

Heaps of climate gas

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The cow as a killer of the climate: This inglorious role of our four-legged friends, peaceful in itself, is well-enough recognised, because, with their digestion, the animals produce methane, which is expelled continuously.

Now, however, a team of German scientists from the Institute of Soil Ecology of the GSF – National Research Center for Environment and Health (Helmholtz Association of German Research Centres) and Czech colleagues at the Budweis Academy of Science have been able to show that bovine animals can also boost the production of this climate gas in soil.

This effect can be observed especially when the animals do not spend the cold season exclusively in the cowshed, but are kept on winter pastures. The study, carried out on a Czech farm, proved that two factors are vital for this process to take place: the amount and quality of organic material from the excrement and the strong compaction of the soil by the weight of the cattle. These changes lead to the fact that methane-producing micro-organisms from the gastro-intestinal tract of the animals can be established in the soil while, simultaneously, the process of methane oxidation is restrained.

Grass lands that are not used intensively for agriculture generally act as sink for the greenhouse gases, methane, carbon dioxide and laughing gas. However, this situation can change if intensive management of the pastures with cattle occurs. Indeed, it is known also that well-aired soils have the potential for producing methane. Hence, the scope of the study

should include examination of the extent to which the over-wintering of cattle on pastures stimulates this potential, and grassland soils really becomes a methane spring. For animal protection reasons, the placing of cattle in winter on pastures - with the possibility of sleeping in a cowshed or of obtaining feed there – becomes increasingly popular.

“The over-wintering of bovine animals is quite widespread at least in the ecological agriculture of Central Europe as a whole,” reports Dr. Michael Schlöter, the leader of the study. “The reasoning is that the animals are less susceptible to infectious disease, thanks to the movement outside and, therefore, fewer antibiotics need to be used. However, this connection has not been proved.”

The investigation was carried out on an farm in south Bohemia. The area in question comprises approximately four hectares and has been used since 1995 for the over-wintering of about 90 cows from October till the beginning of May. According to Schlöter, “At the end of this season, we could clearly see the consequences of the over-wintering, on the soil.” Unlike typical summer grazing, where the animals spread out evenly, the animals on the winter pastures prefer to stay near the feed house. As a result, no vegetation was visible any more in this area, and the ground was strongly compressed. In addition, this area was marked by a very high incidence of organic matter from the excrement of the animals. In more distant areas, the consequences were far less drastic.

The intensive grazing in the areas close to the cowshed led to a clear increase of methane emissions throughout the whole winter. These showed 1,000 times more than the control areas, where no bovine animals were kept. Methane oxidation is the metabolic way that can lead to the breaking down of the methane. Interestingly, the classical process of methane oxidation, which is related to aerobic conditions, was restrained in the intensely grazed areas. According to Schlöter, this is explained by the high quantities of urea in the ground. The scientists

were able to show further that methane producing micro-organisms from the gastro-intestinal tract of the cattle could survive in the soil and suppress parts of the autochthonic microflora. The newcomers profited from the environmental conditions in these soil, namely the extensive organic material.

Although in summer and autumn the animals were kept on other pastures, the composition of the microflora barely changed in the strongly over-grazed areas. Indeed, the methane production rates clearly decreased during these months, because the continuous supply of organic material was absent. “We shall continue the project, because we also suspect consequences for the nitrogen cycle,” adds Schlöter. “In addition, we have possibly proved a very rare process in the strongly compounded areas, namely the anaerobic oxidation of methane. All in all, it can be said that just about every agricultural measure has its positive and negative consequences. What weighs more in each case, however, is a social, rather than a scientific question.”

Source: National Research Center for Environment and Health

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