



*If we understand a soil,
we can improve it*

Managing Calcareous Soils

A *calcareous* soil is created from parental rock that is primarily calcium carbonate (lime), and is relatively common in the drier areas of the earth. The dominant nutrients or elements in these soils are *calcium* and *carbonate*, and an overabundance of either element can create challenges for the farmer.

Calcium (Ca^{2+}) is an important nutrient for crops and is needed in relatively large amounts. However, in a calcareous soil there is so much calcium that the availability of other important nutrients like potassium and magnesium, as well as many trace elements (zinc, copper and manganese), is severely restricted. From a soil testing and fertility perspective, it is practically impossible to determine the soil's cation exchange capacity as well as the ideal ranges for potassium and magnesium. From a practical perspective however, even if the ranges were determinable, it would not be economically viable to increase the potassium and magnesium levels to the point where they would be reasonably balanced with the extremely high calcium level. Even if it were not prohibitively expensive, when these nutrients are added to a calcareous soil through appropriate organic fertilizers, they are immediately bound in the soil and unavailable to crops.

In addition to the dominance of calcium, there is a large amount of carbonate (CO_3^{2-}) in the soil.

Carbonate in the soil reacts chemically with water to increase the soil pH. This can be a helpful process in soils that are acidic and is the reason why farmers add lime to acidic soils. However, when carbonate is present in such high amounts, the soil pH is increased to a level that causes important crop nutrients to become much less available in the soil. This is particularly true for trace elements (those listed above as well as boron). In addition, a high pH soil reduces the soil's biological diversity, making it more challenging for organisms to decompose, fix nitrogen and carry out the vast array of beneficial activities that they provide soils and crops.

One of the only options for adding nutrients and trace elements to crops growing in calcareous soils is through *foliar feeding*, because it allows the crops to take up the nutrients by spraying them directly on their leaves. This can be a challenging method of fertilization for farmers due to the increased cost of foliar fertilizers (nutrients need to be in a chelated form), the need to regularly fertilize, the equipment required, and the challenges of foliar feeding in a rainy climate.