Press release

13 September 2019, No. 111/2019

Excellent research: "Soil is important in order to take carbon dioxide out of the atmosphere"

German Environmental Prize 2019: Individual recognition for soil researcher Prof. Dr. Ingrid Kögel-Knabner

Munich, Germany. "Her excellent research demonstrates the immense significance of soil as a water and nutrient reservoir, a life giver, a pollutant filter and a guarantee of the global food supply. Her latest findings on carbon fixation in soil and how it influences the climate system around the world are a major milestone." – With this statement, Alexander Bonde, General Secretary of the German Environmental Foundation (DBU), announced that the German Environmental Prize 2019 would be awarded to geoecologist Prof. Dr. Ingrid Kögel-Knabner (60), Chair of Soil Science at the TUM School of Life Sciences Weihenstephan at the Technical University of Munich (TUM) in Freising, Germany. German President Frank-Walter Steinmeier will present her with the award on 27 October 2019 in Mannheim. Ingrid Kögel-Knabner will receive an award amount of EUR 250.000.

Making ecological processes in soil visible step by step

"Dr. Kögel-Knabner is an eminent scientist who is highly respected in the field of soil science thanks to her much-cited publications, and whose expertise is in demand around the world," says Bonde. At the same time – and fitting for her field of study – she remains extremely down to earth. Having grown up on a farm, she turned her agricultural roots into her passion and, as a scientist, has uncovered the ecological relationships of soil step by step. She is driven to 'zoom in' to the landscape all the way down to the nanometre level, make processes visible and then use this knowledge to draw conclusions about the landscape – in other words, to 'zoom out' again. Bonde: "One of her greatest skills is the ability to observe the nanocosmos of the soil and use this information to gain insight into the complex connections between global challenges such as climate change, maintaining biodiversity and land use, and to contribute to sustainable approaches and solutions." At the TUM, she has established one of the

Contact
Franz-Georg Elpers
– Press Officer-
Kerstin Heemann
Jessica Bode

DBU Contact
An der Bornau 2
49090 Osnabrück
Germany
+49 541|9633-521
+49 171|3812-888
presse@dbu.de
www.dbu.de

TU München Contact
Dr. Ulrich Marsch
+49 89|28922779
marsch@zv.tum.de

world's leading soil science laboratories, which utilises a broad range of state-of-the-art analytical methods and is an important hub for scientists from around the globe.

Soil is important for carbon storage

One thing that all scientists agree on is that human beings are responsible for global warming, in part due to the use of fossil fuels, which release too much carbon dioxide (CO_2) into the atmosphere. The future Environmental Prize winner points out: "Soil is important in order to take CO_2 out of the atmosphere." Carbon dioxide is absorbed by plants and, when these plants die, it is released again by microorganisms as part of the decomposition process. There are a number of mechanisms that trap the carbon from the plant remains – the "C" in CO_2 – in the soil.

A 'house of cards structure" stores plant remains

"Clay minerals are formed when granite or basalt weathers," says the Franconian researcher, describing one of these mechanisms. At the micrometre level, clay minerals have a flaky structure similar to a house of cards. Plant remains are stored in these minuscule gaps and, with the help of microbial slimes, are bonded to organic-mineral structures – loam in the form of fine-pored 'crumbs'. The bonded structures also keep germs at bay: "This is a key feature of soil, and is the reason that we can drink ground water." The pores are "so small that microbes can't penetrate them," which means that these microbes are unable to 'feed on' the plant remains, which in turn keeps the carbon locked in the soil. Bonde: "This better understanding of climate-relevant process is closely linked with Dr. Kögel-Knabner's major achievement of using state-of-the-art technologies, such as a highly sensitive NanoSIMS device, as well as funds from the German Research Foundation (DFG), and establishing innovative spectroscopic methods in soil science on the nanometre level. She has essentially shed light onto the darkest corners of the planet and made the soil nanocosmos visible."

Major impacts due to rising temperatures in the permafrost soil

She initiated and coordinated a DFG focus program on soil both as a source of and a method for reducing CO_2 mechanisms, and for the regulation and stabilisation of organic substances in soil – a project that has played a major role in establishing German soil scientists as the leaders in this field of research. "If we can take part of the carbon away from the microbes, then we can keep it in the soil for longer. For centuries or even millennia," stressed Kögel-Knabner. But the warmer it gets, the more hospitable the moist ground is to microorganism, and the more carbon dioxide they release. For this reason, we can expect to see major impacts on the climate as the result of rising temperatures in the permafrost soil, specifically in Alaska, Canada, northern Scandinavia and Siberia. According to Kögel-Knabner, soil is still largely under-represented in climate models. The

United Nations Intergovernmental Panel on Climate Change also addressed this weakness in its IPCC report, which was published in July.

Bringing carbon deep into the soil – habitat diversity encourages biodiversity

The award-winning scientist is currently working on an applied-sciences research project to determine which management measures are suitable for bringing plant remains deep into the soil. "Nature does this through the process of bioturbation, particularly through earthworms or larger animals that move the remains down into the soil," explains Kögel-Knabner. In any case, there is more biomass underground than there is above ground – according to the Federal Environmental Agency, the number of living organisms in a handful of soil is larger than the global population – and many insects rely on the soil as their habitat. According to the professor, agricultural yields result in carbon being stored in the soil: "High yields mean a large root system that remain in the soil after the harvest." In regions, "where yields are low, such as Africa, there is much more potential. It would be possible to keep even more carbon in the soil simply by employing measures to increase crop yield." This would also help to contribute to global food security. It is important to use location data more efficiently and to strive for a differentiated, location-specific approach to land cultivation.

Lead	859	characters with spaces
Remaining text	5,419	characters with spaces

IPTC-compliant photos are available for publication free of charge at www.dbu.de

We use generic masculine pronouns to make our texts easier to read.