Situation of soil – humus content of soils in Upper-Austria

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Humus

Definition based on SCHEFFER:

➢Humus in narrow sense or classical meaning is **stalled organic matter** in and onto soil and being arranged in a permanent process of degradation, conversion and build-up. This process is set in motion and operated by biochemical processes.

Definition based on OEHMICHEN:

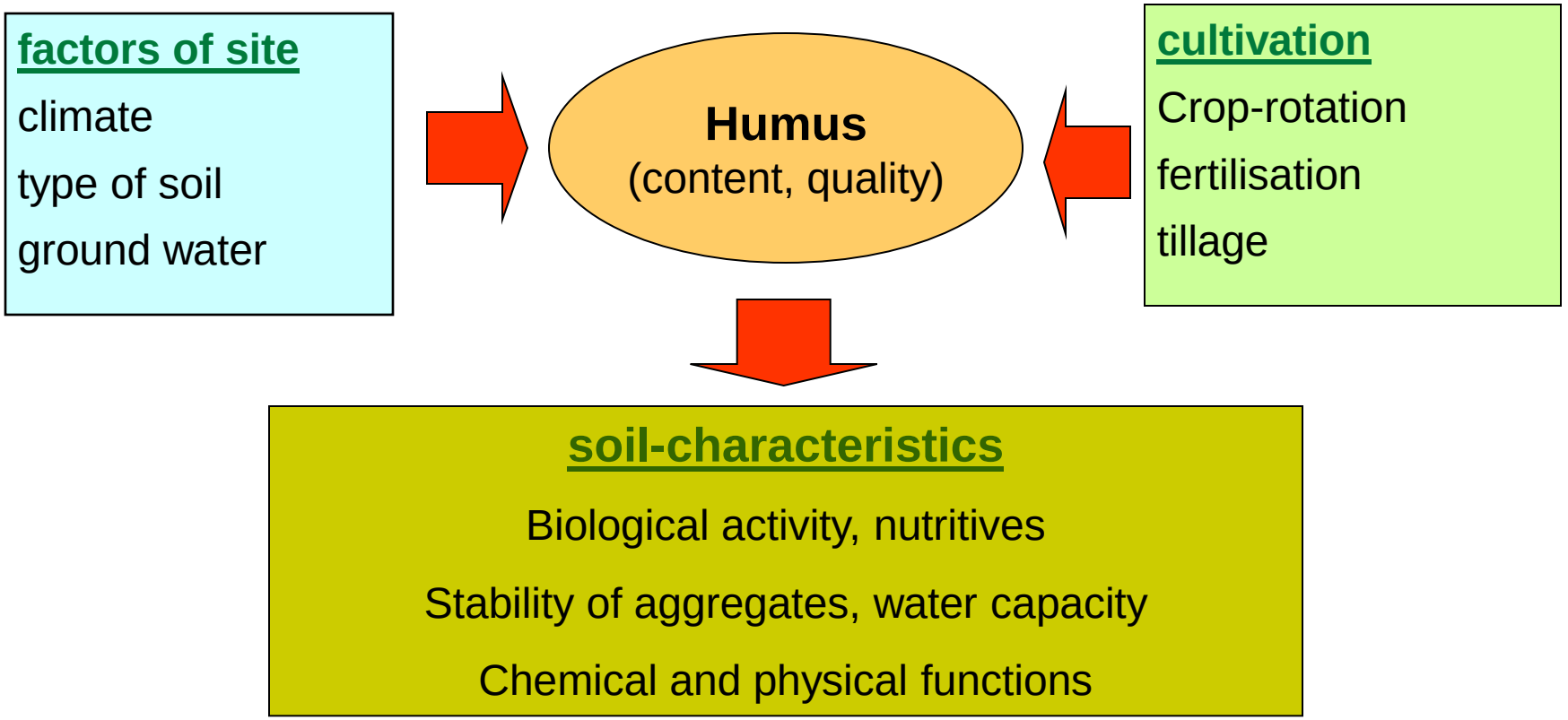
➢Basic material for humification are first and foremost crop residues (roots, leaves, straw…), catch crops (green manuring) and marginal soil organisms

➢Humus: google: 2.990.000 hits

Sustainability means sufficient content of organic matter in soil(s)

- Content of organic matter in soil is directly linked to soil fertility
- Extended use of biomass for energetic use can lead to reduced organic matter in soil, as there might be an unsufficient refeed of biomass
- Further aspect: climate change
- Soil is one of the most important carbon-stores
  - Higher temperatures lead to higher degradation of organic matter in soil; leads to higher CO_2-emission reinforcing global warming

Factors influencing humus-concentration



Depending on characteristics of site and factors of cultivation a specific amount of humus will be set up.

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Austria´s programm of sustainable farming

- Since 1995 Austria has implemented a widely applied programm of sustainable farming (ÖPUL = Österreichisches Programm für umweltgerechte Landwirtschaft)
- Measures for all type of agriculture (organic farming, arable land, grassland, wineyards, measures concerning biodiversity,….)
- **Precautionary measures for protecting soil and water**
  - **Implementation of system wintergreen by catch-crops**
  - **Implementation of „reduced tilling systems“ like mulch-seed and direct-seed**
  - **The main reason at the beginning was fighting erosion and nitrogen-leaching**
  - **Improving the humus-situation is getting more important and a colateral benefit (maybe becoming more important)**

System evergreen (wintergreen)

Measures of soil- and water protection ;Austrian programme of sustainable farming (2008)

	System wintergreen, hectars	Hectars of direct and/or mulchseed following system wintergreen
Austria	431.232	137.300
Upper-Austria	103.236	37.830

Catch-crops - tillage

- **„High-quality-catch-crops“ – lead to an increase of humus**
  - Most important: right time of sowing the catch-crop
  - Fertilisation – depending on catch-crop – important influence for biomass-production
  - No incubation of biomass in autumn – catch-crops stay on field till they freeze off (more lignin, more longchain carbohydrates – leads to better humification)
  - Type of catch-crop is less important regarding humification
  - Blended seeds of catch-crops are nice for biodiversity but less important regarding humification or protecting from erosion
- **Tillage**
  - As spare as possible
  - Combined seed-measures if possible (Direkt-seed, seed in mulch)

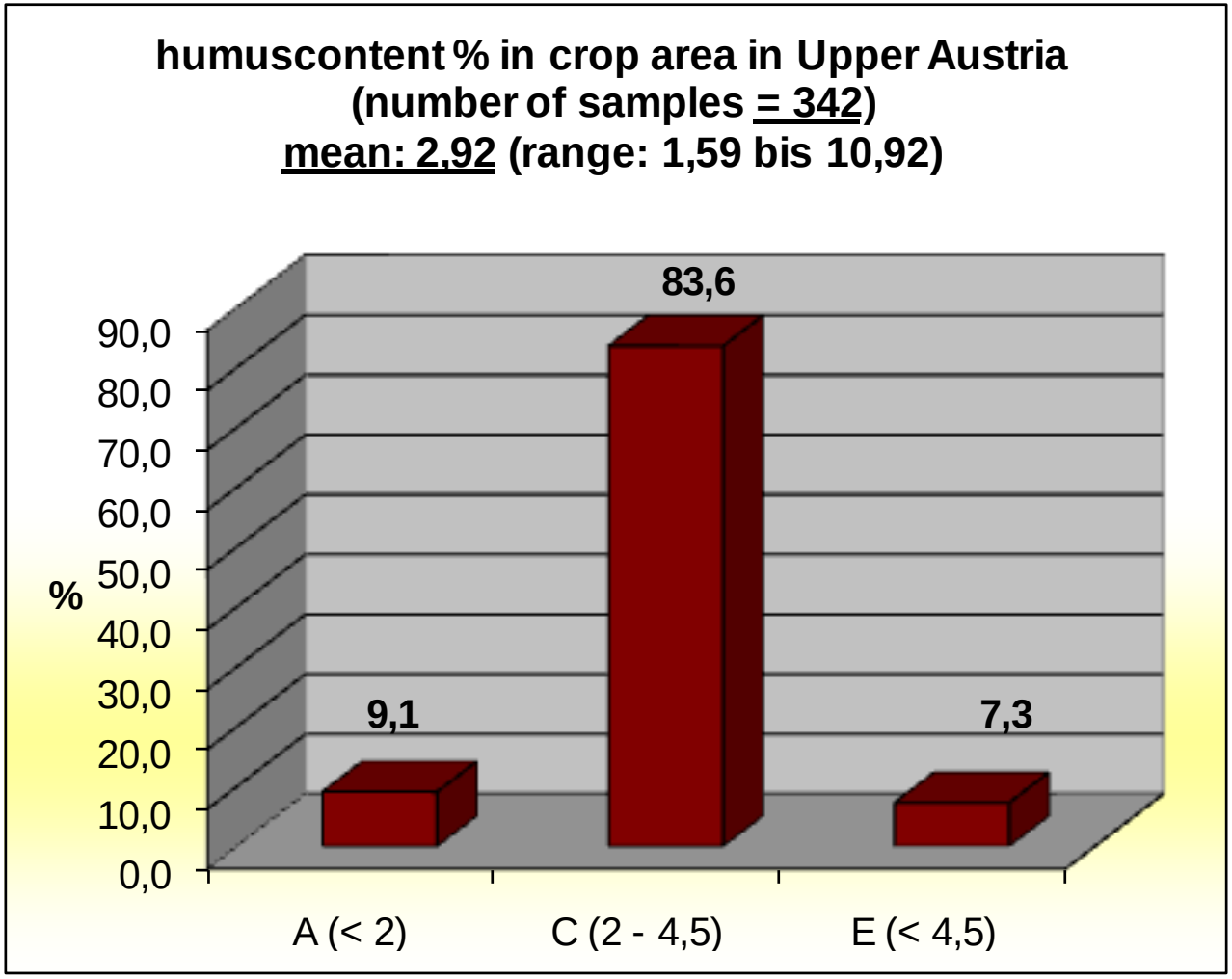
Mainly used catch-crops for system wintergreen

- **Cruciferous plants**
  - Mainly mustard (yellow), oil radish
    - Advantages: cheap, quickly covering soil, poor seed bed preparation possible, good consumers of farm manure, freezing safely in winter
    - Disadvanteges: causing phytosanitary problems in crop rotation with rape-seed
- **Phacelia (Phacelia tanacetifolia)**
  - Advantages: good root penetration, no affinity to main crop plants causing any phytosanitary problems, best „bee-pasture“, safely freezing in winter, direct seed in spring for following crop recommended
  - Disadvantages: seed bed preparation more intensive, costs of seed - sometimes

Soil research – chamber of agriculture Upper-Austria 2004-2009

- Different projects of soil-analysis within 2004 - 2009
- 2004: 486 samples in arable land
- 2005: 627 samples in grassland
- 2008: about 700 samples arable land/grassland
- 2009: Big project – soil analysis in Upper-Austria
- 3.320 farmers, 16.500 samples (ph-value, phopsphate/potash-content, humus-content)
- Not yet finished – we are still working

Humuscontent in crop area in Upper Austria



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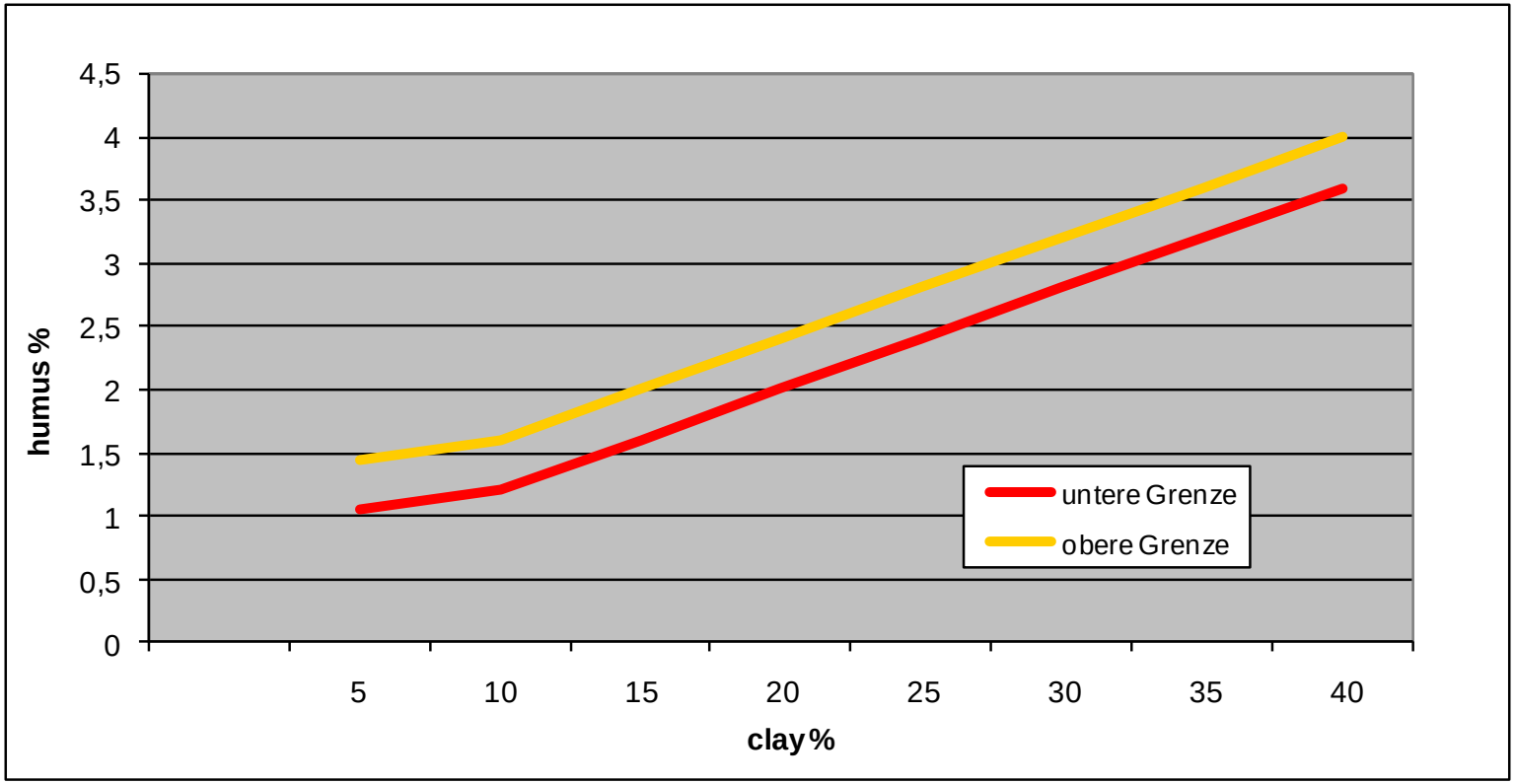
How much organic matter – humus – does soil need ?



Orientation for required organic matter in soil depending on clay content (Körschens et. Al., 1986)

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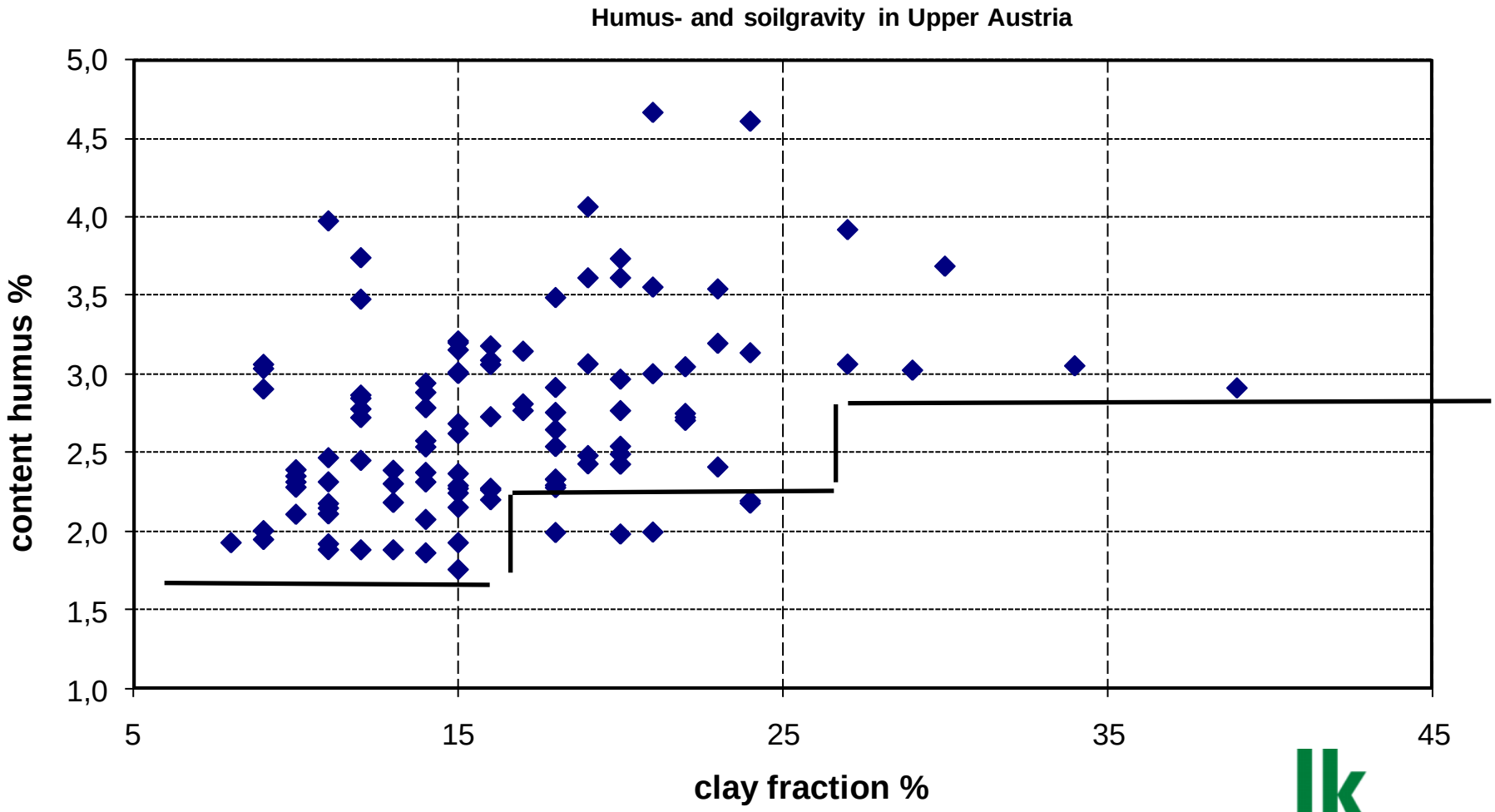
Humus content /soil consistance



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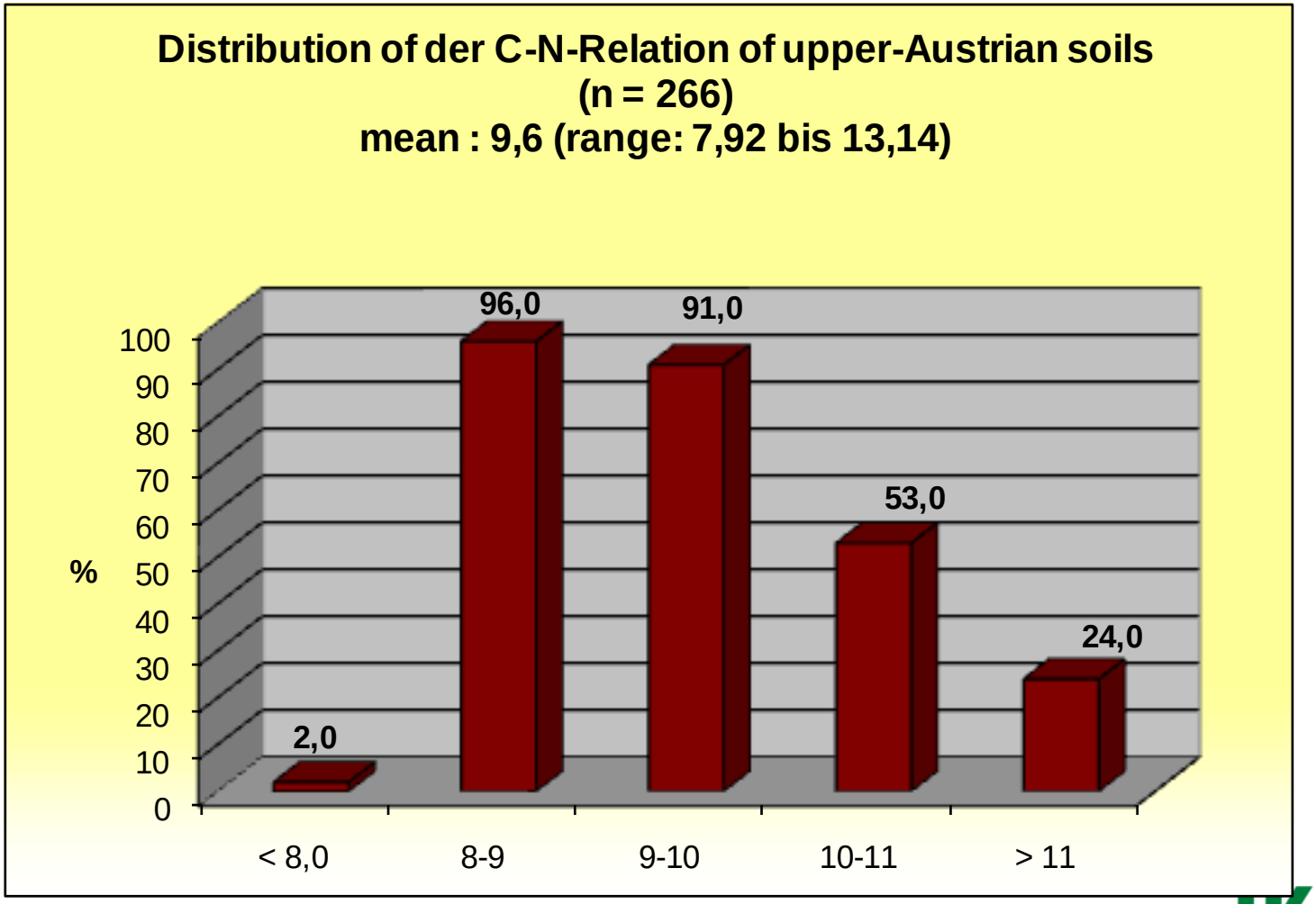
Carbon/nitrogen-relation in soils in Upper Austria



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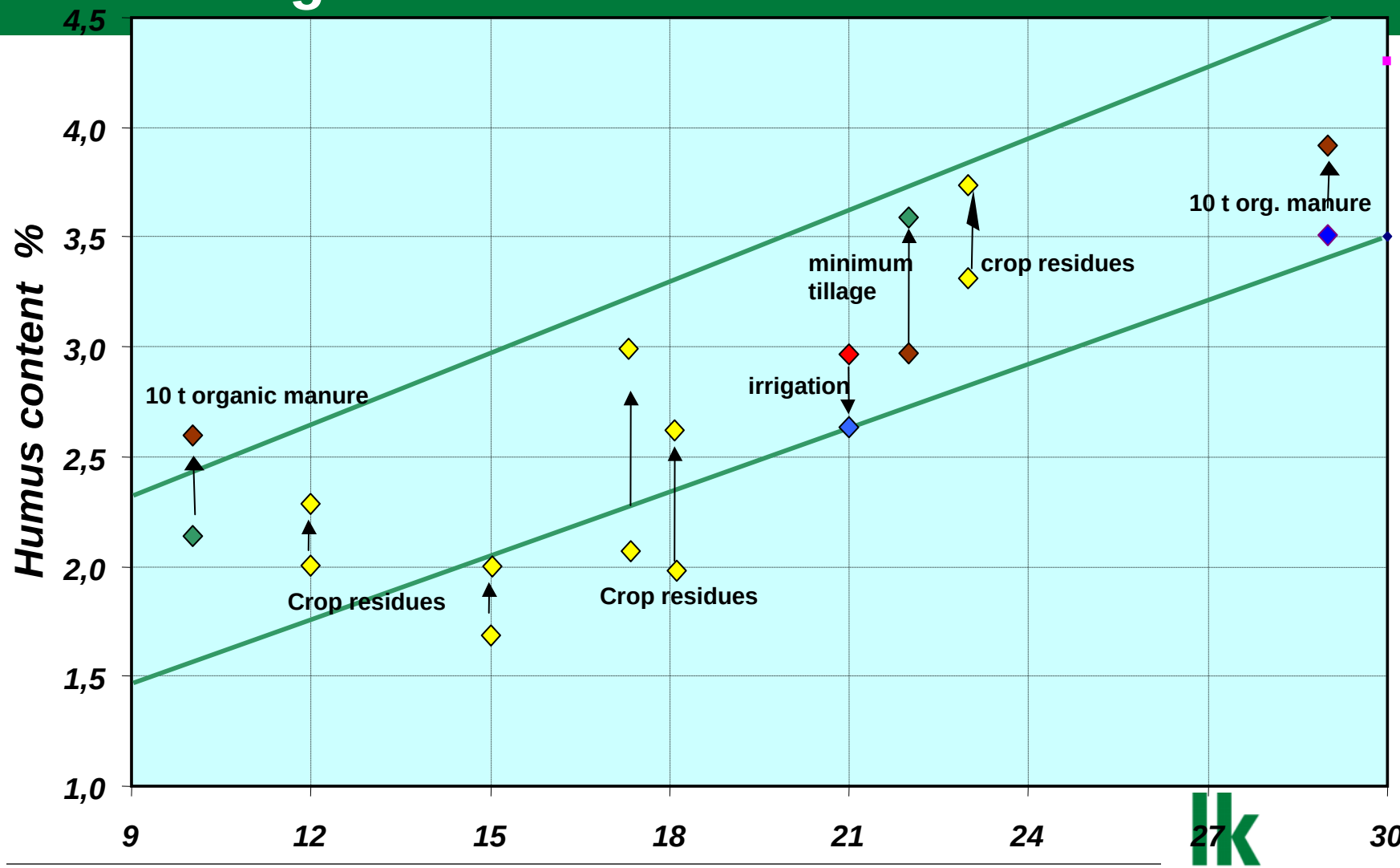
Quelle: Dr. Georg Dersch, AGES

Influencing humus content on arable land



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Summary

- humus content is an important parameter for (sustainable) soil fertility
- humus content can be managed within narrow borderlines dedicated by natural influences like climate, soil type
- Changes in cultivation („System wintergreen“, straw manuring, reduced tillage) within the last years have brought improvements in humus content
- „High quality catch crops“ (best growing time, fertilisation if necessary) brings essential improvement in humus content
- We believe, that humus content is mainly satisfying
- humus content in our soils is mainly in a good range to fulfill the requirements of climate - as well as water protection

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