

Gypsum - The Universal Soil Amendment

Regular use of gypsum is essential to the sustainability of most irrigated soils. Irrigated land eventually leads to sodicity and salinity unless extreme care is taken. Gypsum is a key ingredient for the maintenance of agriculture on many types of soil and over a wide pH range, including sodicity.

Gypsum, in addition to prevention and correction of sodicity, include: greater stability of soil organic matter, more stable soil aggregates, improved water penetration into soil, and more rapid seed emergence.

For many reasons gypsum can be considered to be a farmer's best friend. Some of the reasons are multiple and interrelated.

ADVANTAGES TO USING GYPSUM

Gypsum Improves Soil Structure

Gypsum provides calcium which is needed to flocculate clays in acid and alkaline soil.

Gypsum Helps Reclaim Sodic Soils

Where the exchangeable sodium percentage (ESP) of sodic soils is too high, it must be decreased for soil improvement and better crop growth. The most economical way is to add gypsum which supplies calcium. The calcium replaces the sodium held on the clay-binding sites. The sodium can then be leached from the soil as sodium sulfate to an appropriate sink. Without gypsum, the soil would not be leachable.

Gypsum Prevents Crusting of Soil and Aids Seed Emergence

Gypsum can decrease and prevent the crust formation on soil surfaces which result from rain drops or from sprinkler irrigation on unstable soil. It can prevent crusting that result when acid soils are lime& the gypsum is co-applied with the lime.

Gypsum Improves Low-Solute Irrigation Water

Gypsum is used to increase the solute concentration of low-solute water used for irrigation. Irrigation water from rivers that no longer have sources of leachable salts either penetrates poorly into soil or causes soil particles to degrade which results in low-water penetration. The problem can be corrected with surface-applied gypsum or application to the irrigation water.

Gypsum Improves Compacted Soil

Gypsum can help break up compacted soil and decrease penetrometer resistance. Combination with organic amendments also helps, especially in preventing return of the compaction.

Gypsum Makes Slightly Wet Soils Easier to Till

Soils that have been treated with gypsum have a wider range of soil moisture levels where it is safe to till without danger of compaction or deflocculating.

Gypsum Improves Water Runoff and Erosion

Gypsum improves water infiltration rates into soils and also the hydraulic conductivity of the soil.

Gypsum Decreases pH of Sodic Soils

Gypsum immediately decreases the pH of sodic soils or near sodic soils from values often over 9 but usually over 8 to values from 7.5 to 7.8. These values are in the range of acceptability for growth of most crop plants.

Gypsum Increases the pH of Acidic Soils

One mechanism in which gypsum can increase soil pH enough in some acid soils to sufficiently decrease the level of soluble aluminium to grow crops satisfactorily is replacement of hydroxyl ions from some clay lattices by sulfate ions.

Gypsum Improves Swelling Clays

Gypsum can decrease the swelling and cracking associated with high levels of exchangeable sodium on the montmorillonite-type clays. As sodium is replaced by calcium on these clays, they swell less and therefore do not easily clog the pore spaces through which air, water and roots move.

Gypsum Prevents Water Logging of Soil

Gypsum improves the ability of soil to drain and not become waterlogged due to a combination of high sodium, swelling clay, and excess water.

Gypsum Can Help Remove Excess Boron from Sodic Soil

More boron was leached from sodic soils when gypsum was applied than when the soil was leached without gypsum.

Gypsum Increases the Stability of Soil Organic Matter

Gypsum is a source of calcium which is a major mechanism that binds soil organic matter to clay in soil which gives stability to soil aggregates.

Gypsum Makes Water-Soluble Polymer Soil Conditioners More Effective

Gypsum complements or even magnifies the beneficial effects of water soluble polymers used as amendments to improve soil structure.

Gypsum Makes Excess Magnesium Non-Toxic

In soils having unfavourable calcium magnesium ratios, such as serpentine soils, gypsum can create a more favourable ratio.

Gypsum Corrects Subsoil Acidity

Gypsum can improve some acid soils even beyond what lime can do for them.

Surface crusting can be prevented. Gypsum is now being widely used on acid soils.

Gypsum Can Enhance the Values of Liming

Addition to soil together with lime increased crop yields. The combination also decreased leaching losses of potassium and magnesium.

Gypsum Improves Water-Use Efficiency

Gypsum increases water-use efficiency of crops. In areas and times of drought, this is extremely important. Improved water infiltration rates, improved hydraulic conductivity of soil, better water storage in the soil all lead to deeper rooting and better water-use efficiency. From 25 to 100 percent more water is available in gypsum-treated soils than in none treated soils.

Gypsum Creates Favourable Soil EC

Gypsum, being readily soluble, results in proper buffered solute concentration (EC) in soil to maintain soil in a flocculated state. It is better environmentally and cost wise to maintain the needed EC with gypsum than with excess application of fertilizers.

Gypsum Makes it Possible to Efficiently Use Low Quality Irrigation Water

Use of reclaimed municipal waste water is important for conservation of natural resources. Reclaimed water can be satisfactorily used if amendments, such as gypsum and water-soluble polymers, are also used.

Gypsum Decreases Dust Erosion

Use of gypsum can decrease wind and water erosion of soil. Severe dust problems can be decreased, especially when combined with use of water-soluble polymers.

Gypsum Helps Plants Absorb Plant Nutrients

Calcium, which is supplied in gypsum, is essential to the biochemical mechanisms by which most plants nutrients are absorbed by roots. Without adequate calcium, uptake mechanisms would fail.

Gypsum Decreases Heavy-Metal Toxicity

Calcium also acts as a regulator of the balance of particularly the micronutrients, such as iron, zinc, manganese and copper, in plants. It also regulates non-essential trace elements. Calcium prevents excess uptake of many of them; and once they are in the plant, calcium keeps them from having adverse effects when their levels get high. Calcium in liberal quantities helps to maintain a healthy balance of nutrients and non-nutrients within plants.

Gypsum Increases Value of Organics

Gypsum adds to the value of organic amendments.

Gypsum Improves Fruit Quality and Prevents Some Plant Diseases

Calcium is nearly always only marginally sufficient and often deficient in developing fruits. Good fruit quality requires an adequate amount of calcium. Calcium moves very slowly, if at all, from one plant part to another and fruits at the end of the transport system get too little. Calcium must be constantly available to the roots. In very high pH soils, calcium is not available enough; therefore, gypsum helps. Gypsum is used for peanuts, which develop below ground, to keep them disease free. Gypsum helps prevent blossom-end rot of watermelon and tomatoes and bitter pit in apples. Gypsum is preferred over lime for potatoes grown in acid soils so that scab may be controlled. Root rot of avocado trees caused by *Phytophthora* is partially corrected by gypsum and organics.

Gypsum is a Source of Sulphur

Gypsum is a source of fertilizer sulphur.

Gypsum Helps Prepare Soil for No-Till Management

A liberal application of gypsum is a good procedure for starting a piece of land into no-till soil management or pasture.

Gypsum Decreases Bulk Density of Soil

Gypsum-treated soil has a lower bulk density compared with untreated soil.

Gypsum Decreases the Toxic Effect of NaCl Salinity

Calcium from gypsum has a physiological role in inhibiting the uptake of sodium by plants.

Gypsum Multiplies the Value of Other Inputs

Gypsum can improve the response to all other inputs including fertilizers.

Gypsum Can Decrease pH of Rhizosphere

Increased calcium uptake by roots when gypsum is applied can decrease the pH of the Rhizosphere.

Gypsum Keeps Clay Off Tuber and Root Crops

Gypsum can help keep clay particles from adhering to roots, bulbs and tubers of crops like potato, carrots, garlic and beets.

Gypsum Decreases Loss Of Fertilizer Nitrogen to the Air

Calcium from gypsum can help decrease volatilization loss of ammonium nitrogen from applications of ammonia, ammonium nitrate, urea, ammonium sulfate, or any of the ammonium phosphates.

Gypsum Can be a Source of Oxygen for Plants

The sulfate that is taken up by plants and metabolized releases the associated oxygen which is a source of oxygen to plant roots although a limited source.

Gypsum Helps Earthworms to Flourish

A continuous supply of calcium with organics is essential to earthworms that improve soil aeration, improve soil aggregation and mix the soil.

Gypsum Can Increase Water Retention in Soil

Gypsum when applied to sodic soil decreased levels of exchangeable sodium resulted in a large increase in water retention at a given tension compared with controls. Dry matter and seed yield were increased as a result.

Gypsum Can Increase Crop Yields

Gypsum for various combinations of the above effects can substantial increase crop yields from 10 to 50 percent.