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Working Group Soil Protection / Contaminated Sites

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Roadmap „New Soil Strategy – healthy soil for a healthy life“ Statement of Friends of the Earth Germany (BUND), Working Group Soil Protection / Contaminated Sites

We welcome that the European Commission will revise the Thematic Strategy for Soil Protection. The need for a single European soil protection regime was already recognised in the 6th and 7th Environmental Action Programs. An EU framework directive on soils has so far failed due to the resistance of a few Member States. However, in order to provide a legally binding European framework for soil protection, it is still urgently necessary **to implement a European soil framework directive.**

The protection of soil biodiversity and the maintenance and improvement of soil ecosystem services in general, which has been neglected to date, must be integrated into all policy areas. European and international initiatives and agreements must be taken into account in the revision of the Thematic Strategy. These include in particular the United Nations Sustainable Development Goals (SDGs), the European Green Deal, the EU Mission "Soil Health and Food", the EU Biodiversity Strategy, the EU Chemicals Strategy for Sustainability and the FAO Global Soil Partnership.

The strategy must take due account of the **diversity of all natural soils** and must not focus exclusively on agricultural soils. **Soil protection must not only be local, regional or national.** There are complex interrelationships between soil and climate, some of which have increasing feedback effects. Climate changes influence the soil, and changing soil conditions influence the climate. Soil is affected by climate change and soil protection can and must also be part of the solution to the climate problem. Safeguarding and increasing the humus content of agricultural soils or other soils in use and particularly protecting soils with high C_{org}-Contents (e.g. moors) to maintain and build up the carbon reservoir "soil" contribute to carbon sequestration. The opinion expressed by various stakeholders that the principle of subsidiarity runs counter to EU regulations on soil is invalidated by this example. Counteracting desertification and protecting "healthy" soils for healthy food are European issues that must also be discussed and resolved at European level. These issues include uniform assessment standards for soil damage, so that a uniform approach is possible without distorting competition, as is already being done in the implementation of the Water Framework Directive and in the field of air pollution control.

The role of soil in the context of the debate on climate change is not or not sufficiently known by the general public and also by many decision-makers. One part of the strategy must be to **raise public awareness of the urgent need for soil protection.**

The Thematic Strategy for Soil Protection must contain specific binding targets for good ecological soil status, regulations on land use, specifications for EU-wide quality requirements,

e.g. with regard to contamination. In addition, uniform standards (assessment, precautionary, test and limit values) should be established for a common responsible approach to soil damage. Soil contamination should be prevented and soil degradation must be avoided. Damaged soil must be restored. Special attention is currently required for per- and polyfluoroalkyl substances (PFAS) due to the high level of soil and water contamination in the EU and worldwide. The EU Chemicals Strategy presented in October 2020 shows that the handling and remediation of PFAS contaminants entails significant costs for society. The example shows the need for a close link between the soil protection strategy and the chemicals strategy and the need to review and revise the effectiveness of existing instruments such as REACH.

A "soil protection passport" must be drawn up for each plot of land to document the state of the soil in the event of already known contamination, replacement building materials and soil materials introduced. This ensures that the materials brought in are properly documented. This is necessary in order to provide reliable information on the soil condition in the event of later questions (e.g. structural or landscape design measures, change of ownership). This is the only way to minimize the risk of pollution and contaminated sites in the long term when buying land.

Feedback to EU Soil Strategy especially concerning agricultural soils

Soils provide a number of very important functions which are substantial for environment and human survival. Beyond sealing and pollution, soils are endangered by the transition to increasingly industrial agricultural practices in the last decades.

Agricultural soils are about to lose their important functions in many agricultural regions in Europe. As soil degradation proceeds stealthily, degradation is often not noticed until severe and irreversible damage is done. Soil erosion under conventional agriculture is on average by a factor of 10 – 100 faster than soil formation or erosion under native vegetation (Montgomery, 2007). In addition, to the best of our knowledge, it is not yet known how and if soil formation works in intensively managed soils.

Major threats to agricultural soils are (i) soil compaction, (ii) loss in soil biodiversity, (iii) loss in soil organic matter (SOM), (iv) loss in soil structure and increasing soil erosion and - resulting from these factors – a **long-term loss in soil fertility**. Loss in soil fertility cannot be compensated to 100 percent by irrigation and fertilization (Pimentel et al. 1995). Moreover, soils also lose their capacity to provide ecosystem services such as water storage and purification, flood and erosion control.

All threats can be prevented by adapted soil management. Thus, the European soil strategy must comprise **prevention of a loss of soil function by inappropriate agricultural management**. This means it needs to prevent (i) soil compaction, (ii) loss in soil biodiversity, (iii) loss in soil organic matter (SOM), (iv) loss in soil structure and soil erosion and thereby prevent loss in soil fertility for environment and humans in future. This has to be laid down and defined in obliged management principles in GAEC in the new conditionality in CAP.

We propose the following strategies in detail:

(i) Prevention of soil compaction

Soil compaction may affect important soil functions and soil productivity. Soil compaction is on the one hand a result of increasing weights of farming equipment and maladjusted management. It may vary among different soil textures and soil types. Wide base tyres may cause less compaction vertically under the tyres but may result in a compaction maximum in

the centre of the lane. At soil water contents where proctor density can be reached, maximum compaction can be expected. Rules of thumb were derived for subsoil compaction by Schjønning et al. 2012. Each tonne of weight and each doubling of tyre pressure increases the depth of a critical stress level of 50 kPa by 8 cm. At water contents around field capacity, weight must not be as high as it exerts stress above a critical level of 50 kPa at depths greater than 50 cm.

On the other hand, - and this concerns significantly more arable land – as soil aggregates are stabilized by soil organic matter and soil biota such as fungal hyphae (e.g. Tisdall Oades, 1982), soil compaction comes from a decreasing activity of soil biota and structural degradation, triggered by simplified crop rotations and a strong decline in humus (see also below) (Beste 2015, Soilservice 2012).

Thus, we demand that the EU Soil Strategy:

- ***recognises soil compaction as potential threat to agricultural soils.***
- ***focuses more strongly on the structure-forming properties of the soil biota and work towards a definition of good agricultural practice in soil management.***
- *suggests these or comparable rules of thumb for farmers and especially soil water content is regarded before soil is traversed.*
- *suggests to return to smaller and lighter equipment.*

(ii) Protection of soil biodiversity

Soil biodiversity is very important for keeping soils functioning: Living organisms in soils (soil biota, edaphon) are decisive for soil fertility and soil structure, as they decompose organic matter and build up fertile humic substances. Soil microorganisms make symbioses with plant roots and significantly contribute to plant nutrition. Soil biota contribute to soil aggregation which provides balanced water and air regimes in soils and prevents soil erosion.

There are several reasons why soil biota is endangered in number and diversity in intensively managed agricultural soils. Very often land cover and input of organic matter are missing and monocultures are increasing. Intensive fertilization, tillage or soil cultivation and technical soil compaction also contribute. Pesticides have potential to damage soil biota. A number of studies are available for glyphosate (*N*-(Phosphonomethyl)glycine), which is, from a chemical point of view, not the most toxic pesticide. Glyphosate potentially reduces the activity and reproduction of earth worms (*L. terrestris* und *A. caliginosa*) (Berghausen et al., 2015).

Glyphosate further damages mycorrhiza and other soil microorganisms that contribute to plant nutrition (Zaller et al. 2018). It is expected that other, more toxic pesticides, also affect soil biota. At a long-term view, soil fertility may be drastically reduced by the use of pesticides.

Thus, we demand that the EU Soil Strategy:

recognises pesticide use as potential threat to agricultural soils.

suggests perennial coverage of arable land by crops or crop residuals.

restricts pollution of agricultural soils by pesticides.

Suggests higher diversity of crops

obtains that the innocuousness of pesticides on number and diversity of soil biota must be approved before admission.

(iii) Protection of soil organic matter (SOM)

The upper meter of soils worldwide stores four times more carbon than the living biomass on earth (Batjes, 1996; Bar-On et al., 2018). Loss in SOM from agricultural soils due to maladjusted soil management contributes to climate change. Furthermore, soil organic matter strongly contributes to soil fertility by storing huge amounts of water and nutrients. Concerning the effects of the climate crisis as for example the droughts in the years 2018 to 2020 it is very important to preserve soil organic matter in agricultural soils. Soil organic matter contrib-

utes to soil aggregation which provides balanced water and air regimes in soils and prevents soil erosion. For instance, by converting pastures to agricultural fields, hundreds of tons of carbon dioxide per hectare may be lost from soils. Missing land cover and damage of soil biota by pesticides further contribute to SOM losses.

Thus, we demand that the EU Soil Strategy:

recognises loss of soil organic matter as potential threat to agricultural soils.

suggests pasture feeding.

restricts pollution of agricultural soils by pesticides.

suggests perennial coverage of arable land by intercropping.

(iv) Soil structure and prevention of soil erosion

Erosion of agricultural soils by water in hills and uplands and by wind in plains leads to losses of tons of fertile soil per hectare and year. Eutrophication of surface waters is another problem resulting from soil erosion.

Soil erosion is indicated when land cover or permanent root penetration is missing. Soil erodibility increases upon losses of soil structure by loss of SOM and damage of soil biota. It is estimated that the rate of soil erosion in intensively used agricultural soils is at least ten times higher than soil formation or soil erosion under native vegetation (Montgomery, 2007).

Thus, we demand that the EU Soil Strategy:

recognises soil erosion as potential threat to agricultural soils

suggests perennial coverage of arable land by intercropping.

suggests pasture feeding.

restricts pollution of agricultural soils by pesticides.

In order to fulfil these requirements, support of further research is indicated. Furthermore, the relationship of producers and consumers must be strengthened and adequate wages for farmers are vital. **Organic farming, permaculture and agroforestry are promising strategies to face the degradation of agricultural soils in Europe.**

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