Pyrolysis charcoal – neither good for the climate nor for the soil

An article by Andrea Beste

Dr Andrea Beste is an agricultural scientist and Dip. geographer. In 2001, she founded the "Institute for Soil Conservation & Sustainable Agriculture" in Mainz. Since 2008, Beste has been an advisor to the German Bundestag, the European Parliament and various state parliaments, and since 2017 she has also been advising the European Commission.

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During the UN Climate Change Conference in Paris in 2015, a global programme for humus formation was launched, the 4 per mille initiative. It aims to increase global soil carbon stocks by 4 per mille annually. It is claimed that anthropogenic CO_2 emissions could be almost offset. "Carbon farming" is the new buzzword for agriculture that supposedly protects the climate. As part of its "Farm to Fork" strategy, the European Commission also announced an initiative to this end. So-called "natural solutions" include, for example, rewetting moors and CO_2 certificates for carbon storage in agriculture. The former definitely makes sense, but the highly technical approach and the narrow focus on carbon storage, despite the low climate relevance of certain practices in arable farming, often turn what initially sounds like a good idea into a misguided endeavour.

What is particularly questionable in connection with the intended storage of carbon in the soil is the use of biochar: increasing the carbon content in the soil in this way is not equivalent to a sustainable agricultural model and the formation of high-quality humus. If the focus is on the stability of carbon in the soil, this contradicts the promotion of active soil life, which we need for a good water-stable and water-retaining soil structure. This urgently requires degradable carbon substrates to maintain soil functions. Active soil life means humus formation, but also constant conversion and decomposition. Biochar is a high-tech

substrate. It has nothing in common with the natural humification process of "Terra Preta", which is often used to name the products, or with its chemical composition, because it is not a humic substance that has been formed over centuries[2].

In order to have an impact on the climate, huge quantities of biochar would also have to be used: to achieve around 1% of Germany's greenhouse gas reduction target for 2030, for example, all of Germany's available biomass would have to be processed into biochar[3]. This is an unrealistic scenario. It is far more effective for the soil and the climate to convert residual and waste materials into high-quality compost than into biochar using a process known as pyrolysis. Furthermore, there is a long-term potential for harmful substances, as the process always produces polycyclic aromatic hydrocarbons (PAHs), which are carcinogenic, largely regardless of the raw materials [used.] This means that harmful substances are added to an uncontaminated organic substrate during the process. In my view, it is essential to warn against confusing such geoengineering techniques with the "nature-based solutions" required by the Food and Agriculture Organisation (FAO) and the United Nations Sustainable Development Goals (SDGs) for climate adaptation[(5)].

A rarely discussed fact is that agriculture's largest contribution to climate change is attributable to the production and use of synthetic nitrogen fertilisers[6]. Approximately 1.2 per cent of global energy demand is required for the Haber-Bosch synthesis to produce ammonia from atmospheric nitrogen[(7)]. For many crops, fruits and vegetables, more than a third of the energy consumed in "modern" agriculture is used to produce agrochemicals (fertilisers and pesticides)[(8)].

We must take a systemic approach to sustainable, climate-friendly agriculture instead of misusing soils as carbon sinks to offset industrially emitted CO_2. This can be achieved through composting and agroforestry, but the most important factors are crop rotation, mixed cropping and catch crops. These are the biggest contributors to humus formation[(9)]. That is why diversity on and in the soil is so important; it promotes all ecological functions. The one-sided focus on carbon storage completely overlooks the fact that soil management is about maintaining ecosystem services. These include biodiversity, circular economy, water storage, water purification, evaporation, cooling, healthy plants, healthy food and much more. This is not possible with dead carbon.

If we want to achieve effective emission reductions in agriculture, we must above all move away from the use of synthetic fertilisers. This would reduce greenhouse gas emissions in agriculture much more quickly and reliably than carbon farming. By reducing livestock numbers and tying them to land and grazing, the second largest contribution of agriculture to climate change could be significantly improved. Grazing in particular contributes to climate protection due to the humus stored in grassland. Apart from soils in permafrost areas, moors and grasslands contain most of the carbon stored in the soil. Protecting these biomes must therefore be a top priority, which is where the term "carbon farming" comes in. Against this backdrop, however, ruminants would also have to be assessed differently than just on the basis of their methane emissions, because they are active climate protectors when grazing[(10)].

Andrea Beste

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