
260120

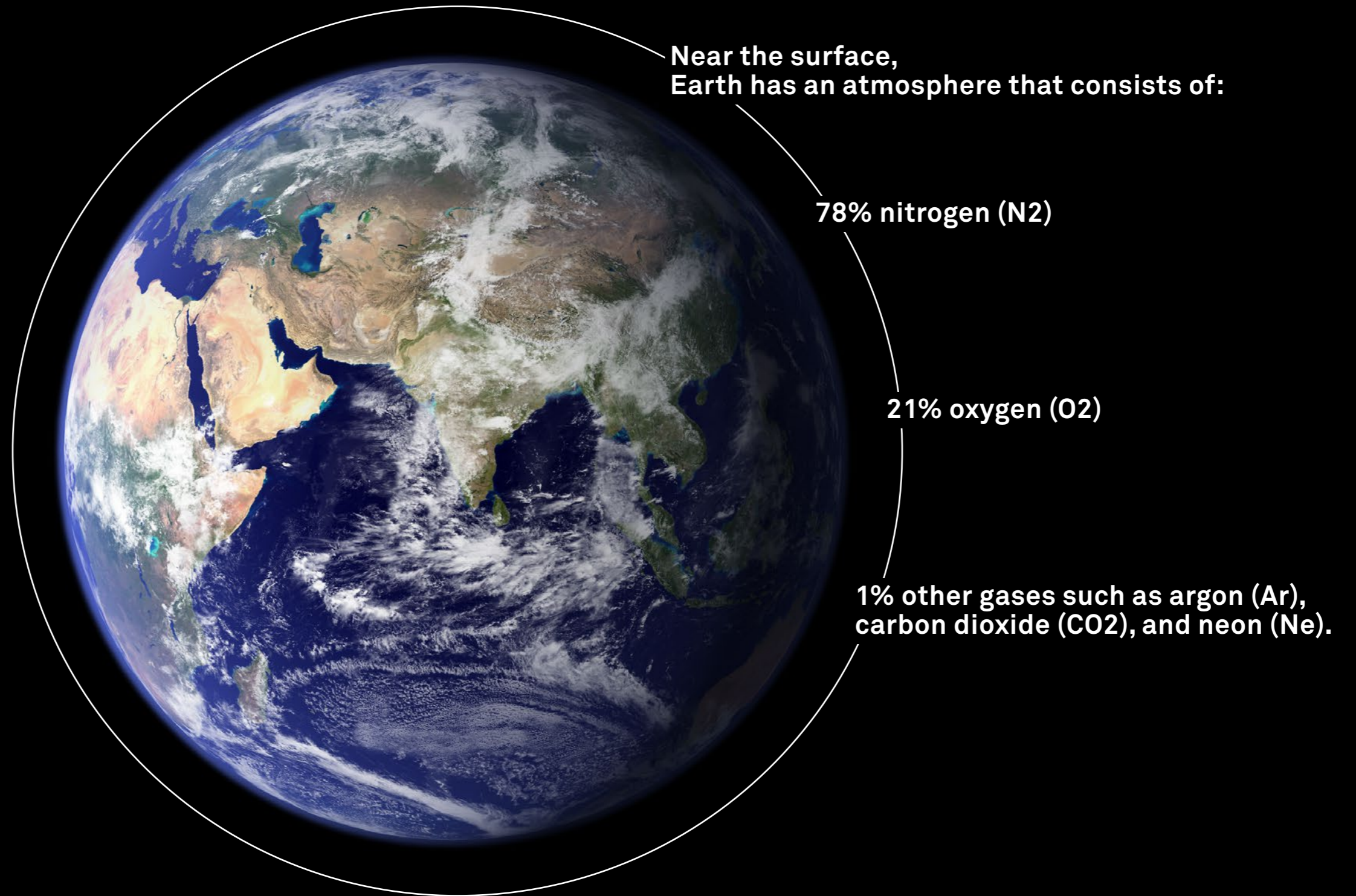
Soil Assembly #3 – Kochi-Muziris Biennale

Ramon Grendene, United Research for Soil

Fertile Soil – The Foundation of Life

Carefully produced and subsequently assessed humus composts (black soils) are a key instrument for rapid soil improvement and organic soil regeneration. In this talk, you will learn about the context of an aerobically controlled humus composting process and its remarkable outcomes for long-term soil fertility.

Fertile Soil The Foundation of Life



The oxygen-rich atmosphere transformed Earth into a planet of complex, interconnected life – including us as humans.

Every Action We Take Has Consequences for the Biosphere and Soil Life

Haze

Dehli

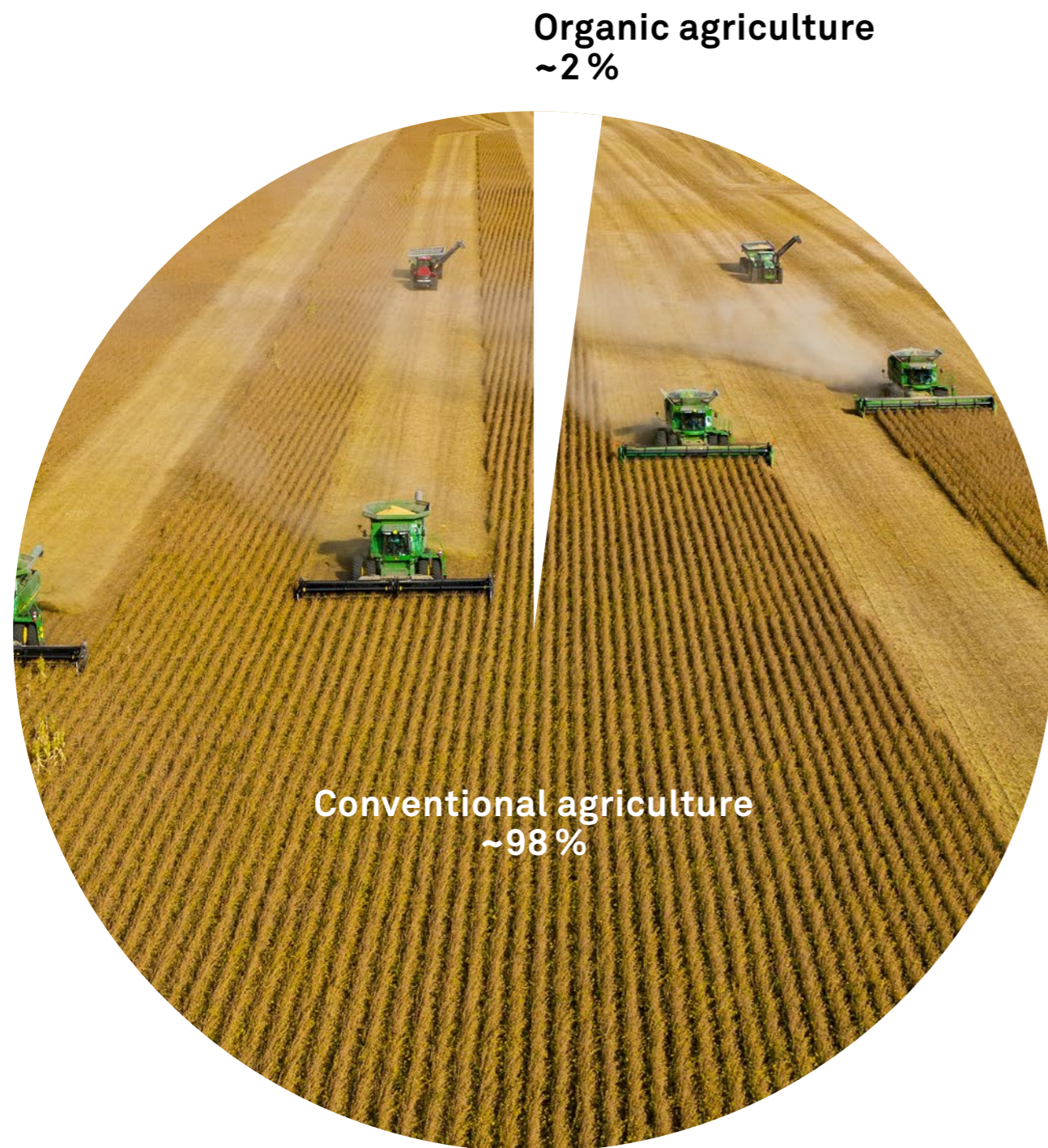
Himalayas

Haze

November 11, 2025

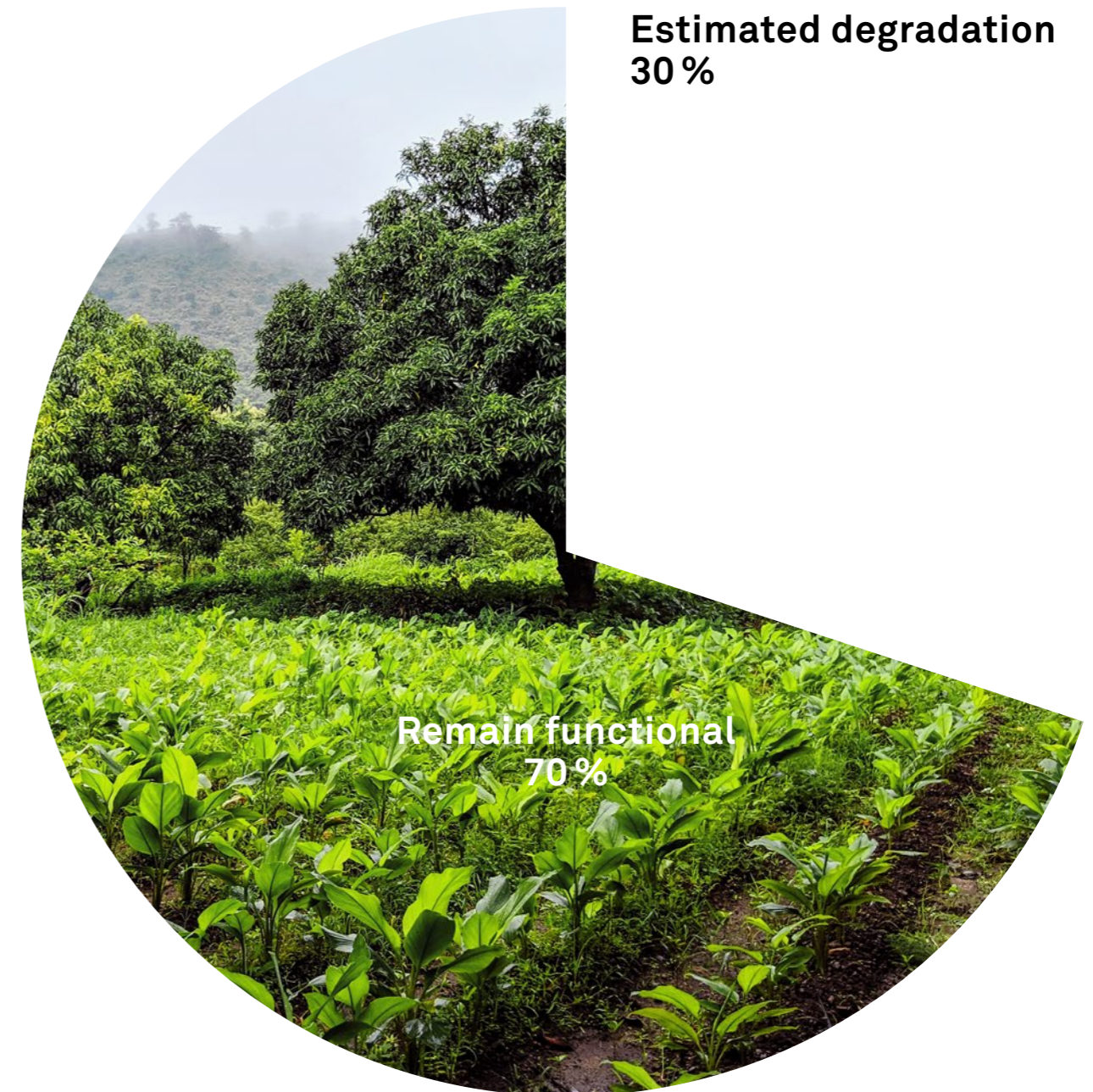
Farmers in Punjab, Haryana, and Uttar Pradesh burn rice stubble between October and December to quickly clear fields before planting wheat.

Agricultural Soil Use as Part of a Living Process



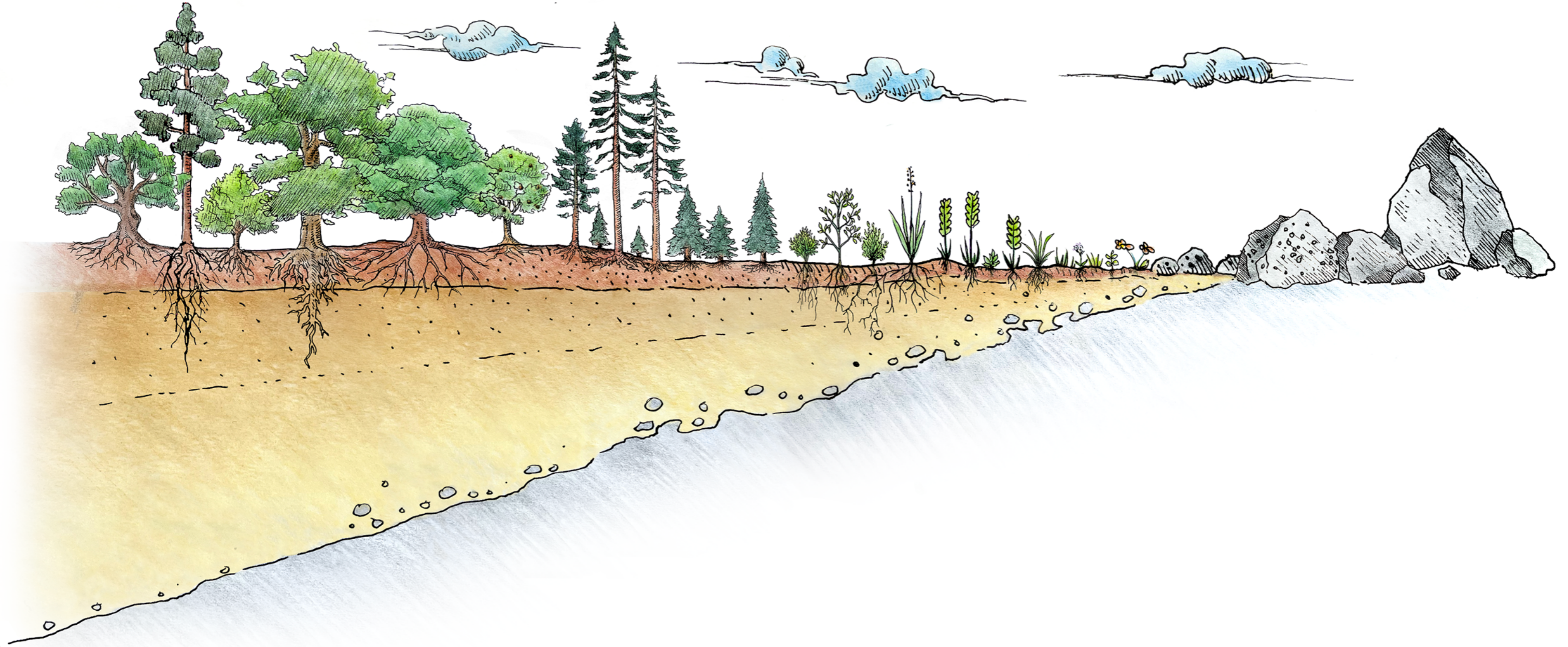
By today only 0.1 of 4.8 billion hectares of global agricultural land are managed organically.

Predicted Global Agricultural Land Degradation by 2030



30% of degraded agricultural land equals more than four times the size of India.

We Are Farming on Borrowed Soil



Succession shows that soil fertility builds gradually, increasing biological diversity over time scales of hundreds of years.

Diversity is essential for life and natural cycles.

Beyond natural disturbances, long-established soil management practices degrade soil life.

We therefore need to actively restore soil fertility based on a comprehension of nature's needs.

TEMPERATE / SUBTROPICS /



Most Soil Life Is Found in the Topsoil

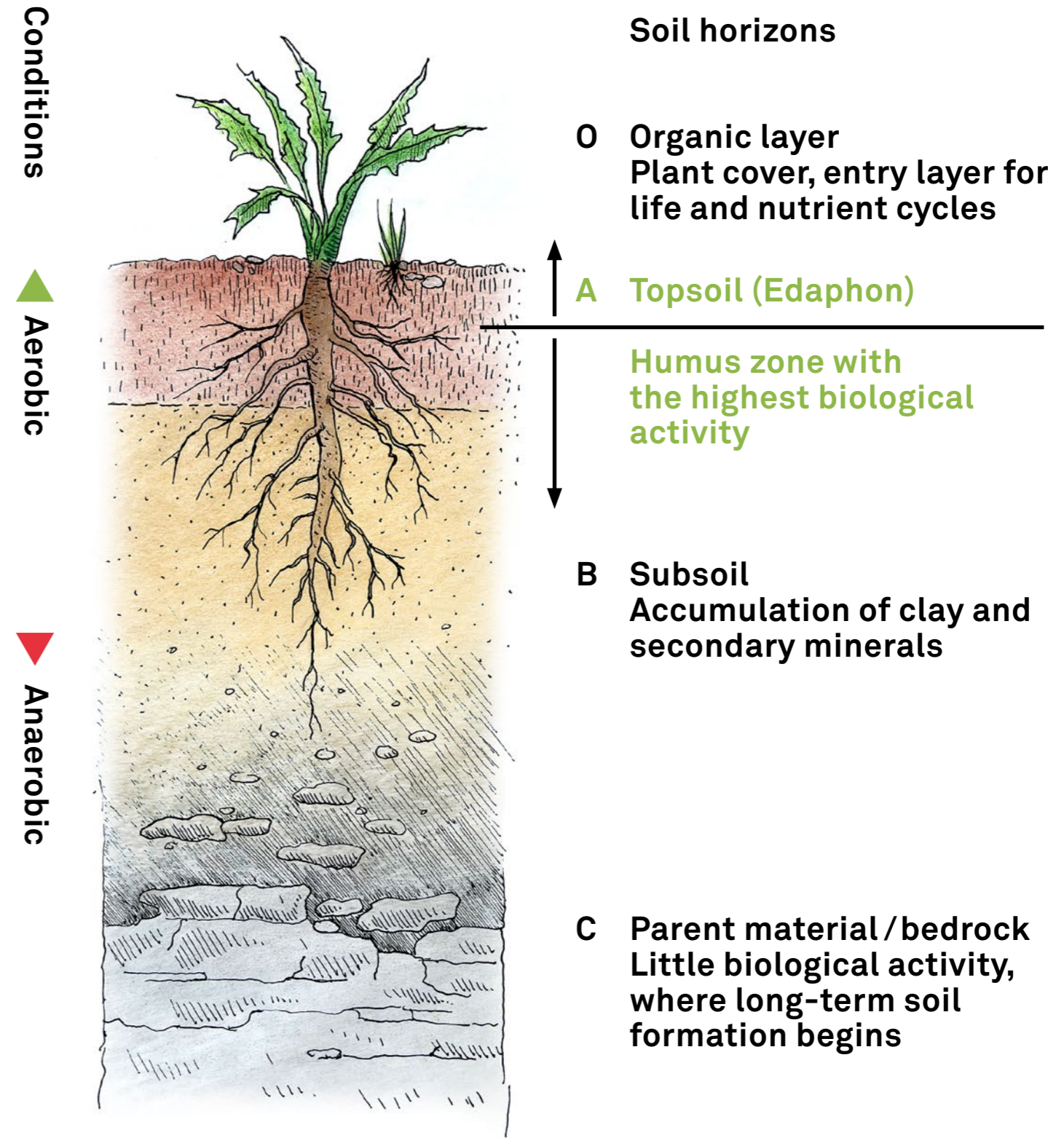


Illustration by Simon Grendene

Image by Fanny Petibon, ETH Zürich

Basic Needs of Humans and Animals

Basic Needs of Soil Life

Soil life needs the same fundamentals as we do. Take away air, food, water, shelter, rest, warmth, or biological networks – and life will collapse.



Breathing
Eating
Drinking
Shelter
Rest
Warmth
Social connections

Oxygen
Food
Water
Shelter
Rest
Warmth
Biological networks

aeration, no compaction
organic matter, root exudates, residues
moisture held by humus
stable crumb and pore structure
low disturbance, work only on dry soil
living and diverse plant cover, mulch

Aerobically Managed Humus Composts as a Key Tool for Soil Health

1. Input materials are layered and piled up into a compost heap:



- Organic materials (C:N = 30:1, as fresh as possible)
- Biochar (up to 30 %)
- Natural diabase rock dust (2–20 kg/m³)
- Soil and compost addition (10 % each)
- Clay powder (humonite) for clay-deficient soils (5 kg/m³)

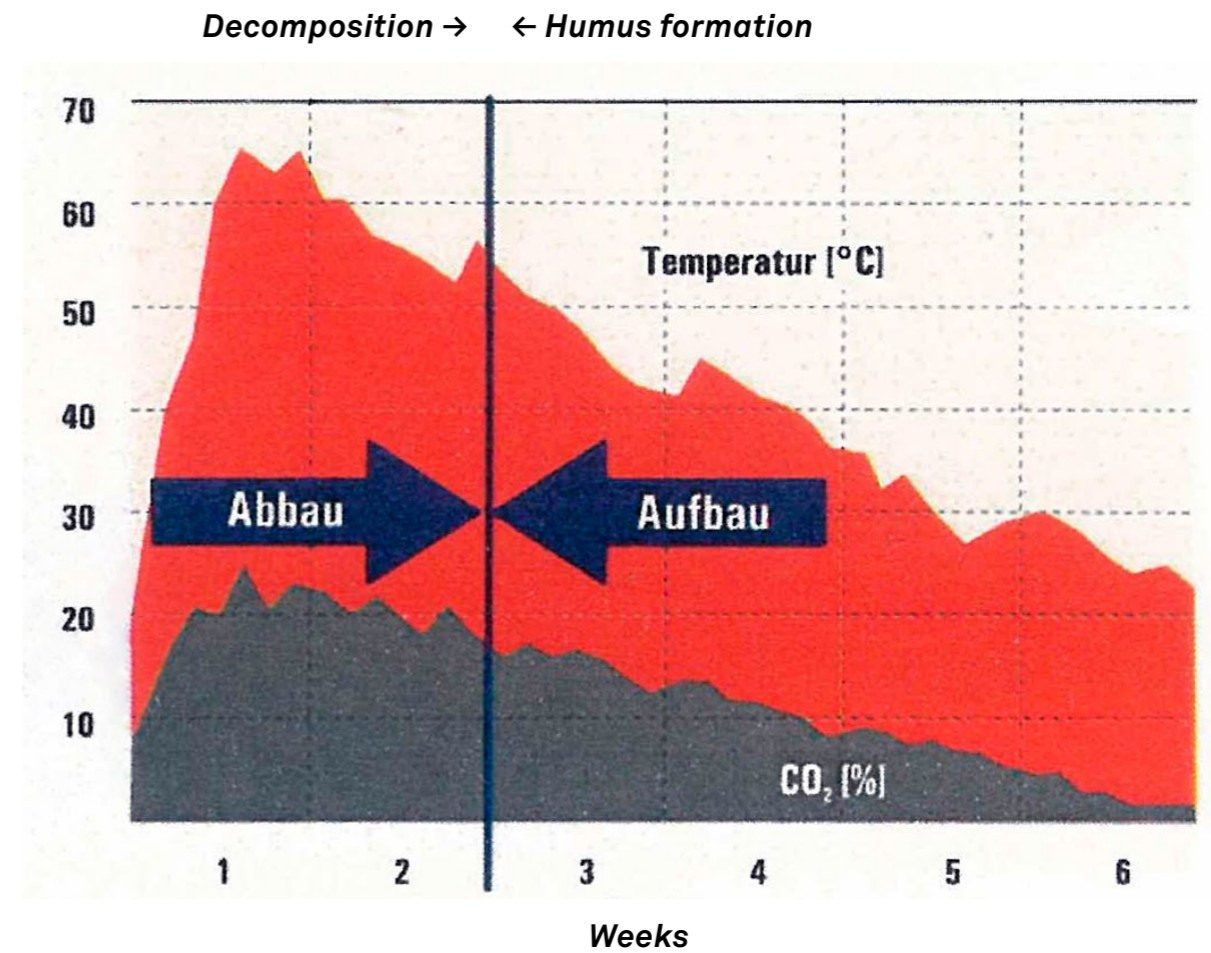


Urs Hildebrandt, United Research for Soil/Austria



The Shift Permaculture, Egg/Switzerland

2. Process parameters are controlled through measurement-based turning and moisture management:



- Aeration (CO₂ /O₂, minimum 5% oxygen)
- Temperature (max. 65 °C)
- Moisture (55—60%)
- Biological inoculation for aerobic humus formation (Pfeiffer-Lübke Starter)
- Protection with fleece (Toptex)

Images by Ramon Grendene, Jan Fabian



3. After 8—10 weeks of processing, the clay-humus-rich compost undergoes several tests before application to soil:



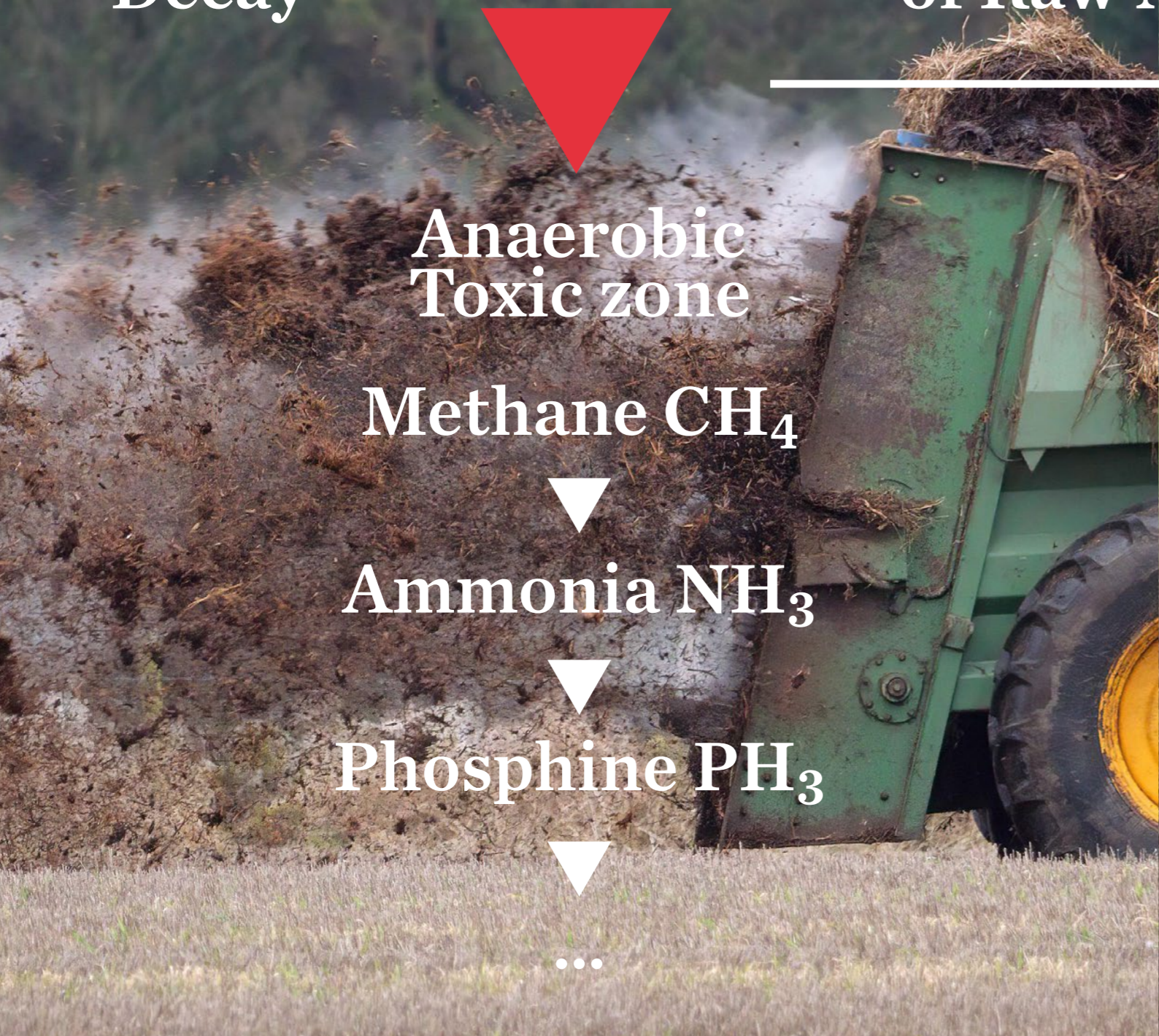
→ 200 ml compost, 40 ml water, 1 g cress (*Lepidium sativum*) in an open and a closed glass; good test results after 7—9 days

- Nitrate content, $\text{NH}_4 \rightarrow \text{NO}_2$ (must be zero) $\rightarrow \text{NO}_3$
- pH value (7—8 in finished compost)
- Sulfide (must be zero), detectable sulfide is plant toxic
- Cress germination test in an open and closed glass
- Microscopic analysis

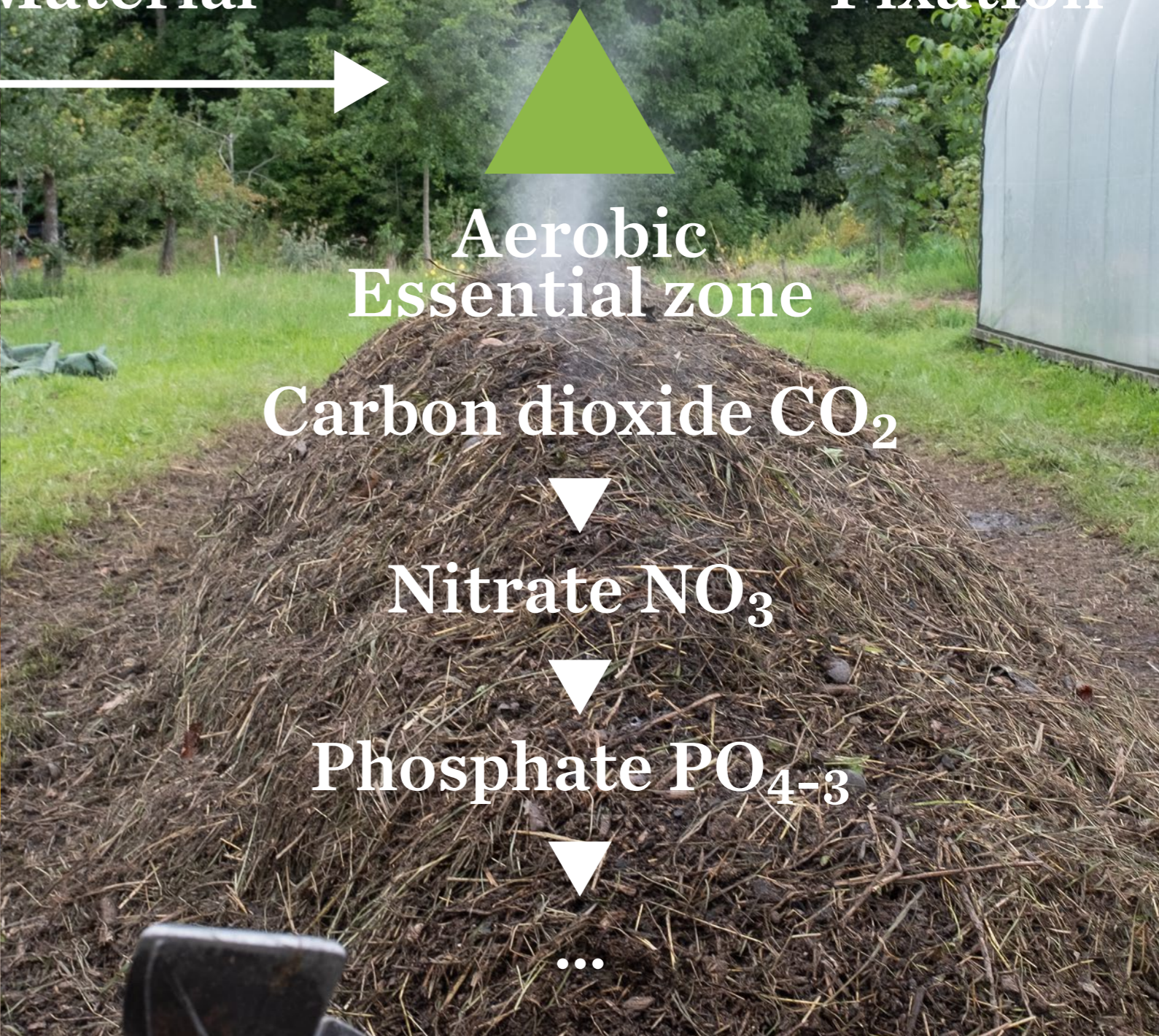
Reduction Decay

Microbiological Conversion of Raw Material

Oxygen Fixation



→ Decay-dominant; anaerobic, reductive, hydrogen-rich compounds accumulate



→ Humification-dominant; aerobic, oxidized mineral compounds accumulate

Uncontrolled anaerobic processes remove oxygen from compounds, resulting in unpleasant odors due to putrefaction.

Aerobic life forms use oxygen and release CO_2 . In aerobic processes, oxygen becomes an integral part of the humus formation.

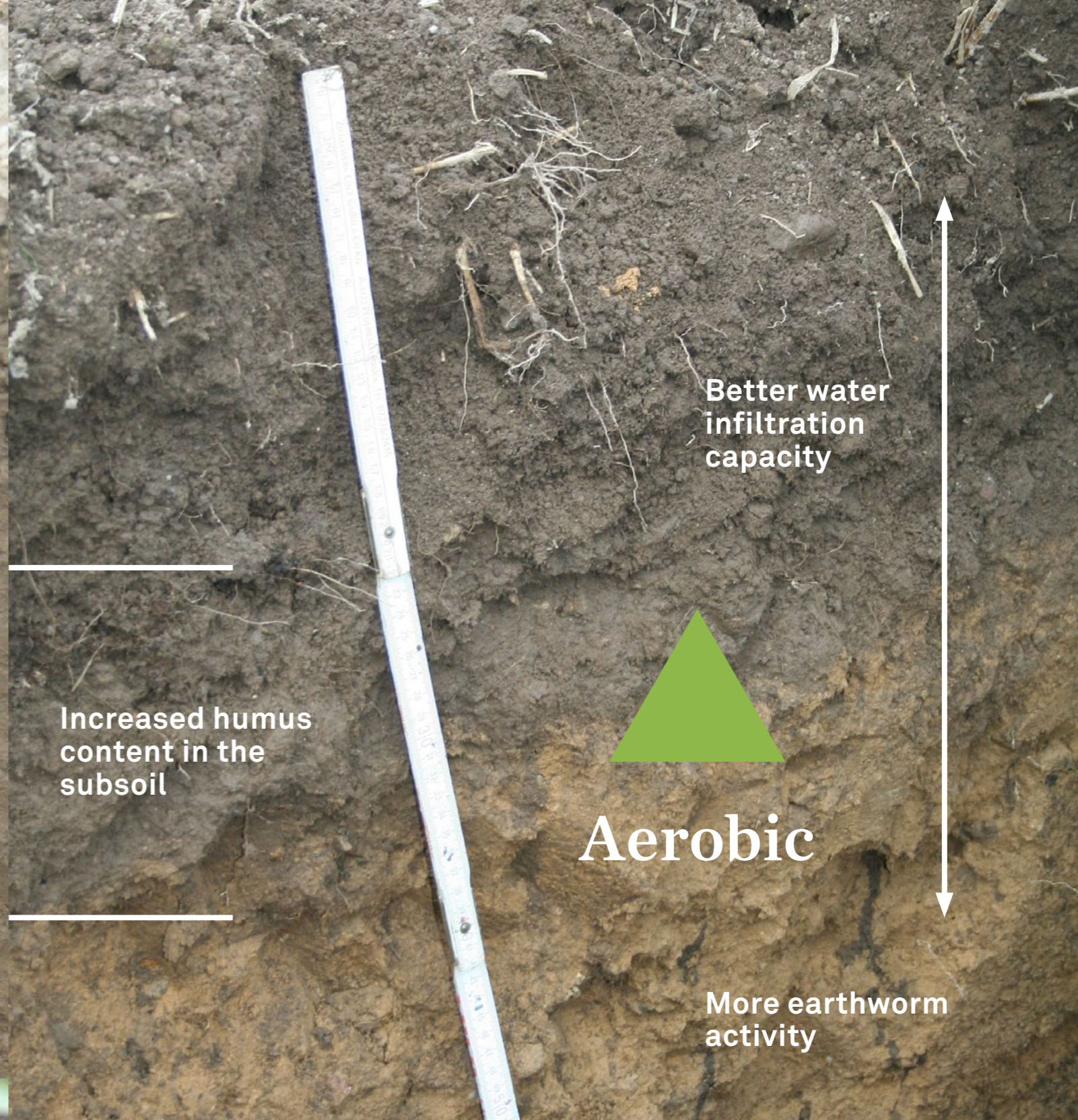
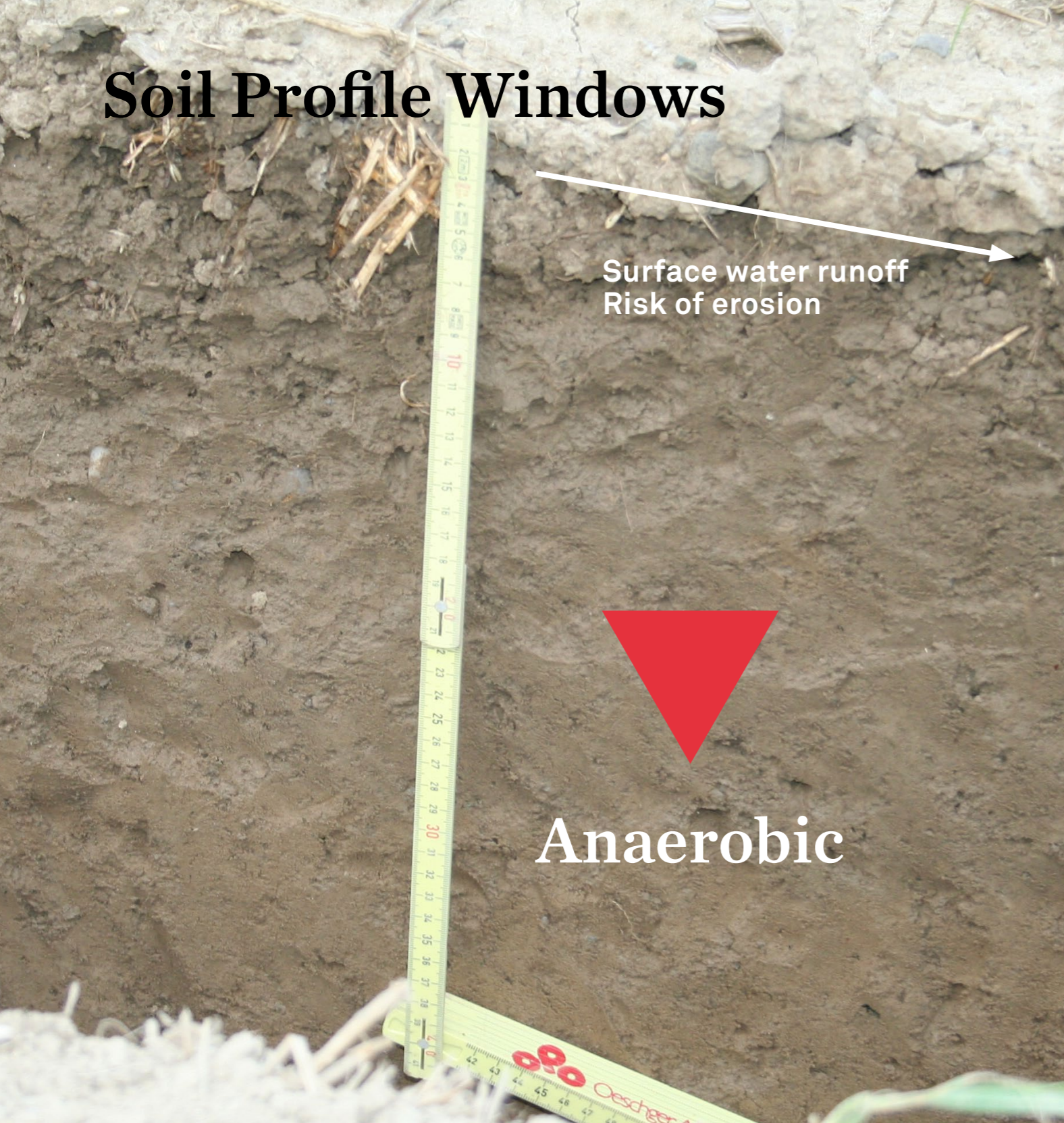
Healthy Food from Humus-Rich Soils



Tested, clay-humus-rich compost inoculates the soil with humus-building microbes and supports plant growth through active plant nutrition.

In active plant nutrition, plants take up nutrients through symbiosis with the soil microbiome – the opposite of fertilizer-based agriculture.

Soil Profile Windows



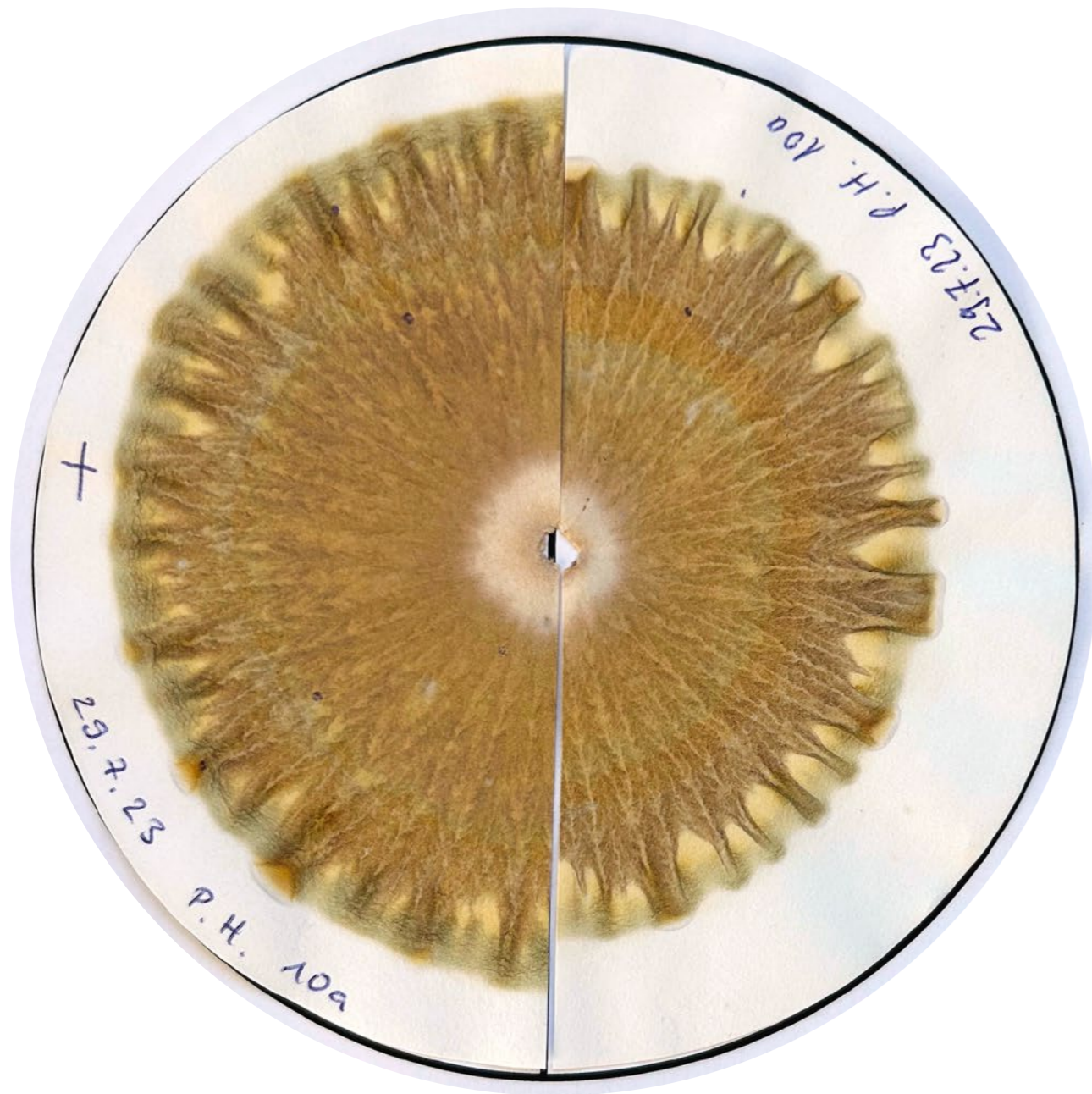
→ Conventional soil management with manure and mineral nitrogen fertilizer; no-till wheat farming

→ Soil management with aerobic humus compost; 8 years of grain farming

Brown soil, prone to soil compaction
Water storage capacity: 276 m³/ha
Organic matter ~ 1,5 %, carbon storage 0–40 cm: 69 t/ha

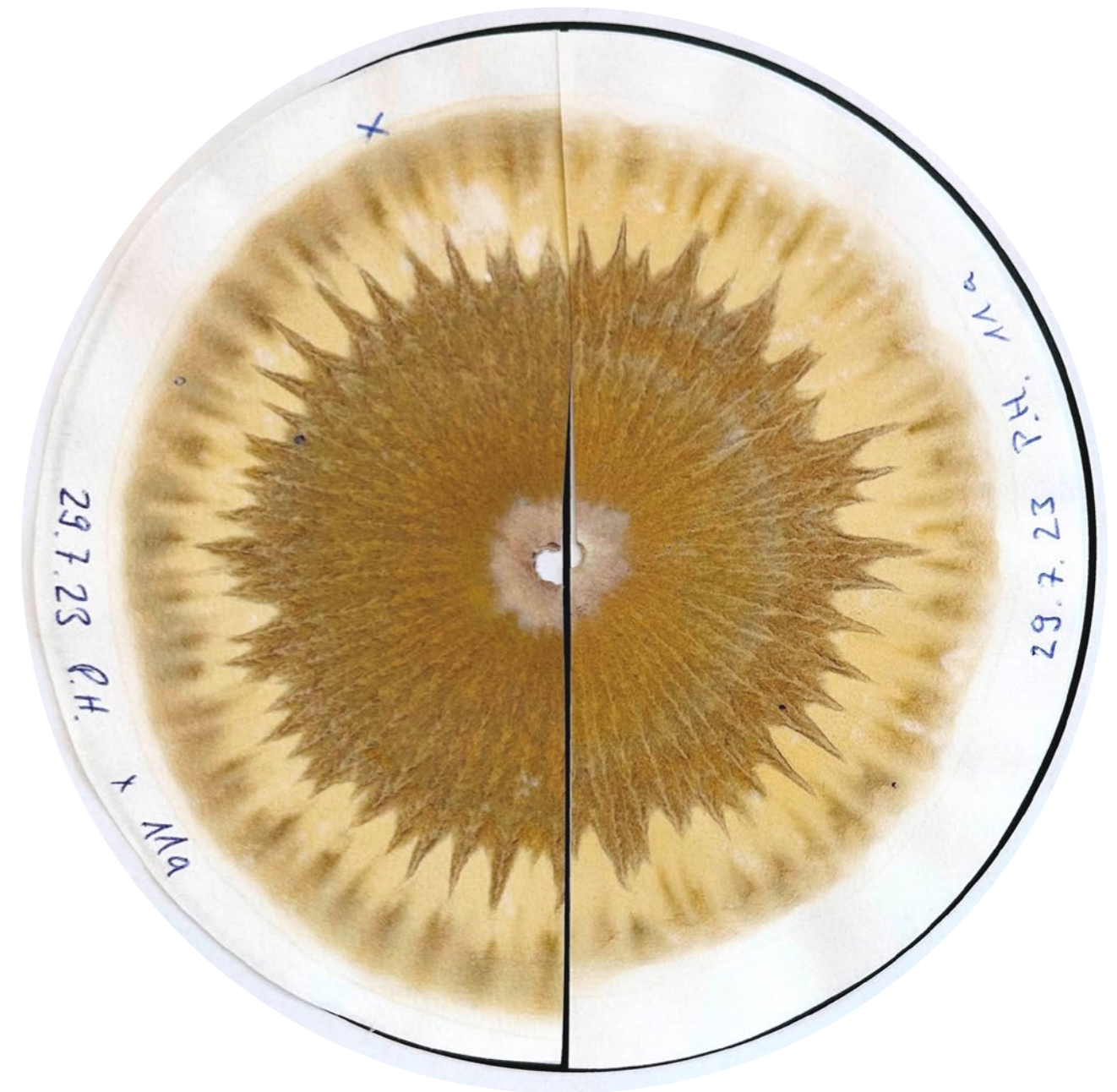
Well-drained brown soil, good crumb structure
Water storage capacity (due to humus): 976 m³/ha
Organic matter ~ 5 %, carbon storage 0–40 cm: 244 t/ha

Visualization of Soil Condition



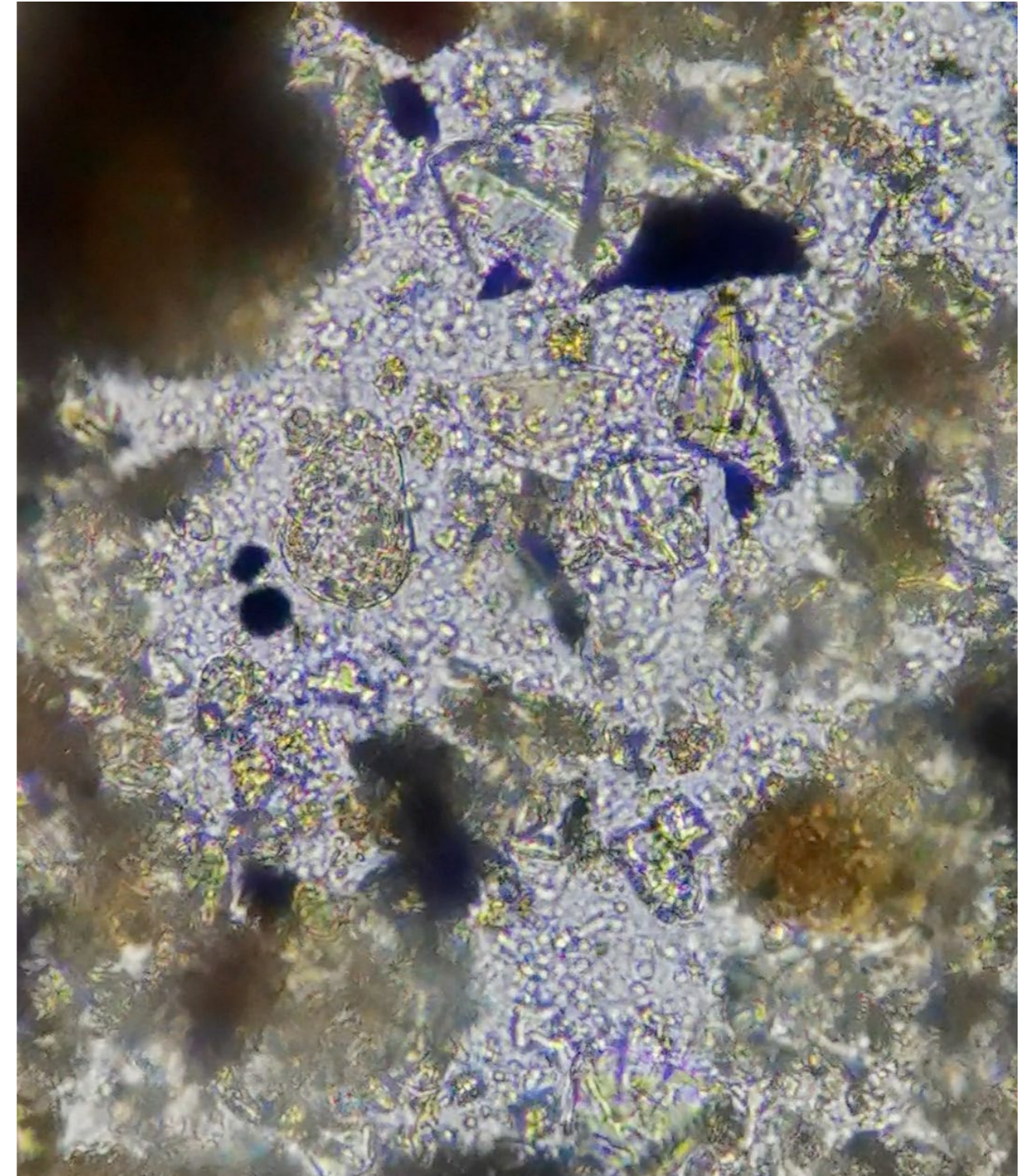
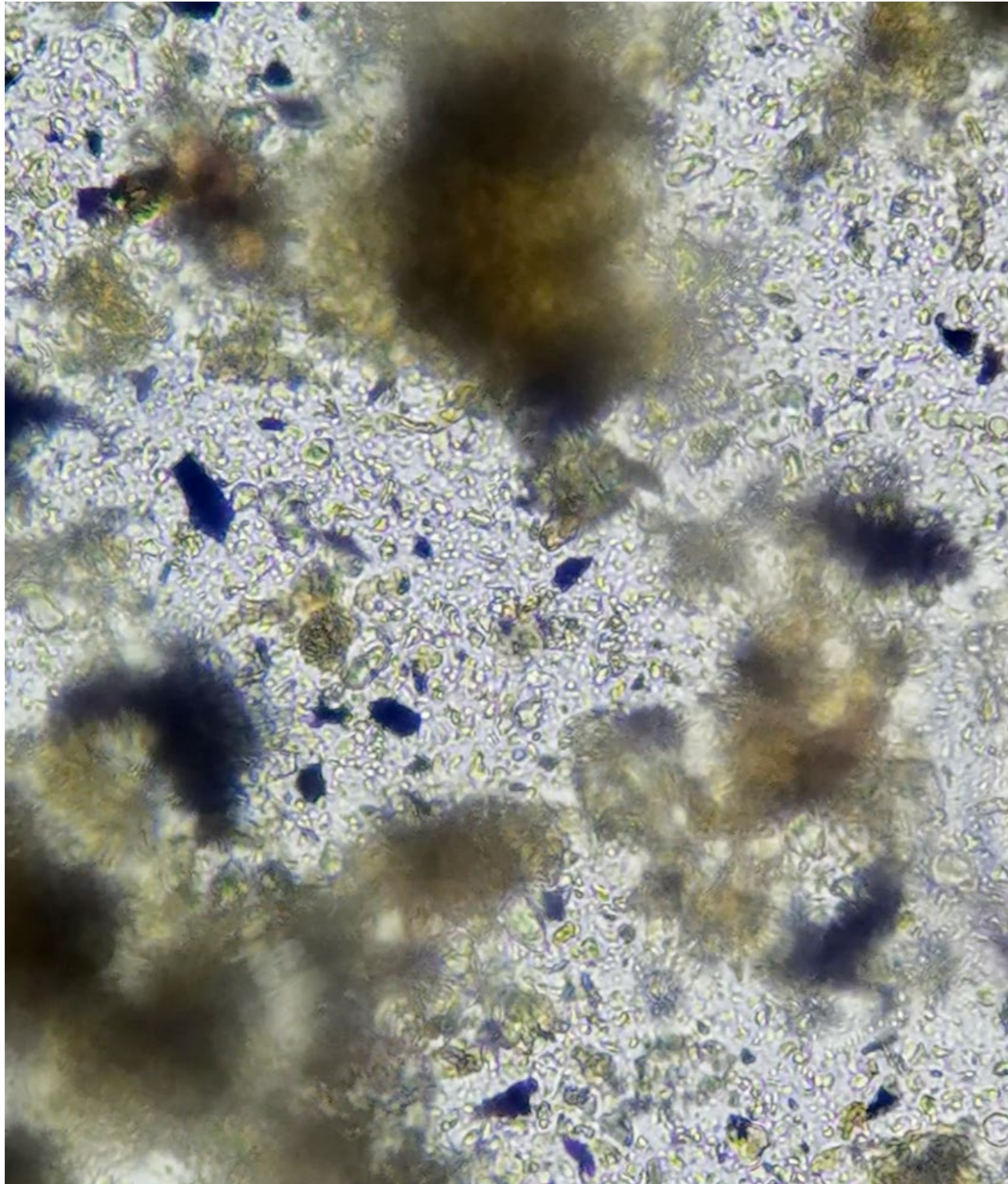
→ Chromatography by Fredy Abächerli, manufactured according to the methodology of Dr. Ehrenfried Pfeiffer

Baseline condition of the parcel.



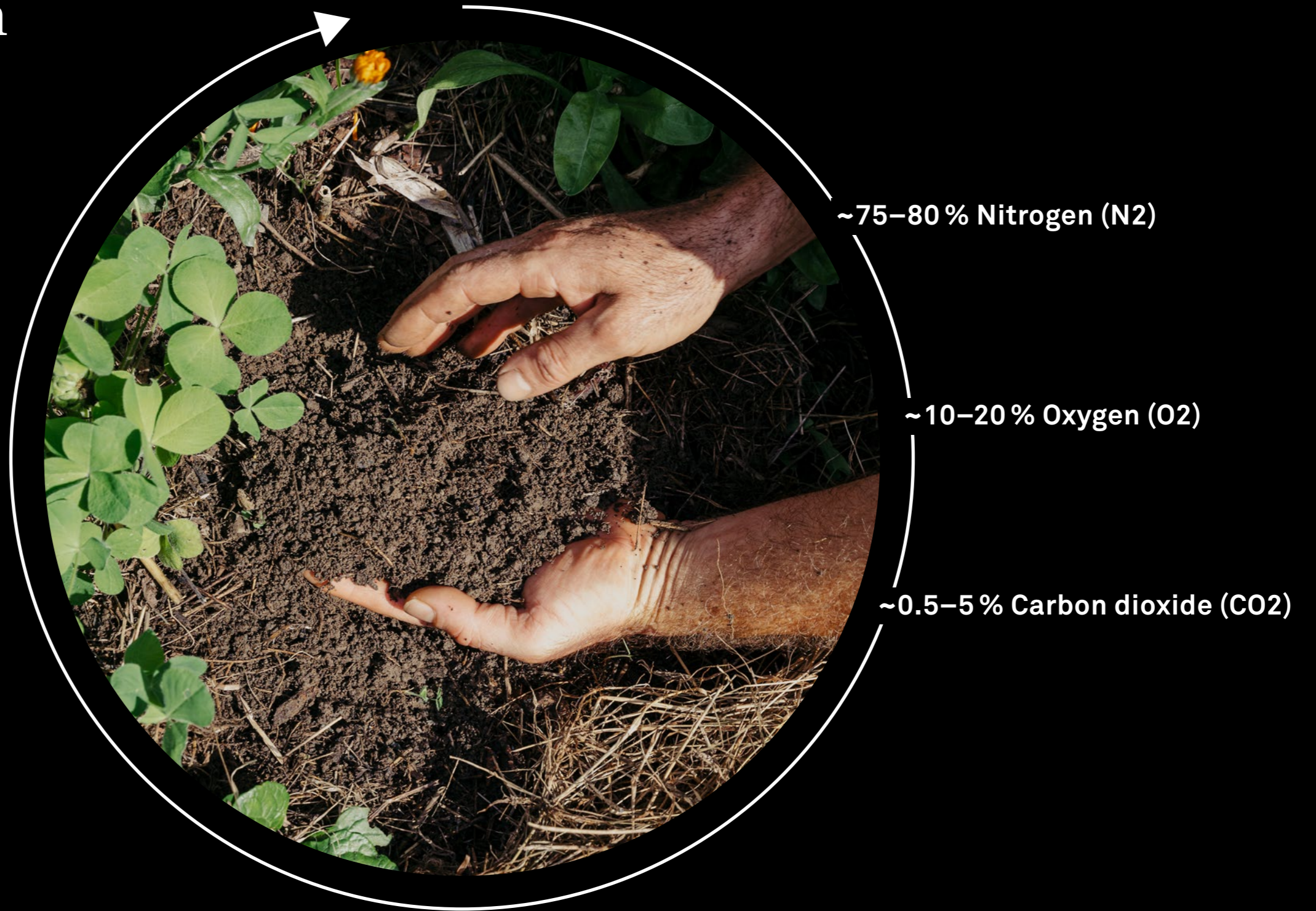
→ Chromatography by Fredy Abächerli, manufactured according to the methodology of Dr. Ehrenfried Pfeiffer

After applying high-quality aerobic humus compost and implementing proper soil management.



Microscopic views of highly biologically active aerobic humus compost.

Life Is Prana
Life Is Cycle
Life Is Interaction
Life Is Fertile Soil



Unlike the atmosphere, soil air is dynamic – healthy soils contain less oxygen and more CO₂, yet must remain aerobic to sustain life.