

ROCK FLOUR FERTILIZATION

Introduction

ARCADIS Netherlands is currently promoting the use of finely ground silicate rocks as both crop fertilizer and soil conditioner. Rock flour acts as a slow release fertilizer, which, depending on the rock type chosen, supplies Ca, Mg, K, or Na and valuable micronutrients. Besides being a slow release fertilizer it offers some additional advantages over commonly used inorganic fertilizers:

1. It restores the long term mineral fertility of the soil
2. It removes carbon dioxide from the atmosphere
3. It is beneficial for surface water quality
4. It enhances the effect of inorganic fertilization
5. It is manufactured in a more sustainable way

The unknown problem

When farmers and agronomists talk about soil fertility they usually speak of soil organic matter, soil structure, nitrogen, phosphate, potassium, pH, and cation exchange capacity. Hardly ever do they seem to realize that the soil minerals themselves are responsible for a large part of soil fertility. Most soil minerals are able to supply crop nutrients by a very slow dissolution process called weathering. Some minerals weather more quickly than others, which is the reason why volcano slopes are usually more fertile than soils overlying sandstones. The amount of nutritious soil minerals in a fertile soil is huge and therefore its ability to deliver nutrients seemed endless.

However, during the last decades world population has grown immensely, and so has crop production. Consequently the rate of nutrient removal from soil by crop harvesting has increased a manifold. This explosive increase in crop production is one mechanism that has accelerated depletion of soil silicate minerals. The other mechanism that caused accelerated depletion of soil mineral fertility is soil acidification as a consequence of inorganic nitrogen fertilizer use, liquid manure and acid rain. Scientific literature points out that despite liming, up to 500 kg of soil cations/ha/yr originating from silicate minerals are lost through soil acidification. In 50-70 years probably more than 25 tons of soil cations/ha has been lost. Addition of inorganic fertilizers in a very soluble form, manure and lime is not enough to restore this slow release supply of nutrients. The above basically means that northern countries are actively turning their soils into heavily weathered soils typically seen in tropic areas.

A 'new' solution

Although the underlying mechanisms are not understood, the consequences of mineral fertility degradation are being recognized. Farmers do see that, despite normal fertilization practices, soils seem to run out of certain elements like for example magnesium and potassium. Additional application of soluble mineral salts temporarily solves the problem, but offers no long term solution. Application of rock flour presents a sound solution for this problem by restoring the slow release fertilization properties of the soil. It actually is the only fertilizer that can restore a soil in this way. It may seem a new fertilization technique; however, its efficacy has been proven already for more than 100 years.

Other environmental benefits.

The production of conventional inorganic fertilizers is responsible for a considerable consumption of fossil fuel. Besides this it is accompanied by a large production of waste (brines, polluted gypsum). The production of rock flour requires relatively little energy: it is mined, milled, bagged and transported to the client. The production of waste is virtually nil, rock flour itself is often already available as a by-product from quarries. Rock flour stabilizes soil pH just like lime. When replacing lime by rock flour, the emission of 440 kg of CO₂ per ton lime is saved. If you look at it the other way around, every ton of rock flour applied will capture 200 - 500 kg CO₂ in the long run.

ARCADIS and rock flour

Arcadis is currently developing 'tailor made' rock flour blends and the 'steady state' fertilization principle. Tailor made rock flour blends will be accurately designed to meet the needs of the customer's soil. Steady state fertilization is a method that allows you to initially build up a reservoir of soil minerals in a few years time, followed by yearly low dose maintenance fertilization. ARCADIS will also continue to initiate demonstration projects, develop market opportunities and translate available scientific results to applicable techniques.

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