

# Supplying balanced minerals

The plants themselves control demand when rock flour is used





The use of rock flour as a soil conditioner has been common practice in Germany for over 100 years. With the emergence of organic farming the demand for this product is increasing. Huig Bergsma, with ARCADIS, believes it offers opportunities for all farmers.

Huig Bergsma is a geologist by profession. He notes that throughout history the regions where agriculture flourished and major civilisations emerged often contained volcanic soils or a rich clay soil that was regularly replenished with new minerals due to the flooding of rivers, such as in Egypt. "The condition for agriculture is a healthy balance between cations in the soil," says Bergsma.

The volcanic soils contain weathered rock with a rich composition of minerals. This goes beyond just NPK alone. In contrast, Bergsma also believes that when only the main elements are used, the soil will deteriorate from a mineralogical perspective. "This awareness has not yet sufficiently settled in. Many soil experts too easily assume that the other minerals are simply there," says Bergsma.

On the surface, it is not evident why a company like ARCADIS would launch itself into an area such as soil fertility. The idea emerged from a group of free spirits within the organisation looking for sustainability. "I asked myself if there were sustainable and especially climate-friendly alternatives to artificial fertilisers and lime. Lime is also detrimental in terms of CO<sub>2</sub> emissions. This is how we came up with rock flour." At one nursery, Bergsma found there was a separate bag for each mineral. "People often view the soil more as a conduit for nutrients rather than a source. Silicates in particular contain a lot of nutrients. If you view the soil as a bank with mineral deposits, then the soil will deteriorate from a mineralogical perspective if you only deposit NPK."

The experience of farmers is that when you use artificial fertilisers other materials tend to be depleted sooner. "You need to provide better supplementation for this. A farmer who is currently testing rock flour under contract to the province of Utrecht experienced in the past that he needed to add more and more every year fertilisers to maintain the same level of production. That sounds like proof for the additional loss of minerals in sandy soil."

As a geologist, Bergsma is used to analysing the entire stone. In agriculture, soil experts are paying too little attention to the silicates in the soil to his liking. "Agricultural and environmental experts are looking at the soil within a too limited frame of reference. Farmers often do not know exactly what is missing. The large bulk of soil silicates contains what is needed to steadily replenish the minerals." Soils have lost a great deal of these soil silicates through intensive agriculture,

but also due to acid rain, which for thirty years has been washing minerals away. Bergsma uses French research to illustrate that as much as 400 kilos of minerals per hectare per year can wash away like this. Rock flour could once again restore the balance in this respect.

Bergsma spoke with farmers in Brazil who for economic reasons opted for rock flour. These are experienced growers who for years used potash from Canada and are now using rock potash from sources in closer proximity. These appear less sensitive to rising energy prices and yield the same production at lower cost.

Bergsma calculates that rock flour is far less sensitive to energy price fluctuations than artificial fertilisers. Grinding and transporting rock flour for soil conditioning is far less energy dependent than producing and refining artificial fertilisers.

The number of responses from farmers to recent publications concerning rock flour is surprisingly high. Bergsma notes that growers want to start using the product, while a lot of knowledge remains to be collected. "We want to know whether it will work over the long term on the basis of long term testing. Rock flour suppliers often say that you have to add a bit every year. We don't have the knowledge required to comment on this."

Research is designed to show, for example, whether it is possible to apply a large quantity of rock flour all at once that will be sufficient to last crops for years. "It is impossible to apply an overdose, because the plant controls demand. Weathering of soil minerals is stimulated by acids and complexing agents produced by plant roots. One type of rock flour can be more reactive than another one, however. For example, in case of some types you must prevent a sort of a cement layer from being created on top of the soil. Ploughing this under, possibly in combination with compost, is then the best solution.

The application of rock flour for the rest is simple. The farmer can spread it with an artificial fertiliser spreader on a calm day or apply it to the soil as a 'wet' mixture. In principle there are unlimited quantities of rock flour throughout the world. "Volcanoes are continuing to produce it. Depending on location, the mineral composition differs. Many mines produce it as a by-product. For a planned mine in Norway that will produce garnet and titanium, it turns out that the composition of the mine tailings, currently regarded as a low-quality by-product, was in fact very good. We can therefore make very good use of the by-product from this mine. This way they look after the separation of minerals for us by already removing what





they need themselves. Who knows, in a few years time rock flour may become their principal product.”

Rock flour would appear to be a more suitable product to Bergsma than olivine, which is a topic of discussion in relation to its ability to sequester CO<sub>2</sub>. Olivine contains too much nickel as a trace element and is therefore unsuitable for agriculture. A side effect of rock flour is that it is good in terms of the CO<sub>2</sub> balance; however the primary goal is to bring soil fertility back up to par. This is why Bergsma considers it a better product for agriculture. ARCADIS is also fielding inquiries from other corners, such as area development and forestry.

### Luxurious consumption

In comparison to KCL, plants appear to exhibit a less luxurious consumption of minerals. “In the case of rock flour, plants appear to limit themselves to a certain level of minerals and then stop there. It could perhaps yield products with a superior composition and nutritional value.”

Bergsma: “We are currently exploring this situation, so that we can provide a better supporting rationale. Especially in the first year we noted that it is sometimes difficult to explain this to non-geochemists. Still, I believe that when I hear the stories of researchers and growers, its application will become essential. The approach is based on two principal concepts: counteracting climate change and restoring basic soil fertility.”

### More information

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