



FIVE QUESTIONS

ON OVER-FERTILIZATION AND BIODIVERSITY

FOR SÖNKE ZAEHLE

Many highly biodiverse ecosystems are low in nutrients. Mr Zaehle, does this mean that fertilization has a negative impact on biodiversity?

SÖNKE ZAEHLE That's certainly true of many habitats. Take low-nutrient grassland in temperate climates, for example. Meadows of this kind are among Germany's most biodiverse environments. A number of studies have shown that biodiversity declines when the amount of nutrients added to the soil increases. Nitrogen and phosphorus play the most important role in this situation. In central Europe, the availability of nitrogen inhibits the productivity of most rural ecosystems, while in the severely weathered soils of the tropical rainforests, the problem is more likely to be phosphorus.

What impact do high nutrient levels have?

Nutrient-rich ecosystems often benefit just a few species that are particularly well adapted to these conditions and can grow more quickly. These highly competitive species take light and space away from other plants. However, if only a small amount of nutrients are available right from the start, many species that are not as strongly competitive have a chance of survival. But you have to remember that other factors, like the climate, play an important role as well. The nutrient content of the plants themselves can also change. Plants fertilized with nitrogen store more nitrogen, for example. Since plant-eating animals are adapted to a partic-

ular nutrient content in their food, changes like these can have a negative effect on their metabolism and therefore on populations and distribution.

Are we using too much fertilizer in Germany?

That's too much of a generalization, but a marked surplus of nutrients has been evident in some regions for quite some time now. This is where we urgently need to take action! The farmers have trouble disposing of the vast amounts of animal excrement that accumulates, particularly in areas where there is intensive pig and cattle farming. More livestock are kept than there is space for the disposal of their waste. However, directly applying manure as agricultural fertilization is not the only way in which nutrients end up in ecosystems. Nitrogen oxides in car exhaust fumes or from industrial plants also have an impact. This is one of the reasons why nutrient levels can actually increase in areas that are not even fertilized. Over the years, this unintentional fertilization can for example lead to very high nitrogen levels in forest soil.

Will the reformed fertilization ordinance passed in Germany in the spring of 2020 have any effect?

The measures it contains are moving in the right direction, but it remains to be seen whether they are sufficient and whether they can be implemented in this form. Generally speaking, fertilizer quantities should be adapted to the actual nutrient requirements

of the plants and the location. It's also important that nitrogen losses caused by fertilization are reduced by employing more efficient spreading methods or adjusting fertilization schedules. This would make it possible to decrease the quantities of nutrients added for agricultural purposes, thus reducing the quantities that infiltrate other ecosystems.

How effective are individual measures of this type?

The fertilizer problem goes far beyond the question of how much fertilizer to use and when. We have to create closed material cycles as quickly as possible. In other words, we should only add nutrients that will be removed when the crop is harvested. Without a paradigm change among consumers and a reduction in the amount of meat we eat, we will never be able to overcome the problem of over-fertilization of entire swathes of land.

Interview: Harald Rösch

Dr. Sönke Zaehle from the Max Planck Institute for Biogeochemistry is investigating how nutrients affect the material cycles of ecosystems.