuts, cotton, and tobacco. Iran also produces dairy products, wool, and a large amount of timber. Irrigated areas are fed from modern water-storage systems or from the ancient system of qanat. Qanat are underground water channels stretching up to 47 kilometers (28 miles) and first used at least 2000 years ago. Unfortunately, many of them have fallen into disrepair in recent years.

Different Climax Soils in Iran

Brown Forest Soil.0T This is the soil of deciduous forest of the most mesic type both in the Caspian and reportedly also in the 19 . It is sometimes mixed with podzolic soils from which it is not easily distinguished. It is confined to areas with high precipitation, part of which falls in summer. Generally, it has a well developed profile with a humiferous A- horizon, moderately acid to alkaline. Beech and Oak forests are the characteristic climax vegetation of the soil. At present, the typical brown forest soil is less extensive than more ruined or skeletal derivative (lithosol facies), or its alluvial variety deposited in the intermountain valleys. Zagrosmountains. It is sometimesmixed with podzolic soils fromwhich it is not easily distinguished. It is confined to areas withhigh precipitation, part of which falls insummer.Generally, it hasa well developed profile with a humiferous A-horizon, moderatelyacid to alkaline. Beech and Oak forests are the characteristic climax vegetationof the soil. At present, the typical brown forest soil is less extensive thanitsmore ruined or skeletal derivative (lithosol facies), or its alluvial variety deposited in the intermountain valleys.

b) Chestnut soil.It develops under humidclimatic conditionsfrom various parent materials such aslimestone and igneous rocks.It is characterizedby the dark brownor dark greyish-brown surface horizon.

c) Rendzinas.True rendzinas developing from soft marlylimestones are confined to humid or semi humidareas.They are generallycharacterized by their dark-coloured usually calcareoussurface horizon which sharply contrasts with the marly or chalkywhite parent rock.In Iran, they are not uncommon in the forest areas of the mountains but are often intermixed with other types.

Alluvial Soils

These are the soilsthat fill the great plainsand valleys.They are partly formed in situ, but largely transported from themountainsand redeposited, and thereby physically changed. There is no mature profile in these soils because of the steady rejuvenation ofthe upper horizons. Alluvial soils inthis sense, do not includehydromorphic deposits, they are ecologically zonal soils, because they are apt to harbour plant communities of the same regional vegetation complex as the adjacent mountains that supply the soil material.Examples are alluvial soils of the intermountain valleysof the Zagros and Alborzmountains, which support the same foresttype that growsinsimilar altitudes of adjacent mountains.

Steppe Soil Series

The bulk of Iran is occupied by steppe and desert, which are characterized by dwarf shrubs or herbaceous formations, the density of which is largely dependant upon the amount of rainfall. The soils classed under

this heading include (Figure 3) sierozems, brown steppe, loess and loess-like soils, as well as hammadas.

Sierozems are typical steppe soils. They are mostly oropedic, shallow, with an A - C profile, almost devoid of a humiferous layer, and grey in colour. They are mostly highly calcareous, free or almost free from injurious salts. In Iran, most of the mountain slopes facing the Central Plateau and all the elevations of the plateau itself are typical sierozems.

Brown soils.

Brown soils are formed under more favourable climatic conditions than sierozems, but are still marginal for arboreal vegetation. In Iran, brown soils are common in more humid parts of the Zagros mountains and in Khorasan (Dewan and Famouri, 1964).

Loess and loess-like Soils. A type of soil reminiscent of loess has been observed in several localities, south of Alborz mountains and in the adjacent valleys. This aeolic soil has a yellowish-brown colour and is deposited mainly as desert dust in valleys on the outer fringe of the desert. It is no doubt confused with brown soils and sierozems. Loess is a fine-grained soil with a medium clay / silt ratio and a high proportion of fine sand.

d-Hammadas. Most of the hammadas are confined to the intermountain valleys and drier parts of the Central Plateau. They are greyish-brown, calcareous soils with a fairly high content of silt and clay mixed with and covered by pebbles of various rock materials (desert pavement). Hammadas are generally poorly 21 vegetated because of the low rainfall. In extreme cases, such as in Dasht-e-Lut, there are immense stretches of altogether bare hammadas.

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