How LandCare can help in the issue of soil salinity

What Is Soil Salinity?

Soil salinity is the build-up of mineral salts on the soil surface. Salts occur naturally in many bedrock deposits and in some deposits that lie on top of the bedrock. Groundwater flowing through these deposits dissolves and transports the salts. Under certain conditions, this groundwater rises to the soil surface where the water evaporates and leaves the salts behind. Over time, salts accumulate in these discharge areas (saline seeps) and in high enough concentrations can prevent plant roots from taking up water and essential nutrients. This restricts plant growth and reduces crop yields. Human practices have increased soil salinity.

The soil salinity is the natural process that results from

- High levels of salt in the soils
- Landscape features that allow salts to become mobile (movement of water table)
- Climatic trends that favors the accumulation

The impact of Soil salinity in Natural Resources

Salts in the soil water may inhibit plant growth for two reasons. First, the presence of salt in the soil solution reduces the ability of the plant to take up water, and this leads to reductions in the growth rate. This is referred to as the osmotic or water-deficit effect of salinity. Second, if excessive amounts of salt enter the plant in the transpiration stream there will be injury to cells in the transpiring leaves and this may cause further reductions in growth. This is called the salt-specific or ion-excess effect of salinity. The definition of salt tolerance is usually the percent biomass production in saline soil relative to plants in non-saline soil, after growth for an extended period of time. For slow-growing, long-lived, or uncultivated species it is often difficult to assess the reduction in biomass production, so percent survival is often used.

As salinity is often caused by rising water tables, it can be accompanied by water logging. Water logging itself inhibits plant growth and also reduces the ability of the roots to exclude salt, thus increasing the uptake rate of salt and its accumulation in shoots

Causes of the growth reduction under Saline conditions

The effects of a saline soil are two-fold: there are effects of the salt outside the roots, and there are effects of the salt taken up by plants.

The salt in the soil solution (the “osmotic stress”) reduces leaf growth and to a lesser extent root growth, and decreases stomatal conductance and thereby photosynthesis. The cellular and metabolic processes involved are in common to drought-affected plants, and described under Drought Stress and its Impact on this site. The rate at which new leaves are produced depends largely on the water potential of the soil solution, in the same way as for a drought-stressed plant. Salts themselves do not build up in the growing tissues at concentrations that inhibit growth: meristematic tissues are fed largely by the phloem from which salt is effectively excluded, and rapidly elongating cells can accommodate the salt that arrives in the xylem within their expanding vacuoles. So, the salt taken up by the plant does not directly inhibit the growth of new leaves.

The salt within the plant enhances the senescence of old leaves. Continued transport of salt into transpiring leaves over a long period of time eventually results in very high Na^+ and Cl^- concentrations, and they die. The rate of leaf death is crucial for the survival of the plant. If new leaves are continually produced at a rate greater than that at which old leaves die, then there might be enough photosynthesising leaves for the plant to produce some flowers and seeds. However, if the rate of leaf death exceeds the rate at which new leaves are produced, then the plant may not survive to produce seed. For an annual plant there is a race against time to initiate flowers and form seeds, while the leaf area is still adequate to supply the necessary photosynthetic. For perennial species, there is an opportunity to enter a state of dormancy, and thus survive the stress.

The two responses occur sequentially, giving rise to a two-phase growth response to salinity. The first phase of growth reduction is quickly apparent, and is due to the salt outside the roots. It is essentially a water stress or osmotic phase, for which there is surprisingly little genotypic difference. Then there is a second phase of growth reduction, which takes time to develop, and results from internal injury.

The Impact of Soil salinity on the LandCare programme

The goal of the National LandCare programme is to involve all communities in the optimal, but sustainable utilization of natural resources so that it can be available for generations to come. The programme focuses on optimal productivity that will lead to greater food security and job creation. Soil salinity impact on LandCare because the money that farmer’s has to use to produce food that will contribute to the reduction of food security will be used to pay for expensive chemicals that has to be used to neutralize salinity in the soil. In some instances soil salinity will result in water logging which will later result in soil erosion(due to poor infiltration of water in the soil, water will run with the top soil in to the rivers or ocean). Soil is one of the important natural resources that LandCare is committed to protect and conserve. All the agricultural natural resources depend on the soil for their survival, so it is important for LandCare as a programme to fight any thing that will result in soil degradation. Soil salinity is not good for agricultural production and LandCare as a programme.

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