

DLR :- Directorate of Land Reclamation.
is under irrigation dept. Head office
in Lahore.

Genesis of Salt affected Soils

Soil genesis refers to the mode of origin of soil with special reference to processes & factors of soil formation for the development of soil from unconsolidated P.M.

Genesis include reducing the size of P.M, rearranging the mineral particles, adding O.M, and other materials like salts, changing the kind of minerals, changing creating the horizon.

Q. Soil genesis is a continuous but slow process. The factors mostly contributes to the genesis of salt affected soils.

(1) Salty P.M

The original and major source of salts is the primary mineral in the P.M. which serves as P.M. for soil formation. In Pak, like other arid and semi-arid regions of the world precipitation is insufficient for leaching of salts out of root zone. Consequently, soluble salts and $Ca-Na$ have been accumulated for thousand of years during the process of soil formation. This is the case of primary salt affected soils. These soils existed before the advent of canal irrigation system in the Indus plains of Pakistan.

2nd Reason

Uneven distribution of rainfall.
Most of rainfall occurs during monsoon season (July - August) while during major part of the year

The salts remain present in the soil and tend to move upward with capillary action of water.

At the soil ~~on~~ surface water evaporates and leaves the salts behind on the surface.

^{Source}
③ Aridity (means arid climate)

Most of the soils of Pak are located under arid & semi-arid region. The rainfall that is received during the year is not sufficient to leach down the salts from the root zone.

④ Physiographic Unevenness:-
Lower level

Micro-unevenness of the soil surface is generally not observable. This situation can be visualized from different depths of standing water after rainfall. The

Primary salinity is due to P.M.
Sec. — is due to brackish water

Rainwater flows from the convex part over the sloping part and is accumulated on concave parts.

In parts where there is low effective leaching accumulation of salts takes place, hence patches of salts develop in an uneven soils.

Considering the entire Indus plain of Pak, there is almost zero slope due to which natural drainage is poor & it promotes salinization.

Salination & sodication processes.

⑤ Irrigation Water: - Natural water \rightarrow Rain Canal

Brackish ^{ground water is} underground water is an other important source and cause of salt affected soils.

Secondary or Man-made salt affected soils have formed after the introduction of canal

irrigation system in Pak.
The ^{intensity} extent of secondary salt affected soils is very small than primary salt affected soils.

Insufficient or unequal application of water, imperfect soil drainage, water logging, poor quality of ground water, lack of proper Mgt. of soil and water, seepage from canal & water courses OR combination of all these factors are the major causes of formation of secondary salt affected soils.

Processes of Salt affected Soils

In arid to semi-arid zone most striking feature of many soil profile is their heterogeneity.

These soils differ from place to place with respect to their type of

Salt.

Solanjati, ~~U. C. G. J. K. S.~~ Salizshic

It is a process of accumulation of soluble salts by which saline soils are formed.

Primary or fossil saline soil have formed as a result of natural causes

in arid to semi-arid regions of rivers where annual rainfall is less than the amount

of water lost by soil through evapotranspiration because of limited rain and high evapotranspiration rate. Leaching of salts is insufficient. As a result, salts accumulate in the soil profile. In humid regions leaching of salts is generally completed and salts are carried to the oceans, by streams and rivers.

Sodium salts usually do not predominate in early stages of salinization.

Reasons of salinization

- ① Salinization occurs naturally where neither the surface water nor the ground water drains away satisfactorily due to flat topography. as in the plains of Sindh & Punjab.
- ② Salt accumulation may occur as a result of a raise in ground water table or under faulty system of irrigation.

③ Insufficient irrigation water, unequal application of water logging, imperfect drainage, poor quality ground water, lack of proper mgt. of water & and soils, or combination of these factors are the main causes of salt accumulation and development of secondary salt affected soils.

④ Salinization of soils may also occur as a result of translocation of salts within the soil profile in areas of limited rainfall. ~~or~~

Sodification

It is the process of accumulation of Ca , Na in soils which results in the formation of sodic soils. Clay minerals and organic matter ^{possesses} ~~possesses~~ the capacity to adsorb cations and all together referred as Ca complex or adsorption complex.

The capacity of soil to adsorb and exchange cation is called Cation Exchange Capacity. CEC:

Ca & Mg are the main cations present in the soil solution and in the exchange complex of normal soils of arid region.

When soil solution becomes concentrated through evapotranspiration a part of originally adsorbed Ca & Mg is replaced by sodium. This process results in the formation of saline sodic soils from saline soils.

Therefore, it can be said that in arid region sodication many times follow salinization.