BIOHUB SOLUTIONS

Solutions for today.
Benefits for generations.

BioTech Series

Sodicity & Salinity

Where science meets sustainability, and your farm's potential meets our passion.

How We Help

We know that understanding biologicals can be both confusing and overwhelming. Your solution should simple, measurable, and profitable. This is why we developed the **BioPlan**.

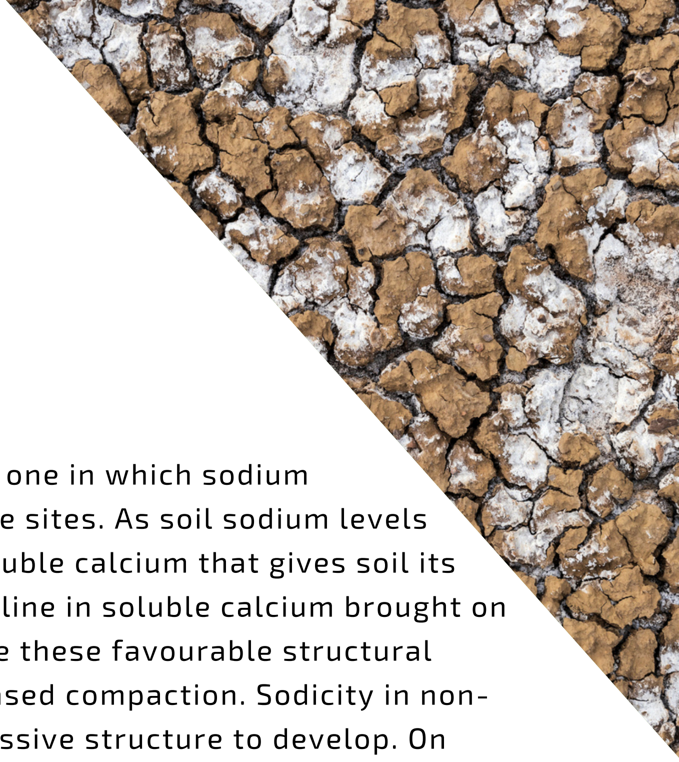
- Focus on testing and data to develop the best solution.
- Integrated solutions focusing on soil, nutrition, and plant health.
- Simple crop and soil monitoring providing solution accountability.
- Simple solutions providing agronomic, environmental, and economic returns.

The BioTech Series has been designed to answer some of the more technical questions you may have about our solutions. Or provide some extra information for inquisitive minds wanting to know a little more about biological strategies. When digesting the information in this booklet and others in our series, remember there is no silver bullet. No solution is the same. No challenge is the same. What is the same are the processes that BioHub team members and trained business partners follow under the BioPlan to try to formulate an integrated solution. This integrated solution can involve nutrition, plant health, biologicals, or soil ameliorants.

At BioHub Solutions, we fuse cutting-edge science and data with the wisdom of nature to deliver pioneering biological solutions to the agricultural sector. Our Australian heritage drives us to innovate for the unique challenges faced by local and global farmers, ensuring our products not only boost your bottom line but also safeguard the environment.

Take the guesswork out of biologicals by contacting one of our team or authorised business partners.

www.biohubsolutions.com.au



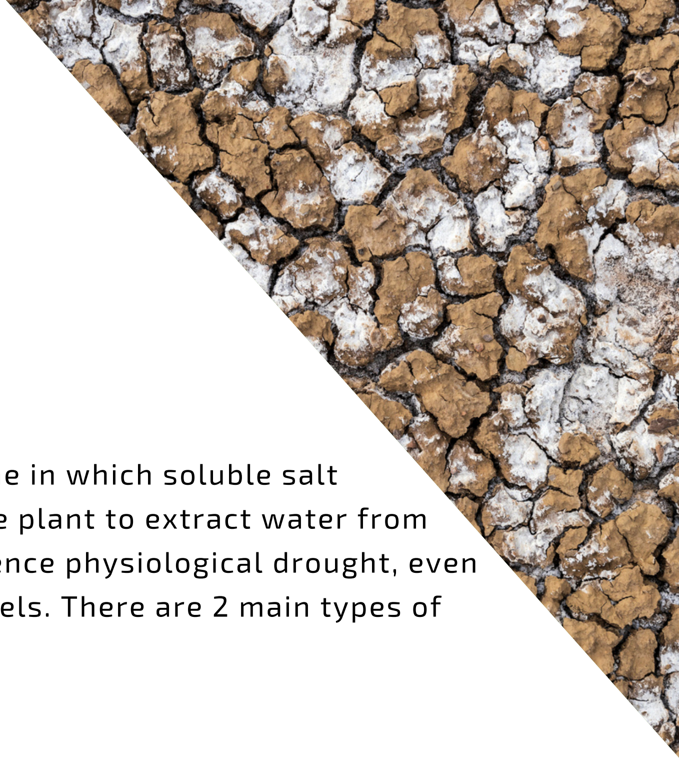
Sodicity

A soil high in sodium, also known as a “sodic” soil, is one in which sodium occupies an excess amount of space on soil exchange sites. As soil sodium levels increase soluble calcium levels decrease. And its soluble calcium that gives soil its friable, loamy, permeable structure. A continued decline in soluble calcium brought on by ever increasing soil sodium causes the soil to lose these favourable structural properties, resulting in impaired drainage and increased compaction. Sodicity in non-saline soils causes soil structure to collapse and massive structure to develop. On drying, the massive structure causes the soil to have high strength. High soil strength slows growth of the primary roots by imposing large mechanical impedance to advancing root tips. Gas exchange within the rhizosphere and uptake of water and nutrients can also be restricted due to waterlogging.

Left untreated, a sodic soil will eventually see decline in crop vigour. Toxicity arising from the sodium ion itself is rare, because problems with soil structure usually arise well before sodium can build to toxic levels. Some common signs include.

- poor vegetation or crop growth
- poor water infiltration
- surface crusting
- dense or hard subsoil
- prismatic or columnar structure in the subsoil
- soapy feel when wetting and working up for soil textures
- pH > 8.5
- cloudy water in puddles
- shallow rooting depth.

It can be a common misconception that high sodium means that the soil is high in salts. This is because they are both a result of sodium chloride. They are however very different and treated differently as such.



Salinity

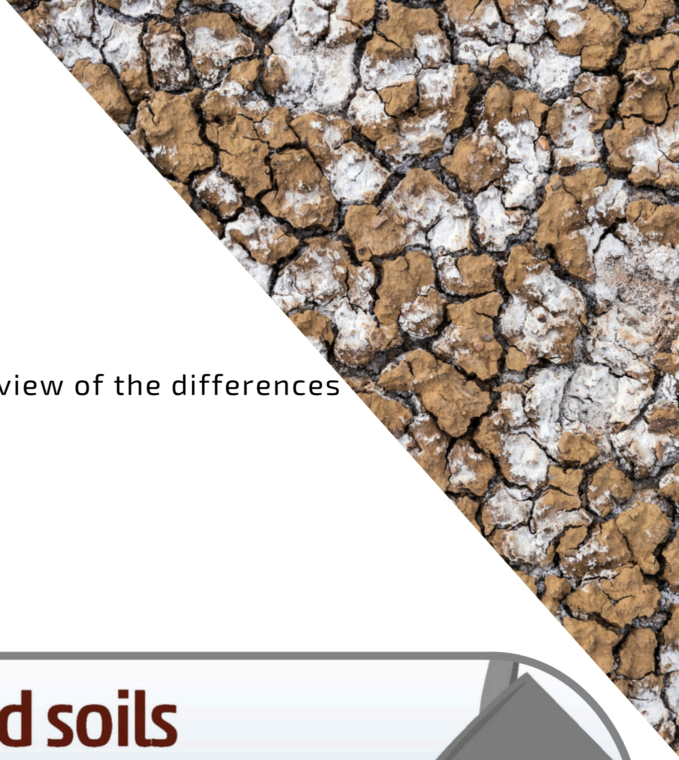
A soil high in salt, also known as a "saline" soil, is one in which soluble salt levels impair turf health by making it difficult for the plant to extract water from the soil. In such circumstances the plant will experience physiological drought, even to the point of death, regardless of soil moisture levels. There are 2 main types of salinity.

- primary - naturally occurring salinity
- secondary - resulting from human activities.

Primary salinity occurs naturally in soils and waters. Examples of naturally occurring saline areas include salt lakes, salt pans, salt marshes and salt flats. Secondary salinity is salting that results from human activities, usually land development and agriculture. Common forms of secondary salinity are:

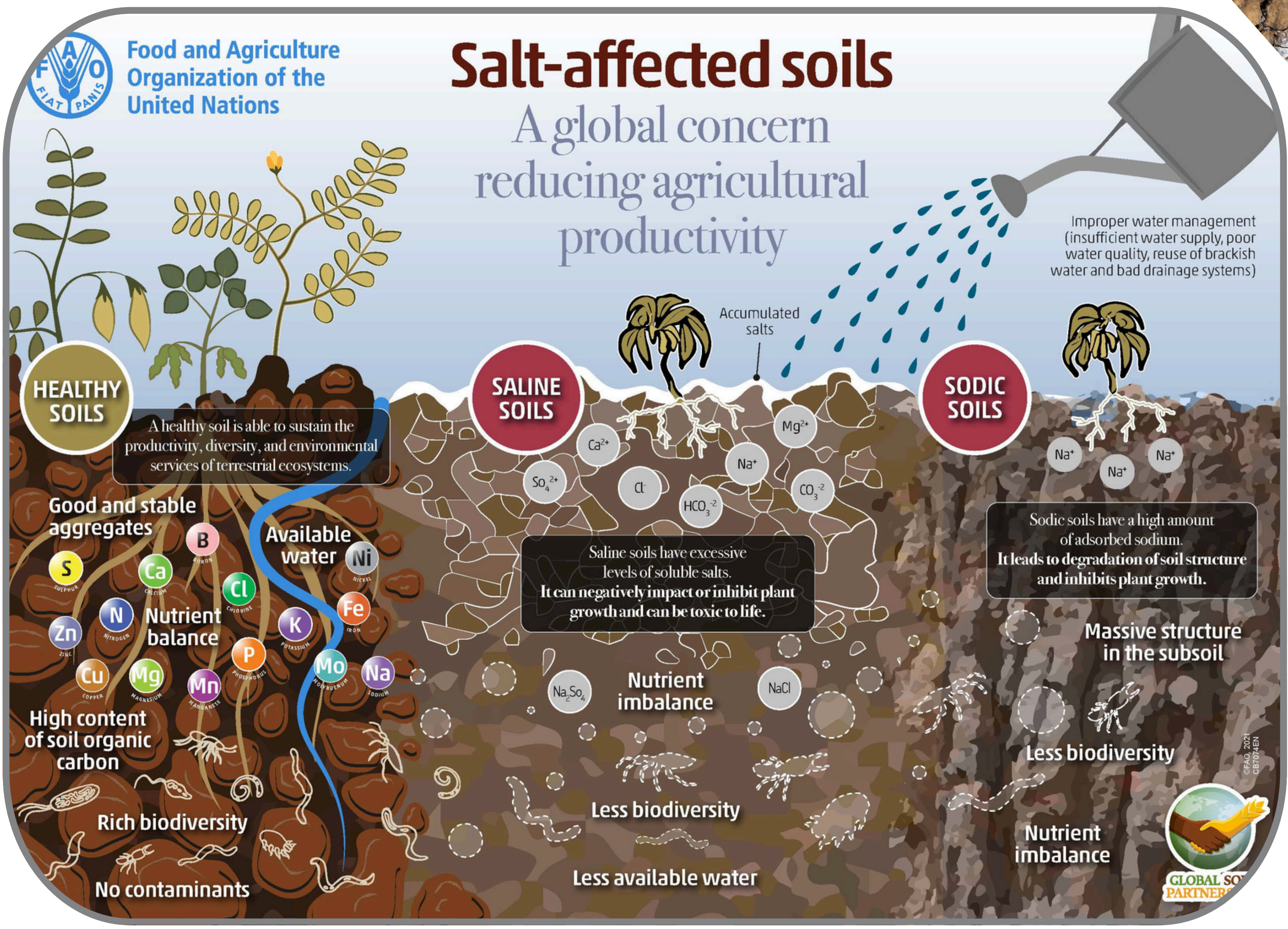
- irrigation - irrigated areas, either as a result of rising groundwater tables (from excessive irrigation) or the use of poor quality water
- dryland - non-irrigated landscapes, generally as a result of clearing vegetation and changes in land use
- sea water intrusion - coastal aquifer systems where sea water replaces groundwater that has been over-exploited
- point source - large levels of salt in effluent from intensive agriculture and industrial wastewater.

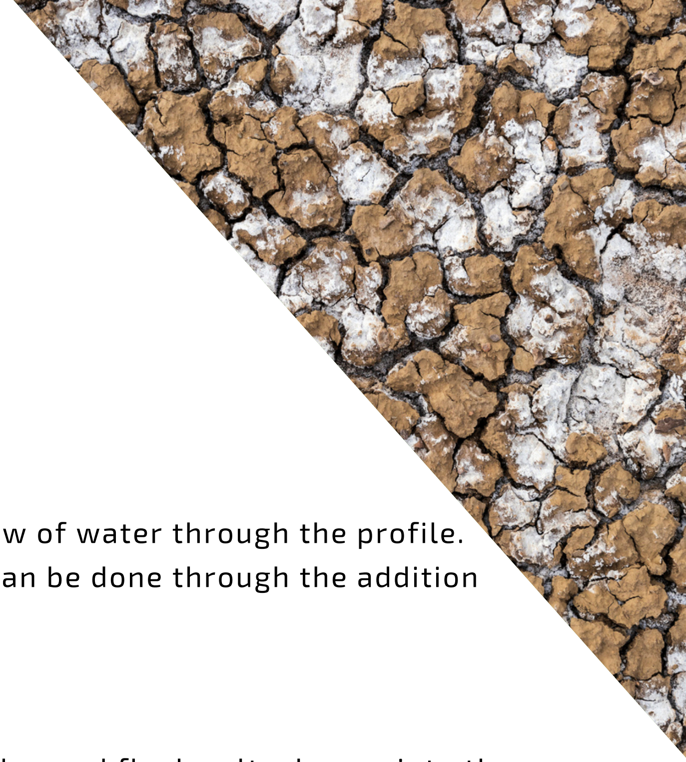
Water moves into plant roots by a process known as osmosis, which is controlled by the level of salts in the soil water and in the water contained in the plant. If the level of salts in the soil water is too high, water may flow from the plant roots back into the soil. This results in dehydration of the plant, causing yield decline or even death of the plant. Crop yield losses may occur even though the effects of salinity may not be obvious. The salt tolerance of a specific crop depends on its ability to extract water from salinised soils. Salinity affects production in crops, pastures and trees by interfering with nitrogen uptake, reducing growth and stopping plant reproduction.Some ions (particularly chloride) are toxic to plants and as the concentration of these ions increases, the plant is poisoned and dies.



The United Nations have produced an excellent overview of the differences and effects of both below.

https://www.fao.org/world-soil-day/en/





Integrated Solution

Soil Structure

Improving the soil structure will allow for better flow of water through the profile. Thus increasing the efficiency of any solution.This can be done through the addition of amendments such as compost and gypsum.

Physical Methods

Applying excess water to saline soils can help dissolve and flush salts deeper into the soil profile, away from the root zone. Proper drainage is essential to prevent the accumulation of leached salts in the lower soil layers.

Chemical Methods

Using chemical soil amendments, such as gypsum and **BioHub Sequest**, can help displace sodium ions and improve soil structure. These amendments should be applied based on soil test results and recommendations.

Crop-based Methods

Growing salt tolerant crops or improving root structure and plant health for susceptible crops to reduce the effects of soil levels.

Biological

Certain beneficial microorganisms, including salt-tolerant Lactobacillus species contained in **BioHub LaB**, can help mitigate soil salinity.They achieve this by

- Bio-remediation. Certain strains can metabolize and transform salts into less harmful compounds, thereby lowering the overall salt concentration in the soil.
- Lactobacillus can help improve soil structure by producing exopolysaccharides (EPS), which promote soil particle aggregation. Better soil structure enhances water infiltration and reduces salt accumulation on the soil surface.
- Lactobacillus produces organic acids such as lactic acid, which can acidify the the soil region near plant root. This process can help solubilise and mobilise salts, making them less toxic to plants and easier to leach out of the root zone.
- Lactobacillus can produce phytohormones like indole-3-acetic acid (IAA), which promote root growth and enhance plant tolerance to salt stress.
- Some Lactobacillus strains can induce the accumulation of osmolytes in plants. These help plants maintain cellular osmotic balance under salt stress conditions.