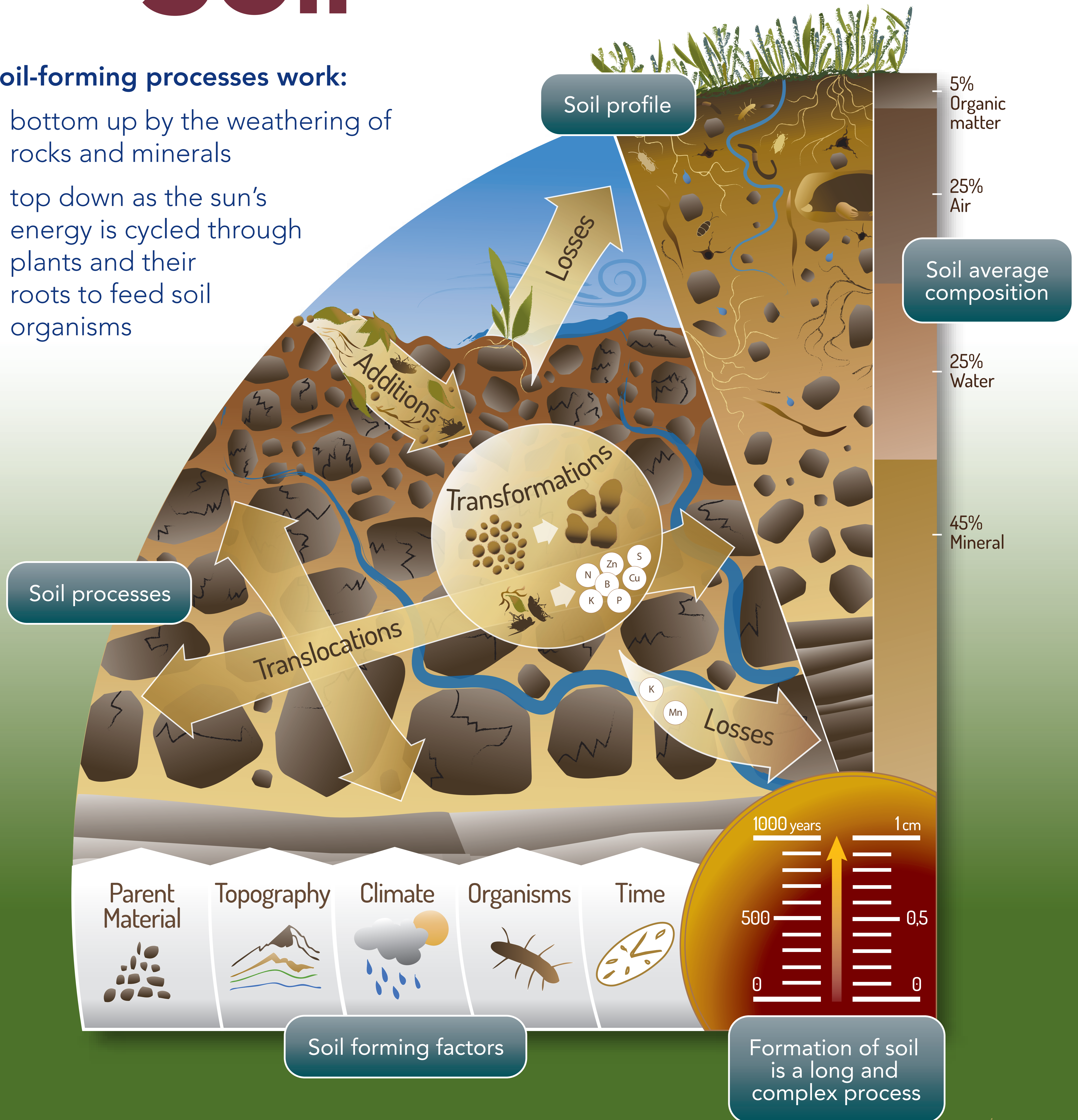


# The living skin of the earth

## How Soil is formed

### Soil-forming processes work:

- bottom up by the weathering of rocks and minerals
- top down as the sun's energy is cycled through plants and their roots to feed soil organisms



Soils in each place are unique, the individual expression of the interactions between soil forming processes in that place over millennia.



Food and Agriculture Organization of the United Nations

NIAB is an international crop science organisation based in Cambridge. We provide scientific research, technical services and advice in plant genetics, agronomy, farming systems and data science across a wide range of crops, including cereals, pulses, soft fruit and vegetables, aiming to improve the yield, efficiency and resilience of crop production.



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# Life beneath the land

Soils maintain a diverse community of organisms that:

- break down and cycle organic materials and nutrients
- form and stabilise soil structure
- help control insect and weed pests and plant disease
- form partnerships (symbiosis) with plant roots

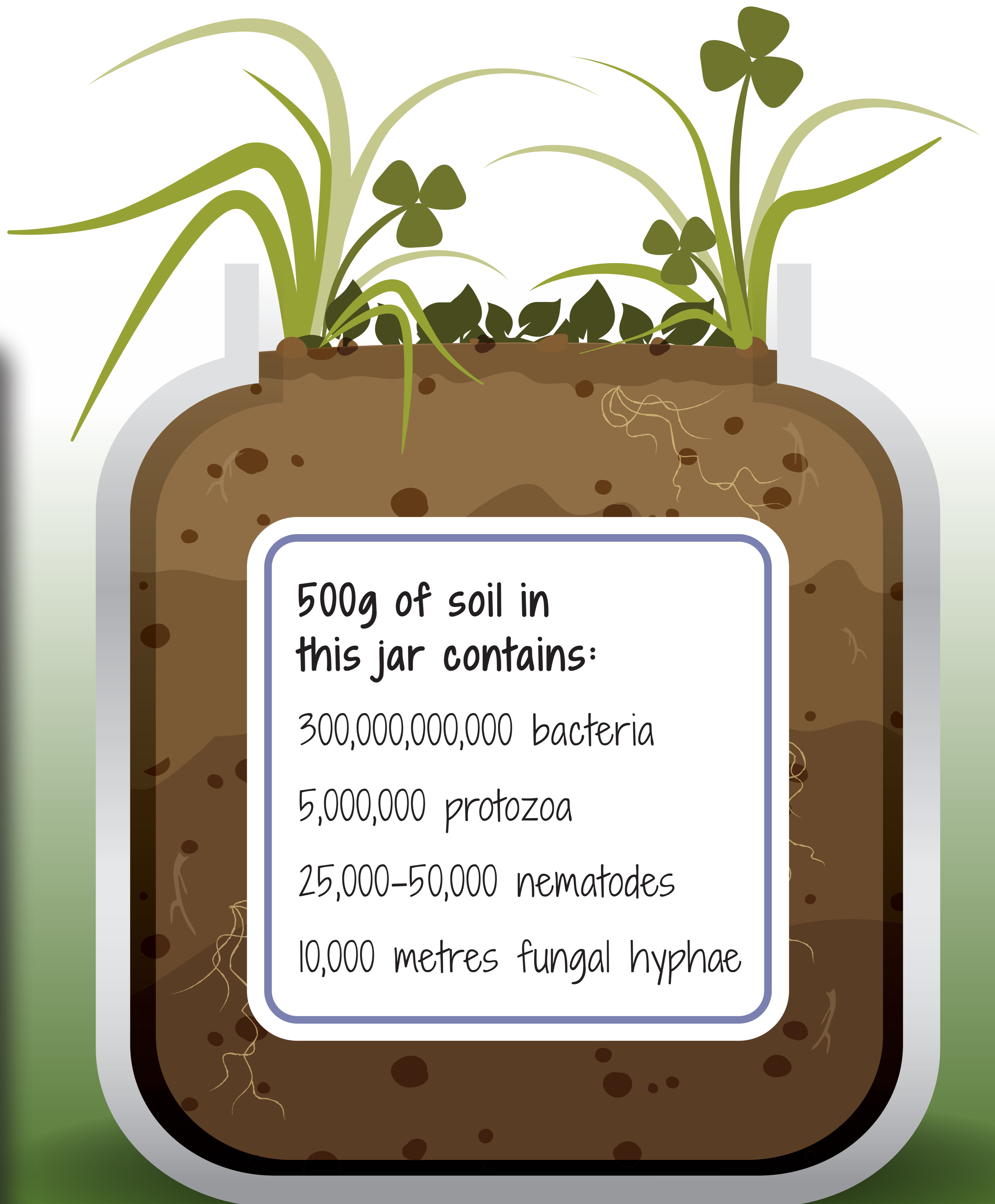
Soils host a quarter of the world's biodiversity; many species are yet to be fully identified.

## watch out for worms

The UK has 29 species of earthworms and these are grouped into three main earthworm lifestyles – litter dwelling, topsoil dwelling or deep burrowing.

They are true engineers: as they move through the soil they create networks of burrows and mix minerals and organic materials.

Worms are also important food for birds, amphibians and mammals.



500g of soil in  
this jar contains:

300,000,000,000 bacteria

5,000,000 protozoa

25,000–50,000 nematodes

10,000 metres fungal hyphae

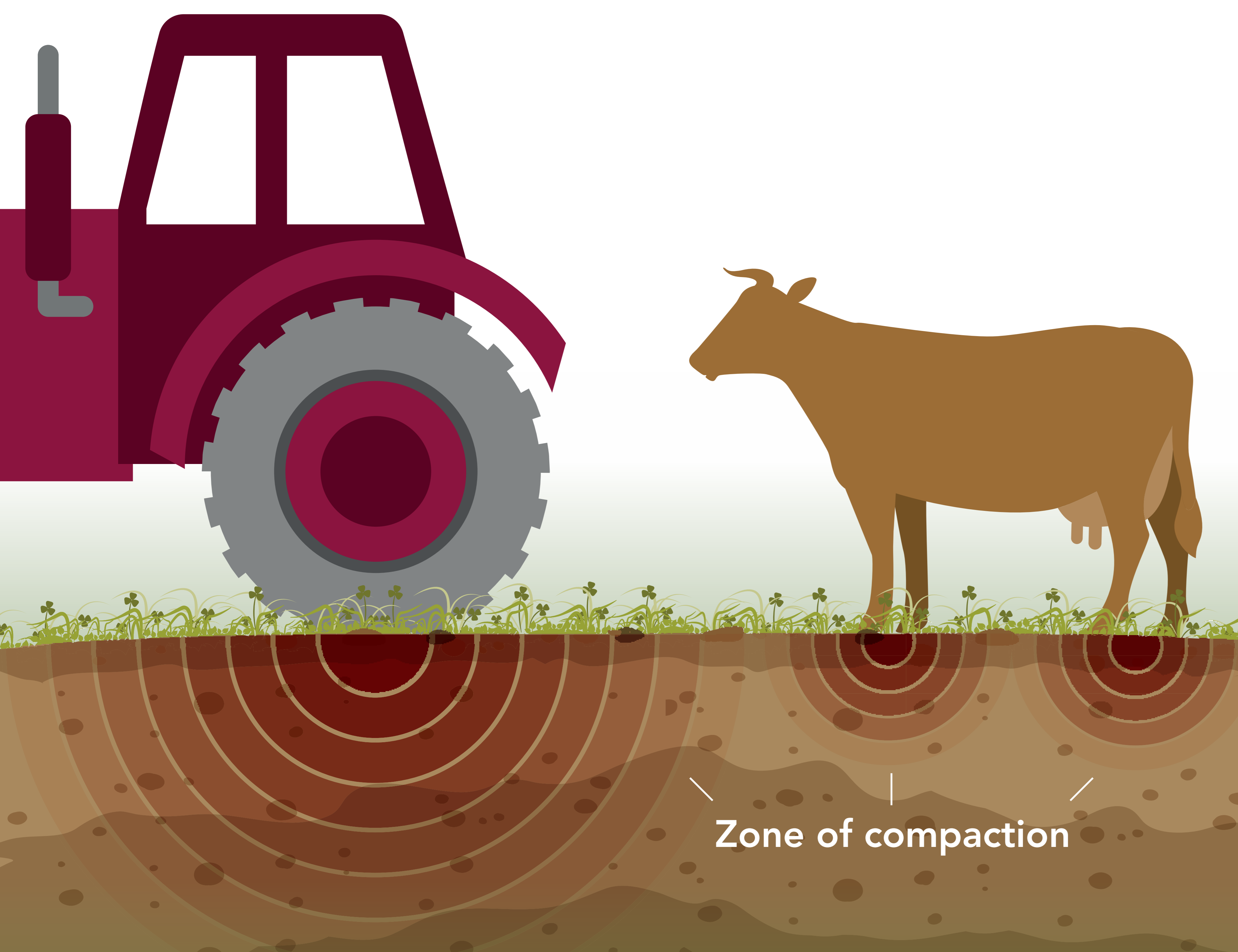
Farming practices can support soil life by:

- Feeding soil organisms regularly through plants and organic matter inputs
- Minimising physical disturbance through tillage and reducing compaction
- Creating plant diversity in space and in time

# Routes for roots (plus air and water)

**Soil structure** results from the interaction of the mineral particles (sand, silt and clay) with soil organic matter as they aggregate together to form the crumbs, blocks and other aggregates that we see in the soil.

The proportion of particles of different sizes (soil texture) that make up the soil have a large impact on the soil structure and properties such as trafficability and workability. Clay soils usually have more small pores than sandy soils and these hold on to more water for longer.



Driving or walking on soil when it is wet can lead to compaction. The change in pore space and arrangement means that roots and water can find it difficult to move through.

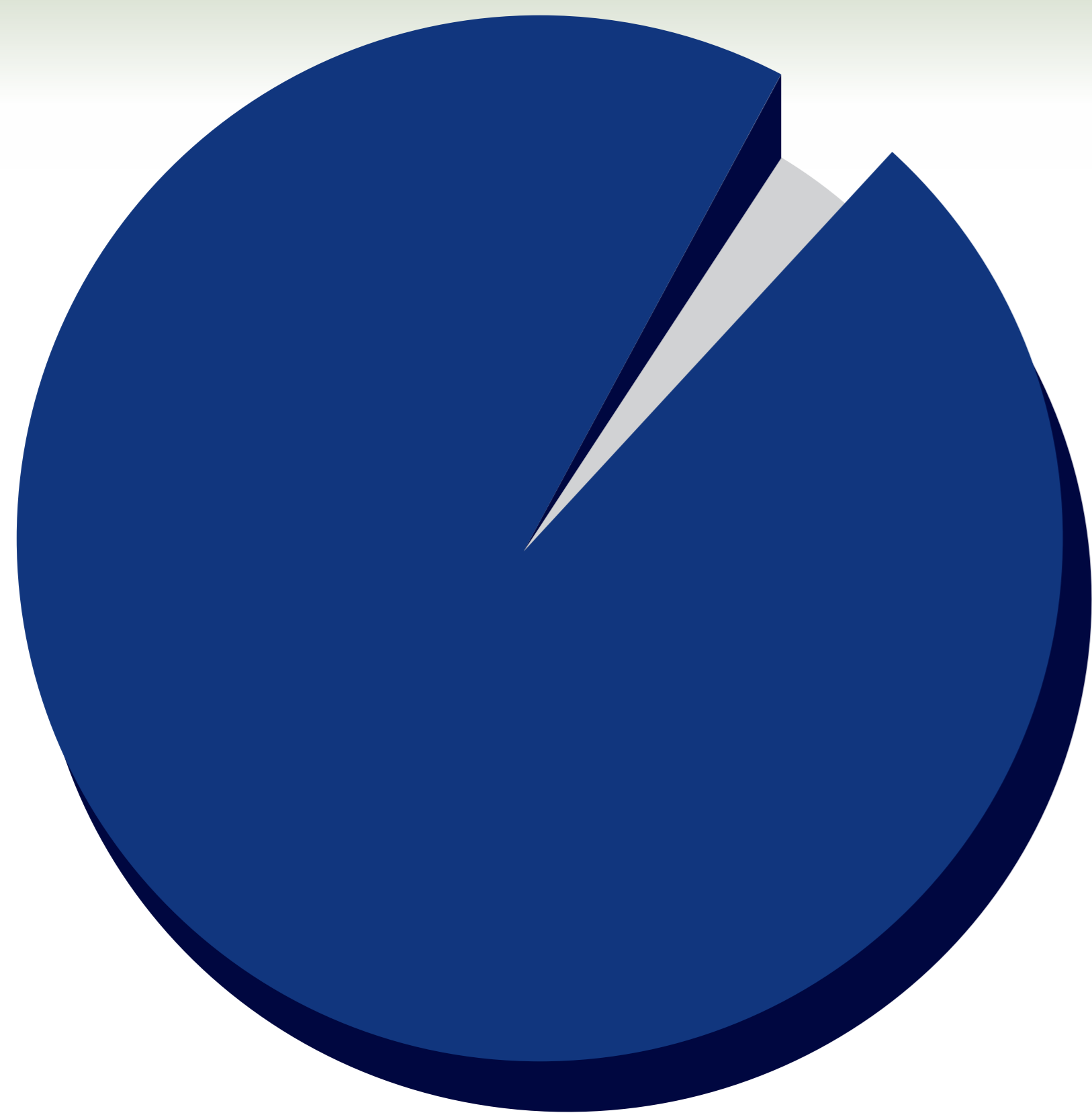
A good structured soil (medium soil) from a controlled traffic farming trial site with zero traffic for the past three years.



A poor soil structure (heavy soil).



# Where food begins



95%

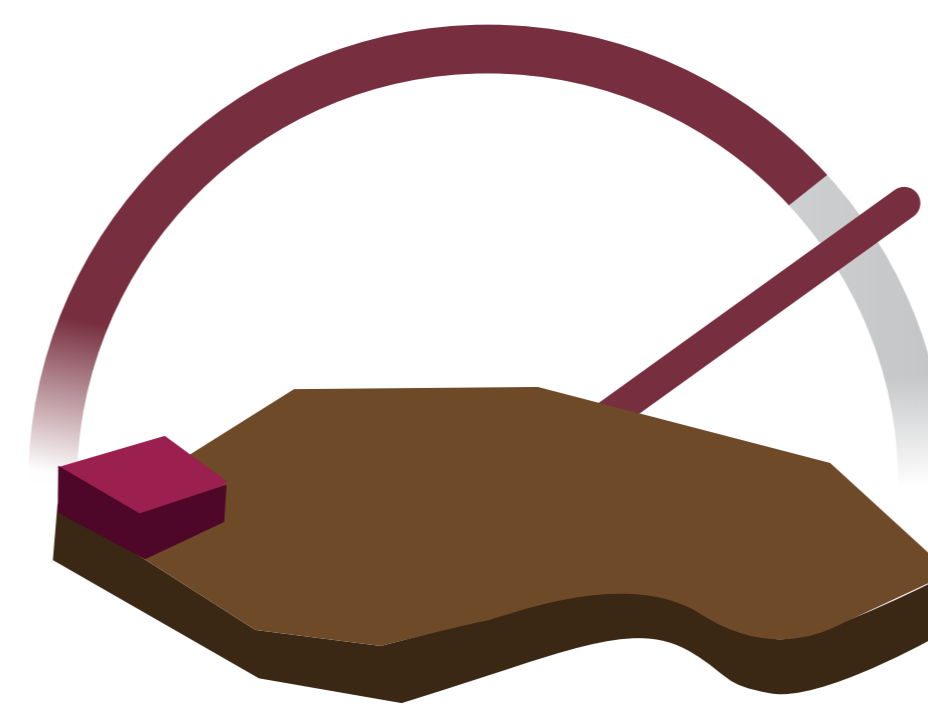
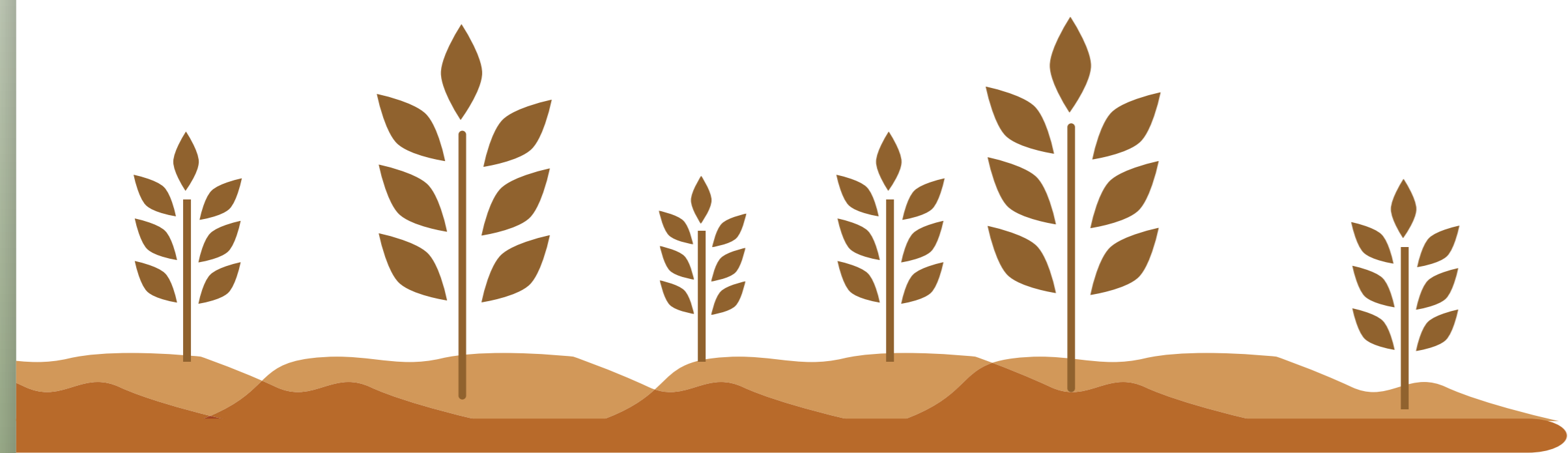
of our food is directly or indirectly produced on our soils.



50 years

In the last 50 years advances in agricultural technology have led to increased food production, but sometimes with negative impacts on soils and the environment.

In many countries, intensive crop production has depleted the soil, jeopardising our ability to maintain production in these areas in the future.



It can take up to 1000 years to produce 1cm of soil.



Soil health and its fertility have a direct influence on the nutrient content of food crops.

Farmers help maintain soil health by:

- Adding organic matter such as crop roots, residues and other inputs (cover crops, composts, manures etc)
- Timing tillage and traffic carefully to reduce compaction
- Rotating crops
- Adding lime and nutrients where and when they are needed
- Maintaining effective drainage systems

Working together with farmers, NIAB is helping to develop tools to measure soil health and manage soils for the future so that we can produce nutritious food and maintain a healthy environment.



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