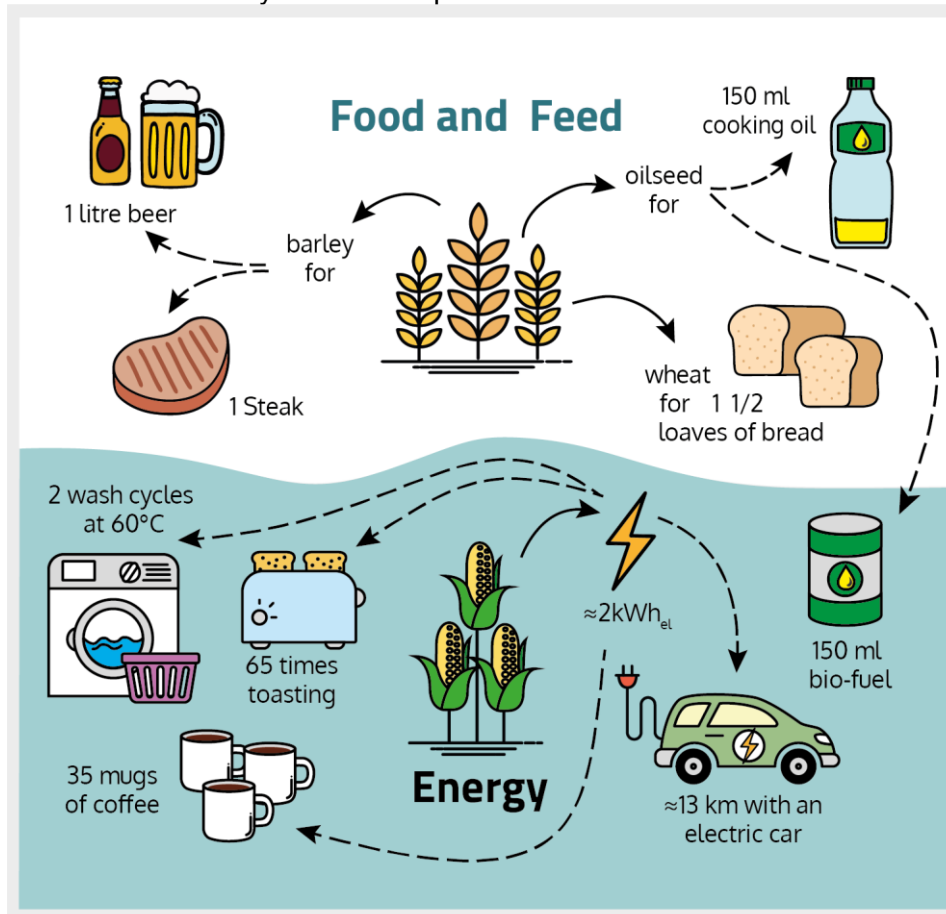


## Soil of the Year 2023 – Arable Soil

Thinking about arable soils, we think of fields with wheat or rye for our bread, barley for beer, maize for animal feed or for the biogas plant. The production of food, fodder and plant raw materials is certainly the most important function of arable soils for humans.



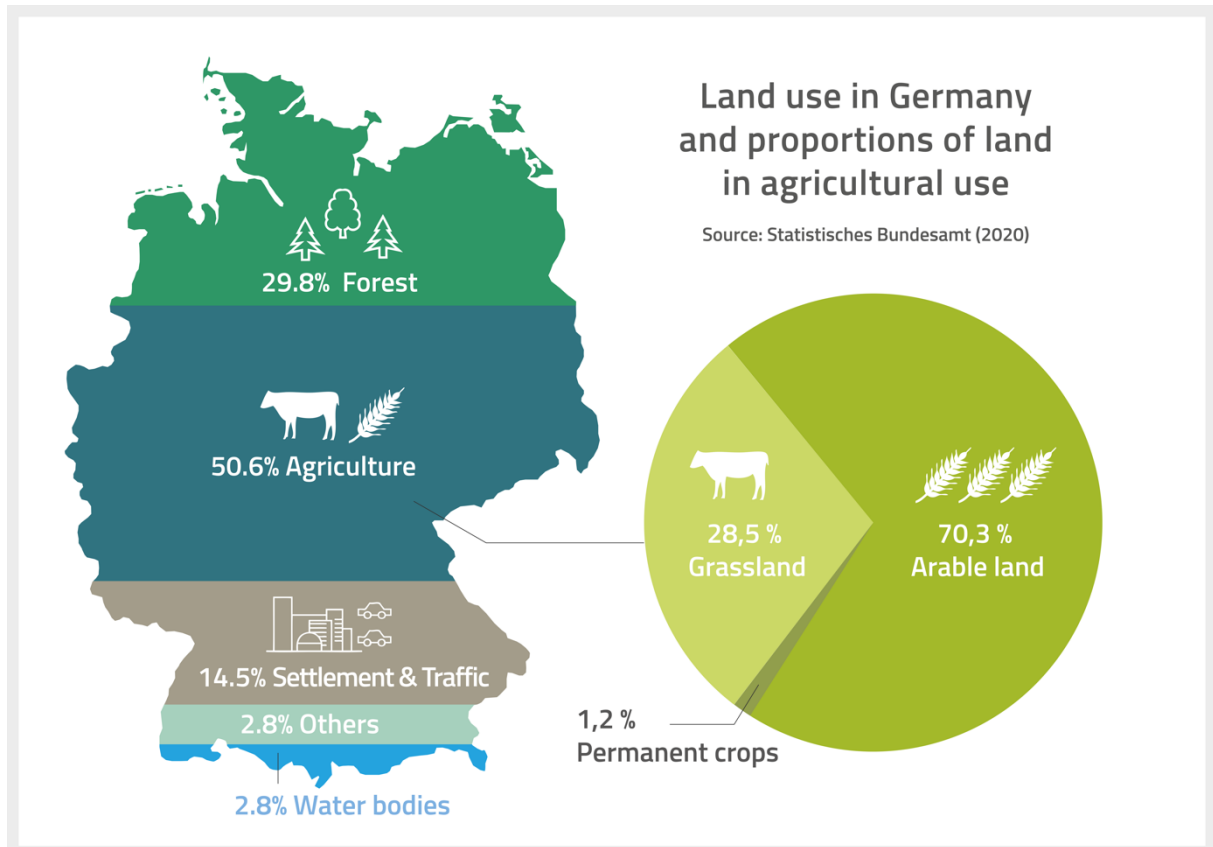
*How much food and energy can be produced on average per square metre of conventionally cultivated arable land? The figure shows selected examples, calculated on the basis of average yields per hectare for wheat, rape, barley and energy maize.*

### Arable soil – soil with many talents

In addition, arable soil stores large amounts of water, which not only benefits crops. Since deep arable soil can absorb a lot of water, it helps to protect us from floods as well. By binding and neutralising pollutants, arable soil further supplies us with drinking water as many drinking water protection areas in Germany are agriculturally used. As a carbon sink, arable soil is also of great importance for the climate: An average of 95 tonnes of carbon are stored under one hectare of arable soil. However, this carbon can also be released again through inappropriate management and contribute to climate change in the form of CO<sub>2</sub>. Last but not least, arable soil provides a home for countless soil animals and microorganisms such as earthworms, bacteria and fungi. The biodiversity below the Earth's surface is also much greater in arable soils than the biodiversity above ground.

### Arable soils everywhere – yet less and less so

Today, a good half of Germany's land is used for agriculture. About 70 percent thereof is arable land. However, for various reasons, this area has been shrinking for years. Because arable soils - unlike forests, bogs or other biotopes - is not particularly protected, arable land is converted into space for settlement and traffic every day and hence largely or completely destroyed.



*About 70 percent of Germany's agricultural land is used for arable farming, which corresponds to 35 percent of the country's total area.*

#### **The arable soil does not exist!**

“Arable soils” are all soils that are currently or have been ploughed in the past. They can be identified by their 20 to 30 centimetre thick topsoil that has developed through regular loosening and mixing with plough, harrow or cultivator, especially since the invention of the tractor. This "plough horizon" usually contains humus and is therefore somewhat darker than the underlying subsoil.

Fertile arable soil is also characterised by a good water and nutrient storage capacity, plenty of humus and good workability.



*Humic "plough horizon" with sharp boundary to the underlying subsoil. Photo: Christian Scheider*

### **Created by man**

Today, the negative consequences of soil management are often focused on. But in doing so we tend to forget that in many places productive agricultural soils only exist because humans have developed and improved them over centuries. We still benefit from this soil amendments today and it is our responsibility to preserve these soils.

### **The cornerstone of the cultural landscape**

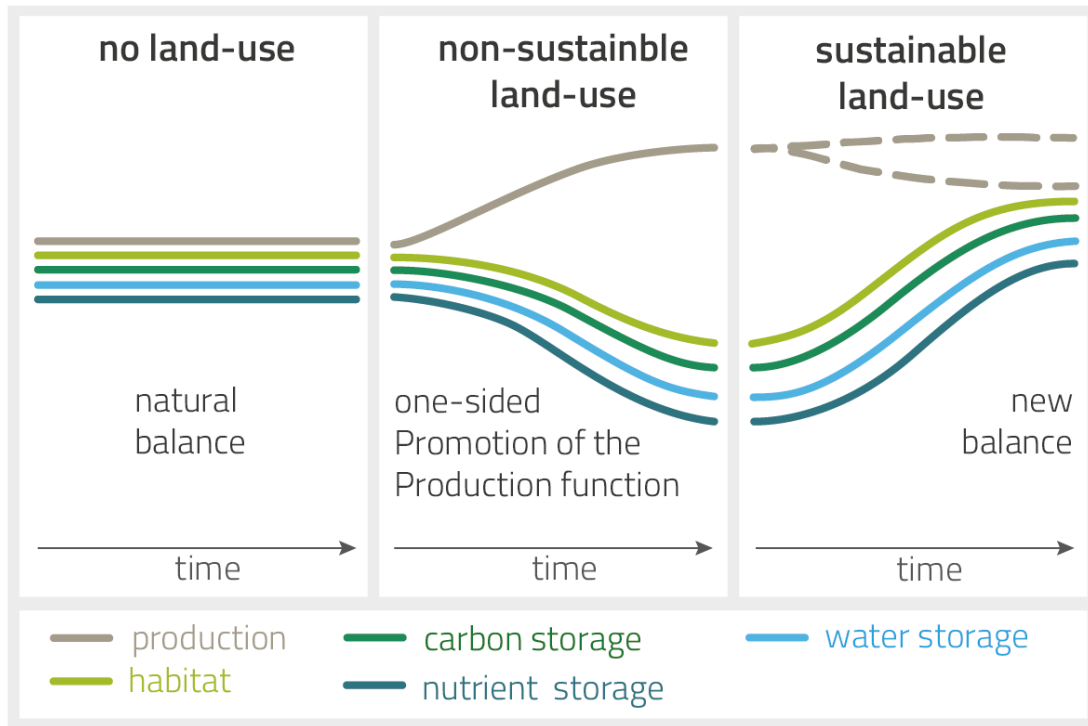
With agriculture, man changed the entire landscape. Forests that once covered Germany almost completely were cleared and an open cultivated landscape with fields and meadows, scattered shrubs, hedges and groups of trees and small forests developed.



*Open cultural landscape at the edge of the central German Uplands. Lack of structural elements such as hedgerows increases the risk of soil erosion. On average, about 2 t of arable soil per hectare are eroded by wind and water in Germany every year. Photo: Susanne Döhler*

### **We need a more sustainable soil management**

Intensive use, which led to enormous increases in yields of wheat, potatoes or rape after World War II, is gradually bringing arable soils to the limits of their capacity. Soil compaction, soil erosion, improper fertilisation, nitrate pollution in groundwater, humus depletion and a decline in soil biodiversity are the consequences. These processes must be stopped by sustainable and careful soil use so that our soils can recover and continue to provide us with food and raw materials in the future.



*Without soil use, the soil functions are in a natural equilibrium that can be disturbed over time by one-sided soil use optimised for yield. Through sustainable, site-adapted soil management, which takes all soil functions equally into account, the soil functions can be brought back into balance. Image: Hans-Jörg Vogel (UFZ)*

### **Change is on the way...**

There is a growing awareness in agriculture, politics and society that we need to treat our arable soils with more care. Already today half of the arable land in Germany is cultivated by applying conservation agriculture, and thus, hardly ever ploughed. Mulching or the cultivation of catch crops protect soils against evaporation and rapid drying. The latter also improve soil structure and may counteract soil compaction. Measures like these help prevent soil erosion, promote soil life and stabilise the humus content in the soil.





*Through agriculture, humans affect and change the soil system. As a result, soil functions can suffer. Sustainable soil use keeps soil functions in balance. Photo: David Jenne (pixabay.com)*

### **Science and agriculture: working together for more sustainability and soil protection**

In cooperation with agriculture, these approaches will be further investigated and new sustainable technologies and cultivation methods will be developed. A major challenge will be the nationwide establishment of new soil-friendly, site-adapted farming methods in agriculture. In some places, yields will decline slightly as a result of management changes. In the long run, however, the transition will pay off for everyone if arable soils recover, remain healthy and productive, and are able to fully fulfil their functions for humans and the environment in the future.