Degrade or upgrade our living environment?

Agriculture must be helped by the rest of society to be able to supply enough food, feed and other products that contain bioenergy and nutrients. Particularly smart cities and all other settlements must **upgrade** the conditions to end "hunger".

There are still no organizations that shed light on and create policies for how the 16 essential chemical elements (H, C, O, N, P, K, Ca, Mg, S, Cl, Fe, B, Mn, Zn, Cu, and Mo) - which the plants must have access to - must come from settlements back to cultivated lands.

The waste derived from plants, animals and micro-organisms should be called "**renewable organic material**". It is highly irresponsible that this material is treated in unsustainable central waste and sewage systems that **degrade** our living environment. These systems are polluting, loss-making and costly and therefore it is time to switch to circulating local systems.

Nitrogen can be mentioned as an example of unsustainable handling. Nitrogen contaminants in the form of **reactive nitrogen** have already crossed the planetary boundary (https://www.stockholmresilience.org/research/planetary-boundaries.html). Therefore, the handling of "renewable organic material" by unsustainable methods which release reactive nitrogen into the air should be prohibited.
This occurs, among other things, during combustion, thermal gasification, pyrolysis, in composting plants and in sewage treatment plants. Then, with energy-intensive processes, nitrogen is bound from the air and mineral nitrogen fertilizers are produced, which during use contribute to increased emissions of reactive nitrogen.
In sewage treatment plants, nitrogen in various forms is sent to the air at a cost estimated at more than 30 euros / kg. Buying a kilo of nitrogen in mineral fertilizers costs less than 1 euro / kg. Citizens pay for both processes and for increased health problems caused by more reactive nitrogen in the air.

The transition to sustainable systems that use biological transformation methods is necessary. The known sustainable method for handling "renewable organic material" in residual products and waste is biological conversion to biogas and biofertilizer. But the prerequisite is that from the time organic waste is generated, all links in the logistics chain must be sustainable to prevent pollution, losses, costs, and unhygienic environment.

At the same time, attention must be paid to always prioritizing a **cascade utilization** of "renewable organic material" in residual products and waste. This means that organic residual product or waste from one process can be a raw material for the next process and for anaerobic digestion i.e. methane fermentation the material that lacks another area of use must be used.

Biogas can be converted to electricity (about 30%) and heat (about 65%), which can be converted to cooling if needed. Using biogas in cars with internal combustion engines creates large energy losses. A gas car drives about 268 km on biogas from a ton of substrate. When the energy in the biogas is converted into electricity and heat, an electric car can cover a mileage of 257 km on the electricity produced. The energy in the heat can be used for heating or can be converted into cooling.

Biofertilizer contains all 16 chemical elements important for photosynthesis. Both bioenergy and plant nutrients are stored in the organic structures of biofertilizers and in microorganisms. Biofertilizer contributes both to carbon storage and to the increase in biological diversity in the soil.
Microorganisms help plant roots to absorb nutrients and the increased number of microorganisms can act as biological control. Full-fledged domestic biofertilizer can replace a large part of imported mineral fertilizers. Biofertilizer maintains and increases soil fertility and thus ensures the production of the plants' new biomass which is a prerequisite for us to get enough bioenergy in the food and in energy-rich methane in biogas.

The thermal and chemical processes use bioenergy from renewable organic materials in an **unsustainable** way. Methods to produce synthetic gas, biochar and biofuels cause the following problems:

- All microorganisms living in the material are killed and thus adversely affect the biological diversity.
- Creates losses of plant nutrients that must be replaced by mineral fertilizers that are energy-intensive during production.
- Causes pollutants that have a negative impact on the environment, health, and climate.

Composting is also an unsustainable method. When 100 kg of material is composted, the result is about 30 kg of compost of very uncertain quality. What happens to 70% of the raw material? The answers are:

- Bioenergy is released as carbon dioxide and water - both are greenhouse gases.
- Nitrogen and sulfur compounds as well as other substances are emitted as gases, causing both losses and pollution of the air.
- Leakage is formed with which certain plant nutrients are lost and at the same time the soil and groundwater are polluted.

Questions for decision makers and all people:
1) How is it possible that the most important thing for life - **sustainable growth on cultivated land** to ensure the production of plant biomass - is still ignored?
2) Why is there still a lack of development and implementation of **local high-tech biogas plants**?
3) Why are priority still given to **large-scale unsustainable processes** such as waste incineration, thermal gasification, pyrolysis and unsustainable chemical processes for the production of biofuels and composting?
4) Why do decision makers allow certain companies to make huge profits from **unsustainable methods** and systems that pollute our common environment?
5) When should the slogan "from farm to fork" be replaced by the slogan "**from photosynthesis to photosynthesis**" to highlight the importance of circular bioeconomy?

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