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C_{org}-Management in Austria

DI Michael Wieshamer-Zivkovic
Prof Dr. Walter Wenzel

Institute of Soil Science



Benefits of C_{org} management



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- “Soil Quality”
 - Agricultural benefits
 - Soil fertility
 - Water holding capacity
 - Aggregate stability (COMPACTION!)
 - Socioeconomic benefits
 - Filter capacity
 - Water retention capacity (floods)
 - Soil erosion
 - Potentially higher food, fodder, fibre (residue?!) production
 - Climate Change

Parenthesis - Development of Agriculture



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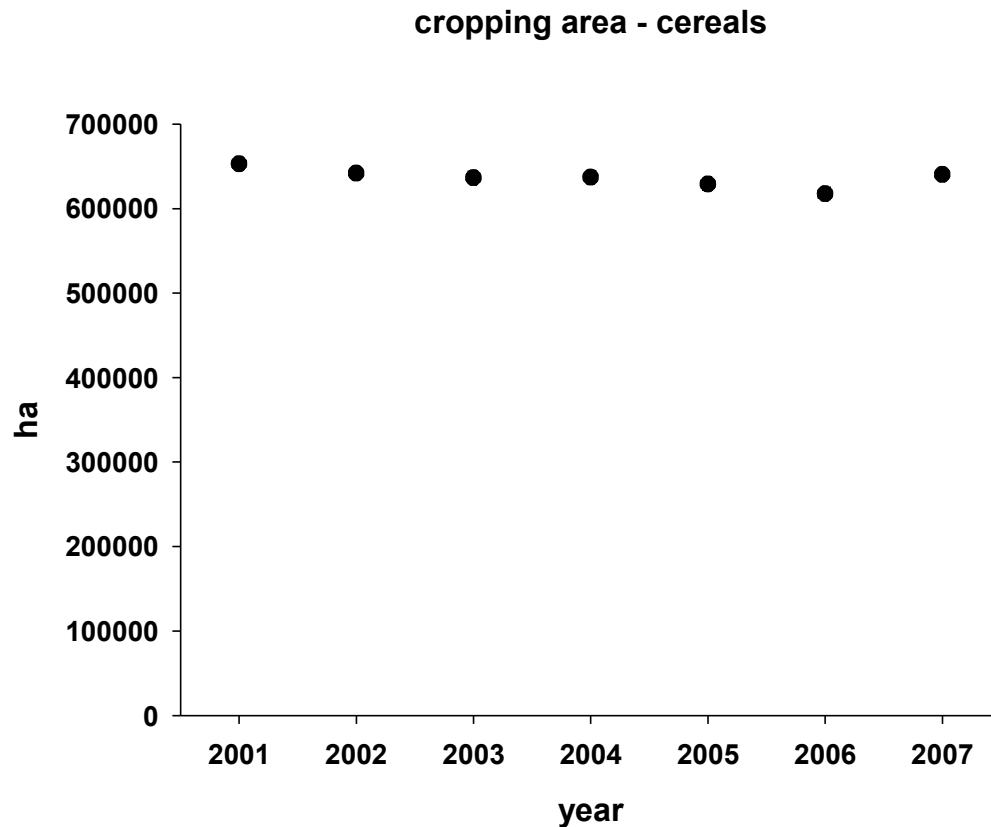
- Breuning-Madsen et al. (2009): Comparing C_{org} in bronze age agriculture and recent agriculture
 - Increased C_{org} in areas with intensive manure input (up to 60%)
 - C_{org} level remained almost the same in systems with low manure input
 - Little decrease, compensated by the thickness of the plough layer (A_p) which has nearly doubled

Trends in agriculture



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Humus consuming crops



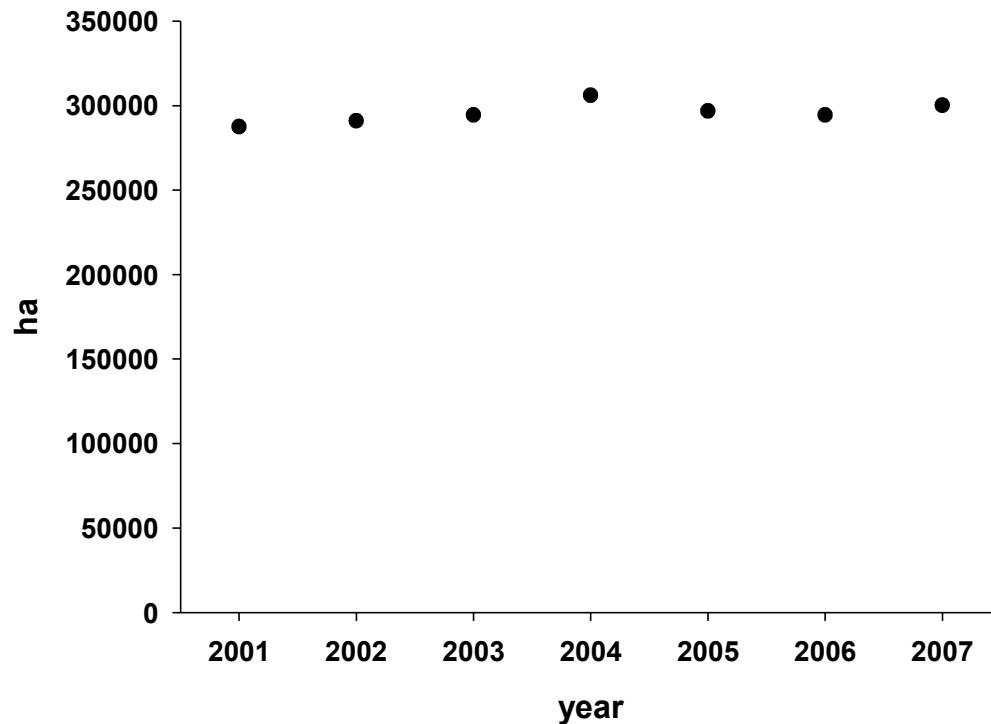
Trends in agriculture



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Humus consuming crops

cropping area - maize and sunflower



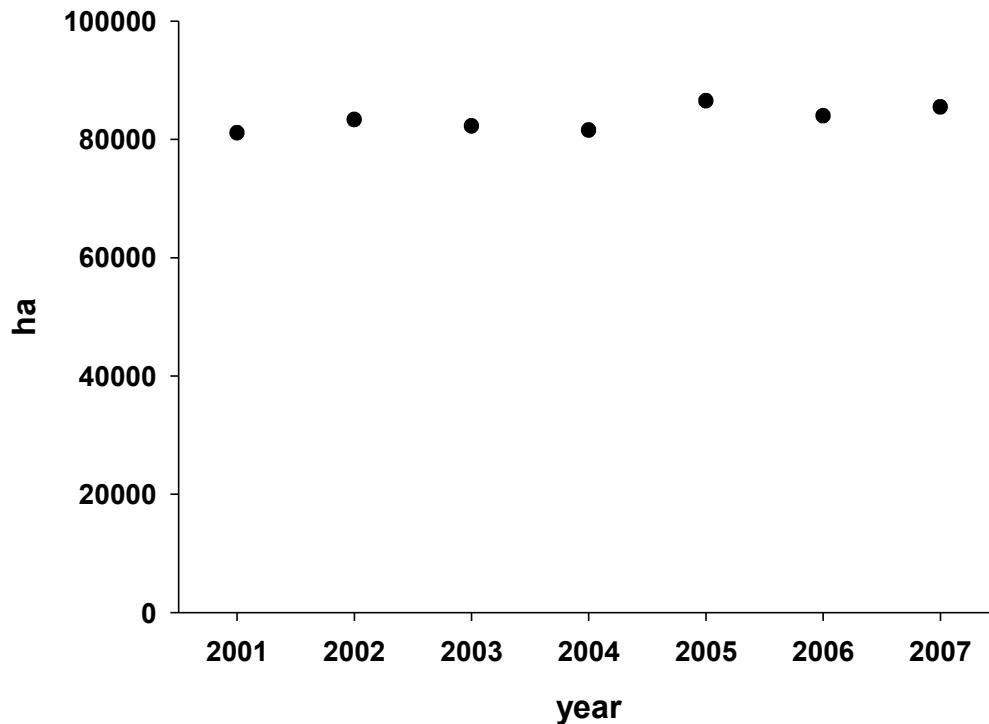
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Humus consuming crops

cropping area - beet, potato, pumpkin, poppy



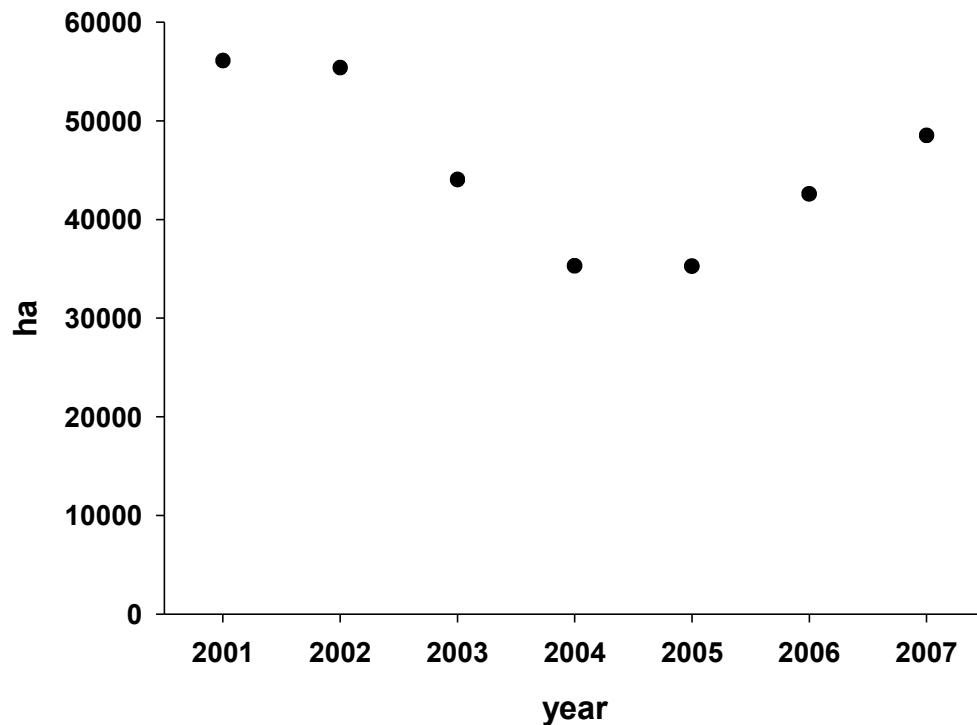
Trends in agriculture



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Humus consuming crops

cropping area - rape



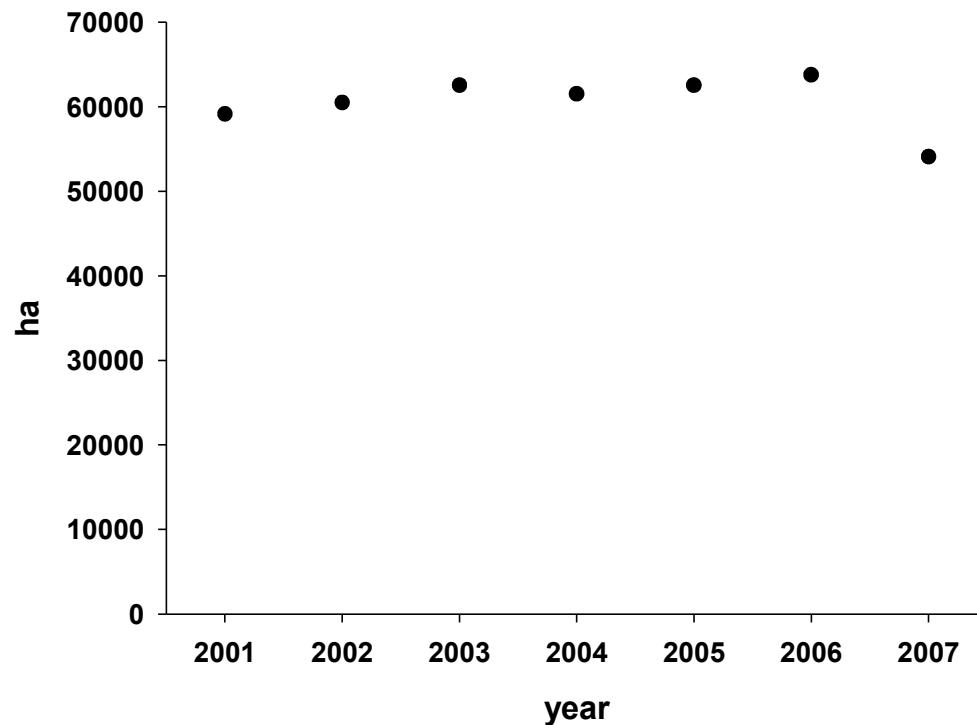
Trends in agriculture



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Humus producing crops

cropping area - grain legumes



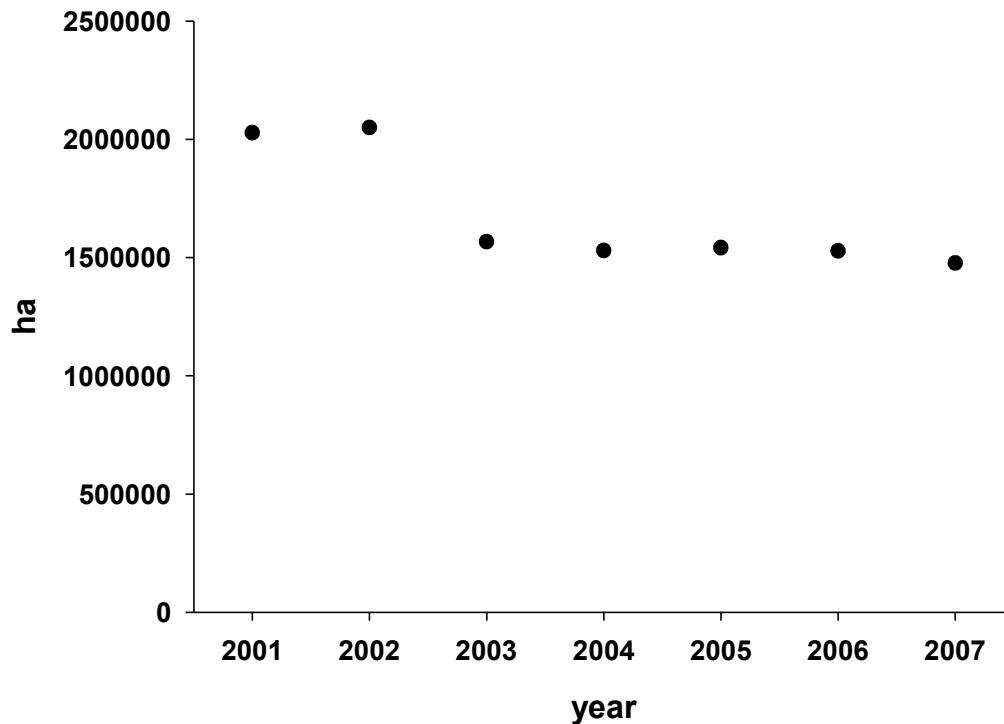
Trends in agriculture



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Humus producing crops

fallow + grassland area



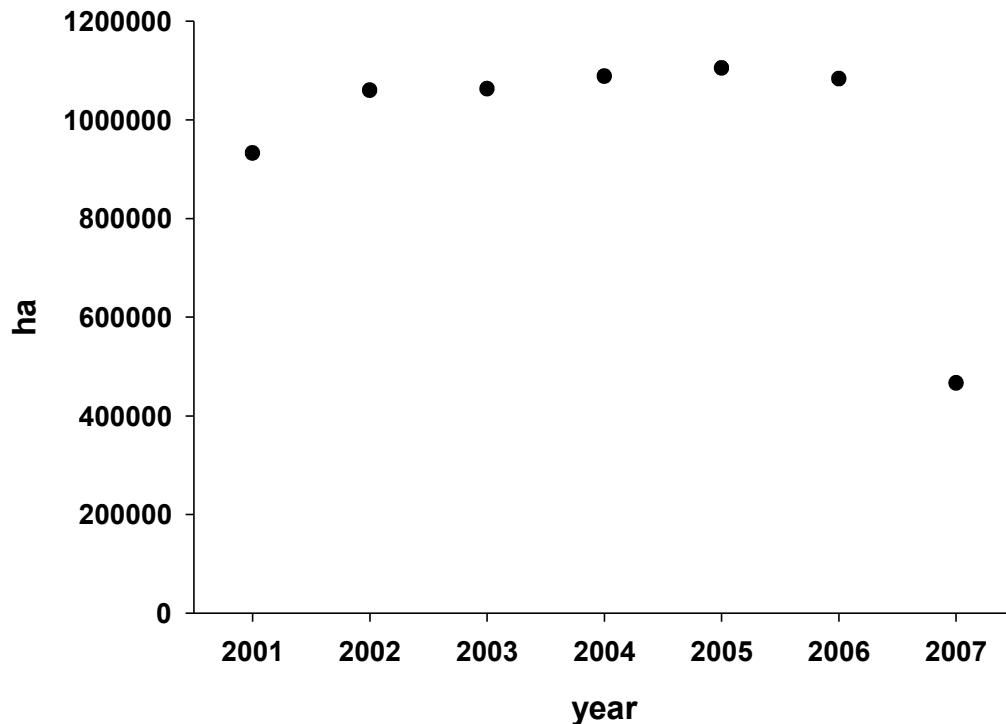
Trends in agriculture



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Humus producing crops

cover crops - ÖPUL

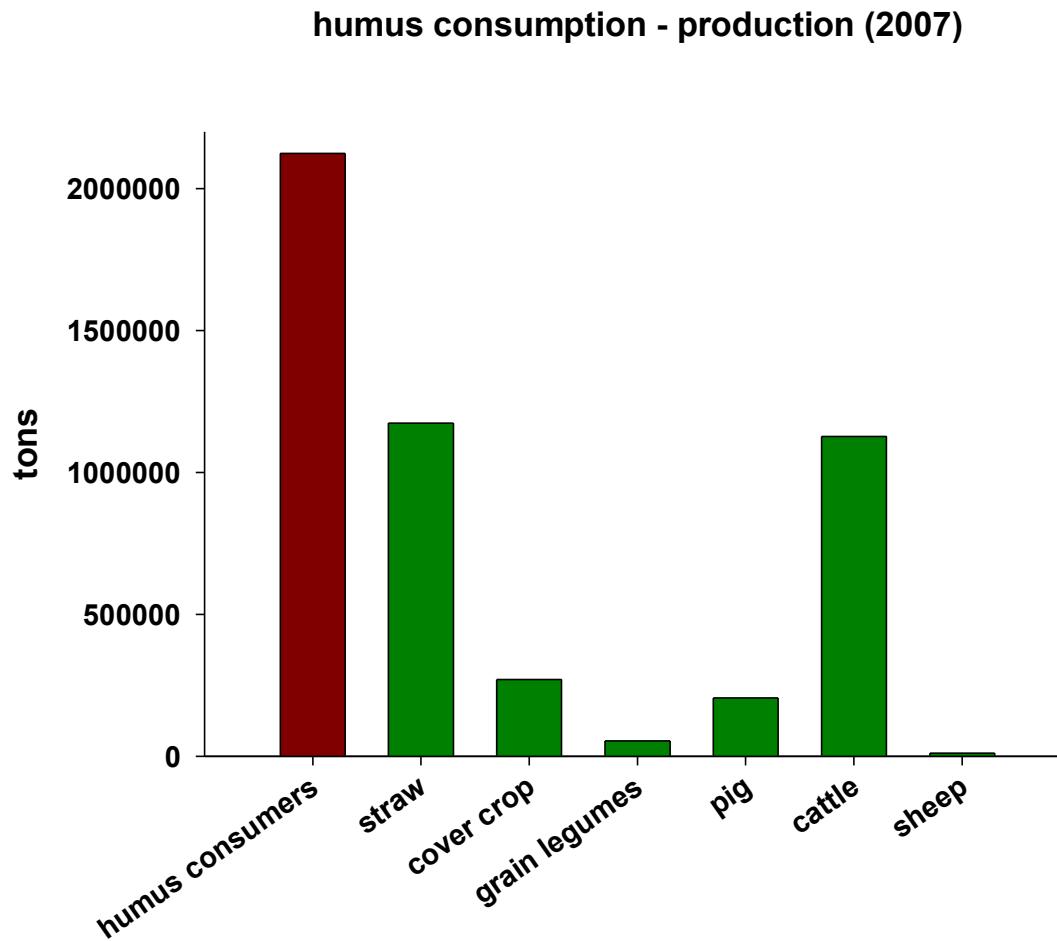


Humus balance

Humus
balance



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Question of distribution



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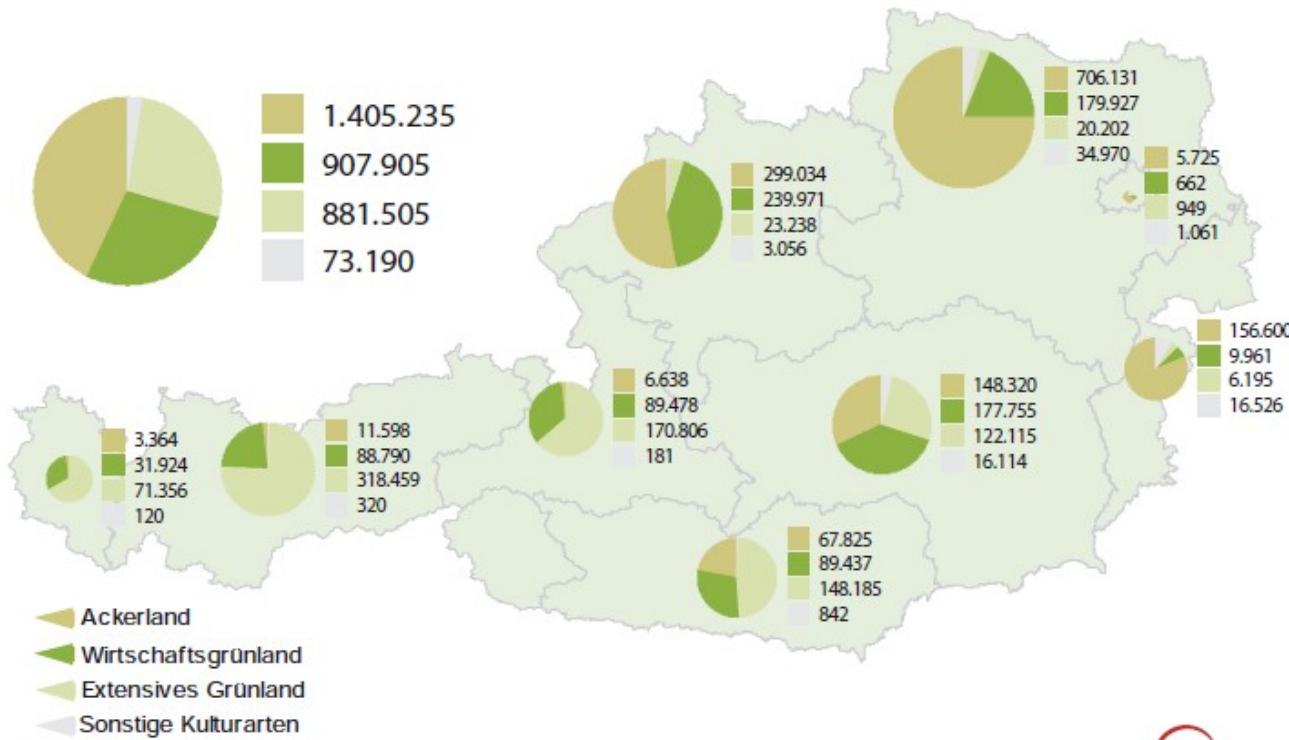
Distribution of agricultural cultivation structure



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Kulturartenverteilung der LF in ha

Österreich gesamt 3.267.833 ha



Quelle: Statistik Austria, Agrarstrukturerhebung 2005



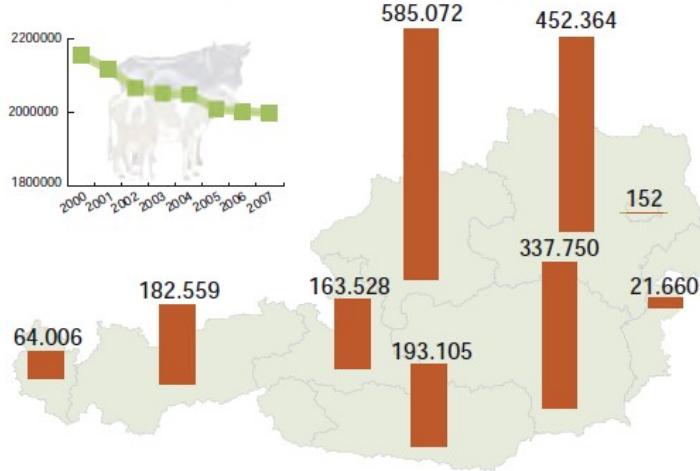
Cattle and pig distribution



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Rinderbestände in Österreich 2007

insgesamt 2.000.196 Stück

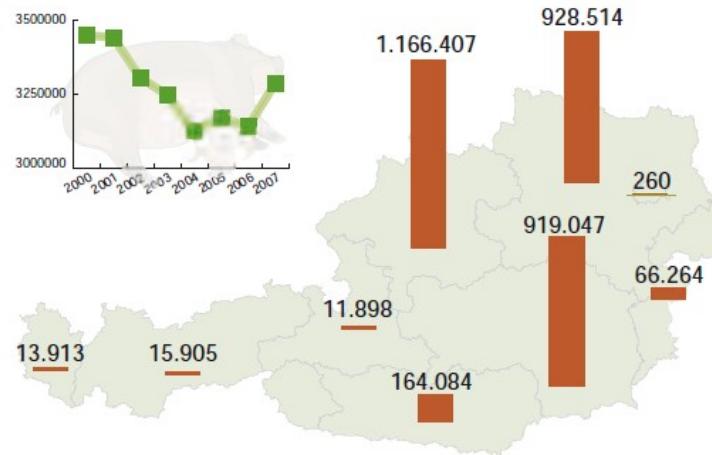


Quelle: Statistik Austria, Viehzählung 2007



Schweinebestände in Österreich 2007

insgesamt 3.286.292 Stück



Quelle: Statistik Austria, Viehzählung 2007



Agri- Environmental programme



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➤ ÖPUL

- Incentive based promotion programme
- Promotes environmentally balanced agriculture
- Follow the line of agri-environmental programmes
 - Possibly adaption for C_{org} management as a main target necessary
 - Increase the voluntary participation

Climate Change further research is necessary



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- Comparison of land use systems
 - Still research is needed to assess C_{org} storage capacities of different land use systems
- Societal requirements to land use
- Research on the establishment of long term stable C_{org} also in subsoils
 - In contrast to topsoils (HF soluble fraction is older) - soil dependent stability of C_{org} fractions in subsoils
 - plant derived (arabinose, xylose) or microbial derived (galactose, mannose) related to Fe and/or Al phases – silicon enriched regions (clay minerals) have little C_{org}
 - Increasing age of C_{org} with the depth
- Research on the temperature dependency of C_{org} mineralization rates
 - Temperature dependency
 - Depth dependency

Sources: e.g.: Ray et al., 2008; Spielvogel et al., 2008



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Rhizosphere Ecology and Biogeochemistry Group



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DI Michael Wieshammer-Zivkovic
Univ. Prof. DI. Dr. Walter Wenzel

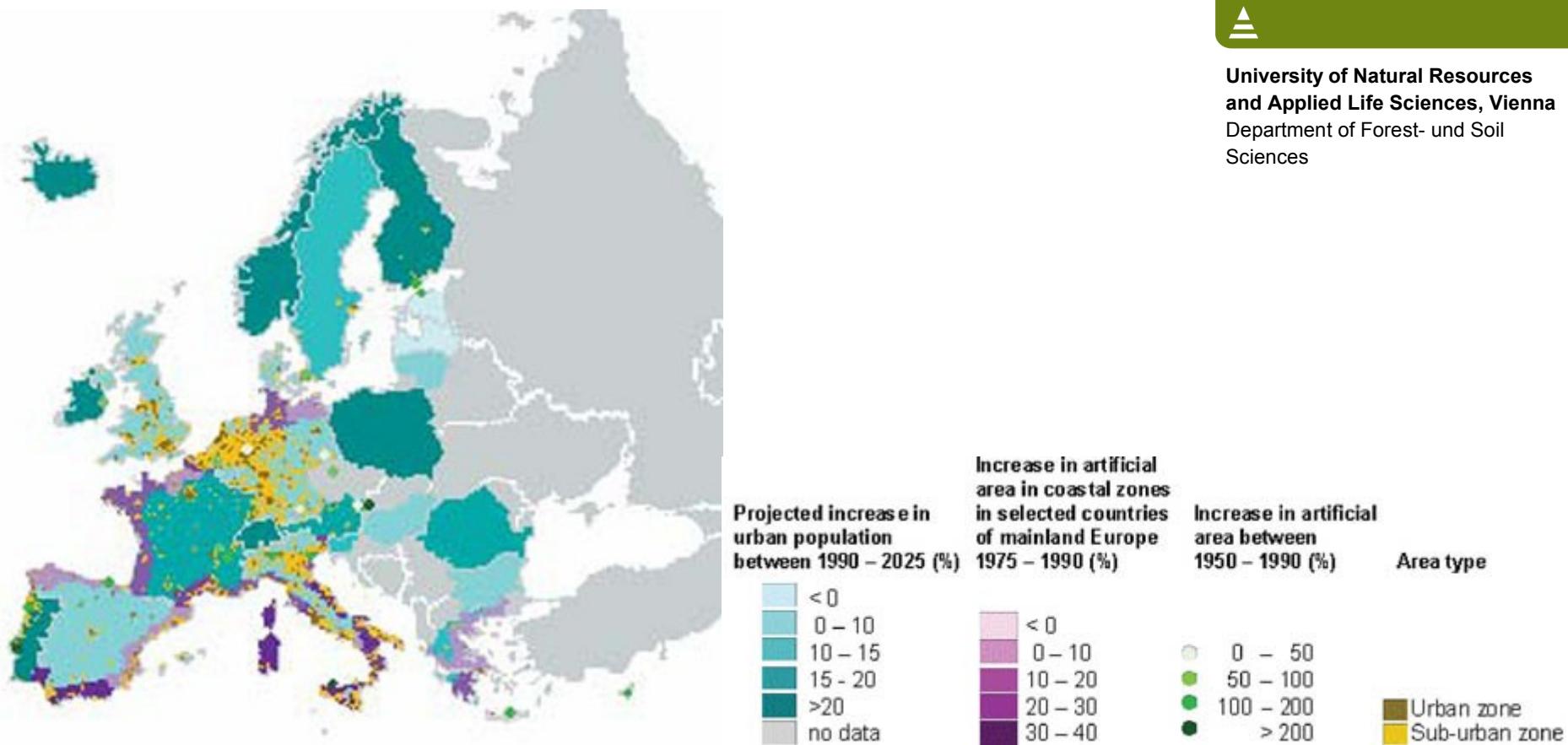
Peter Jordan-Straße 82, A-1190 Wien
walter.wenzel@boku.ac.at , www.boku.ac.at



Consider trends in land use - sealing



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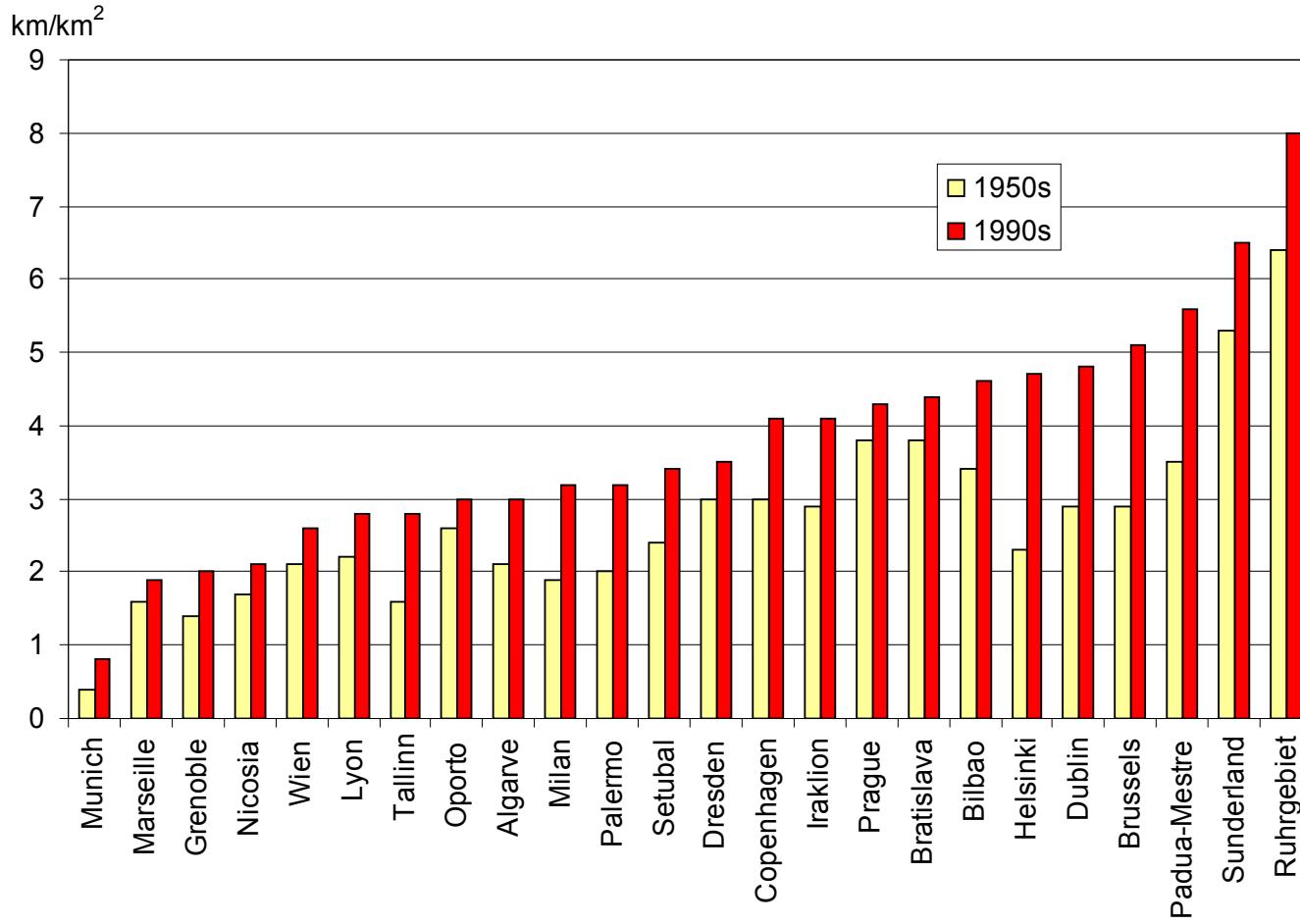


Probable problem areas of soil sealing in Europe (Source European Environment Agency)

Consider trends in land use - sealing



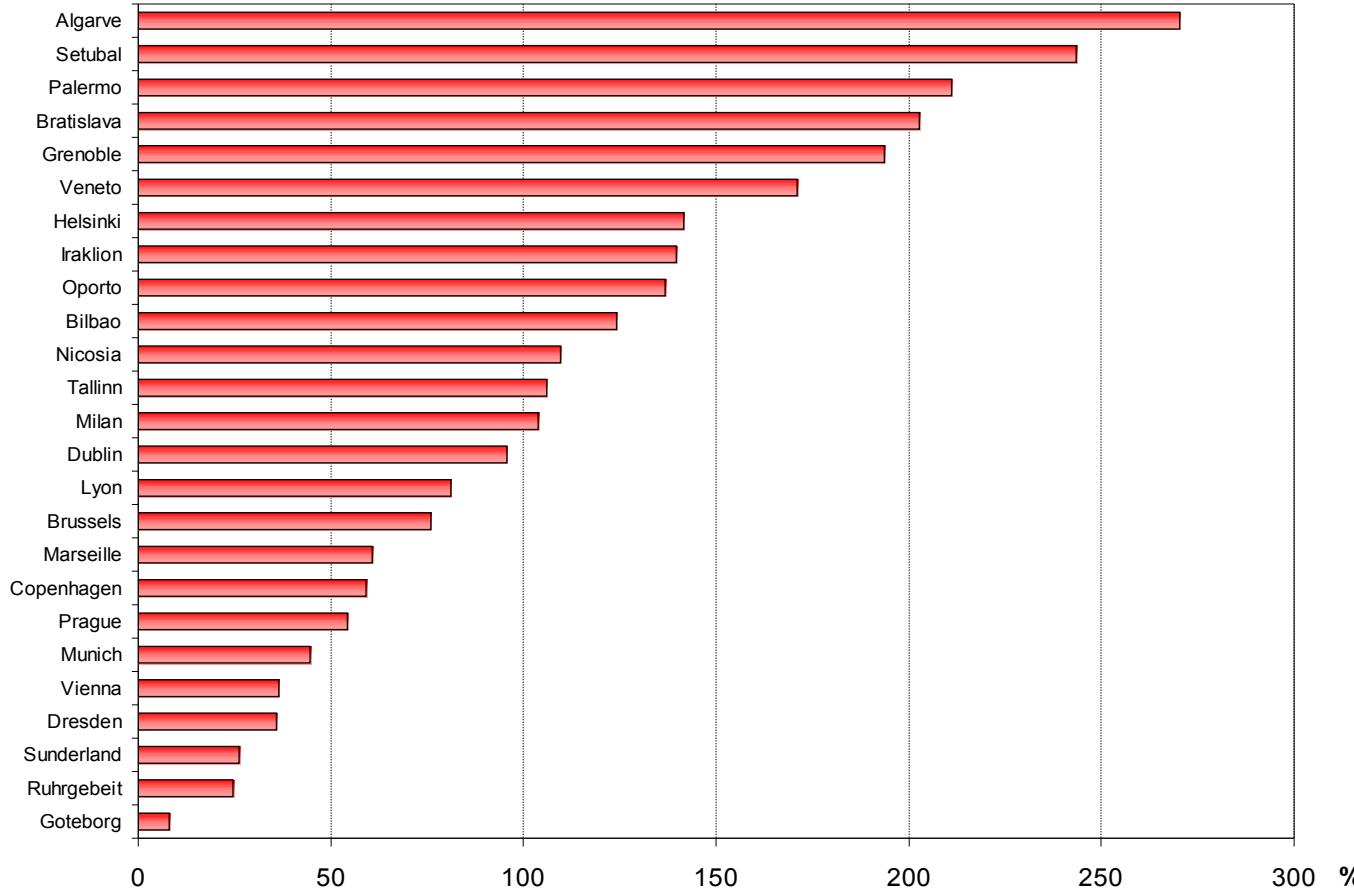
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Road density (ies, JRC, 2003 MOLAND - Monitoring Land Use)



Consider trends in land use - sealing



Growth of artificial areas, 1950 - 1990 (ies, JRC, 2003 MOLAND - Monitoring Land Use)

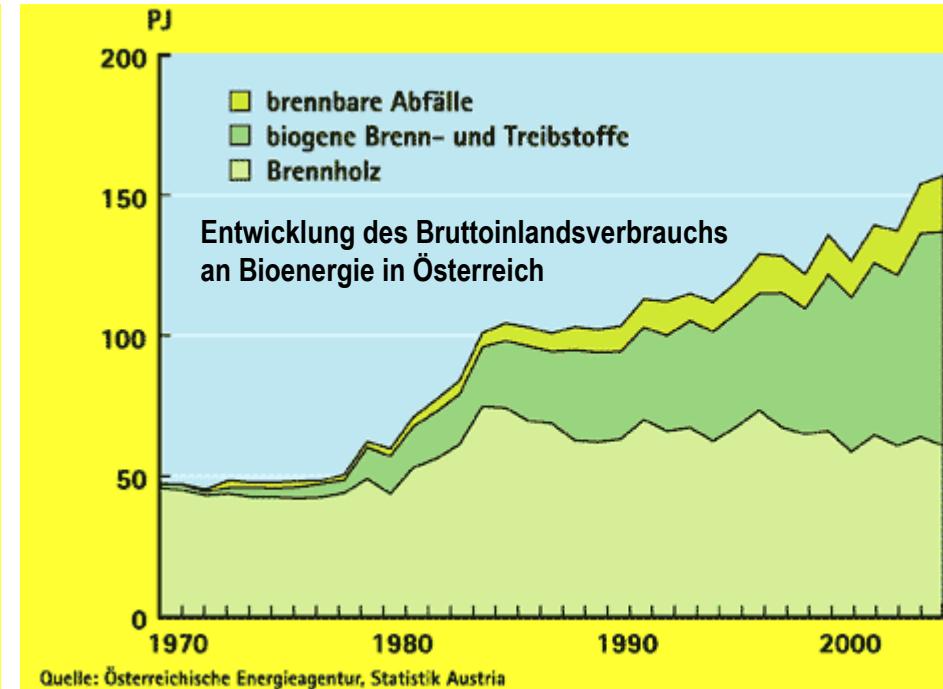
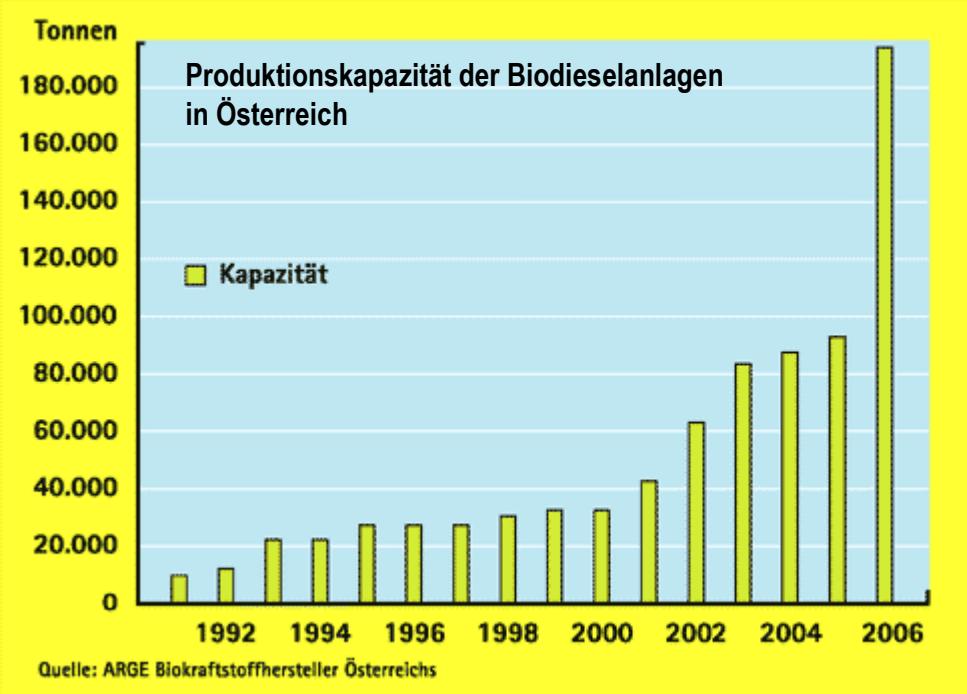
Consider trends in land use - intensification



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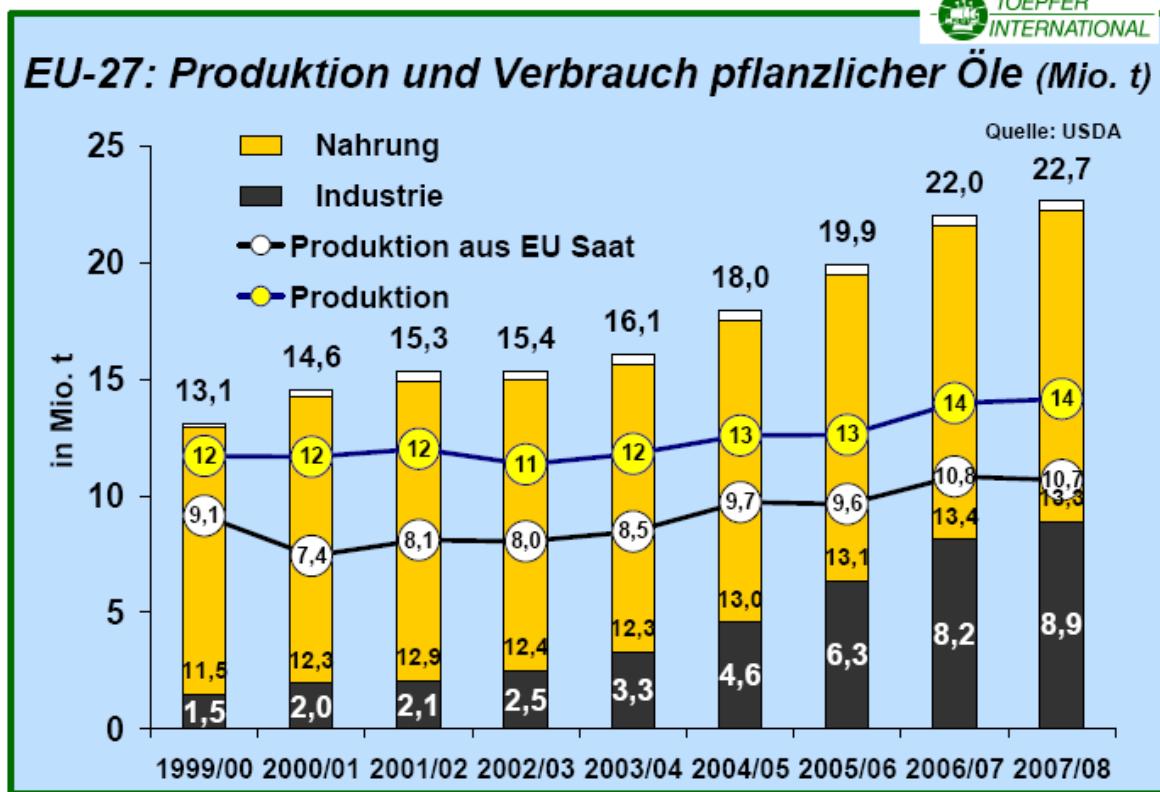
- increasing demand for vegetable raw materials for energy production:
„renewable raw materials“

www.biomasseverand.at



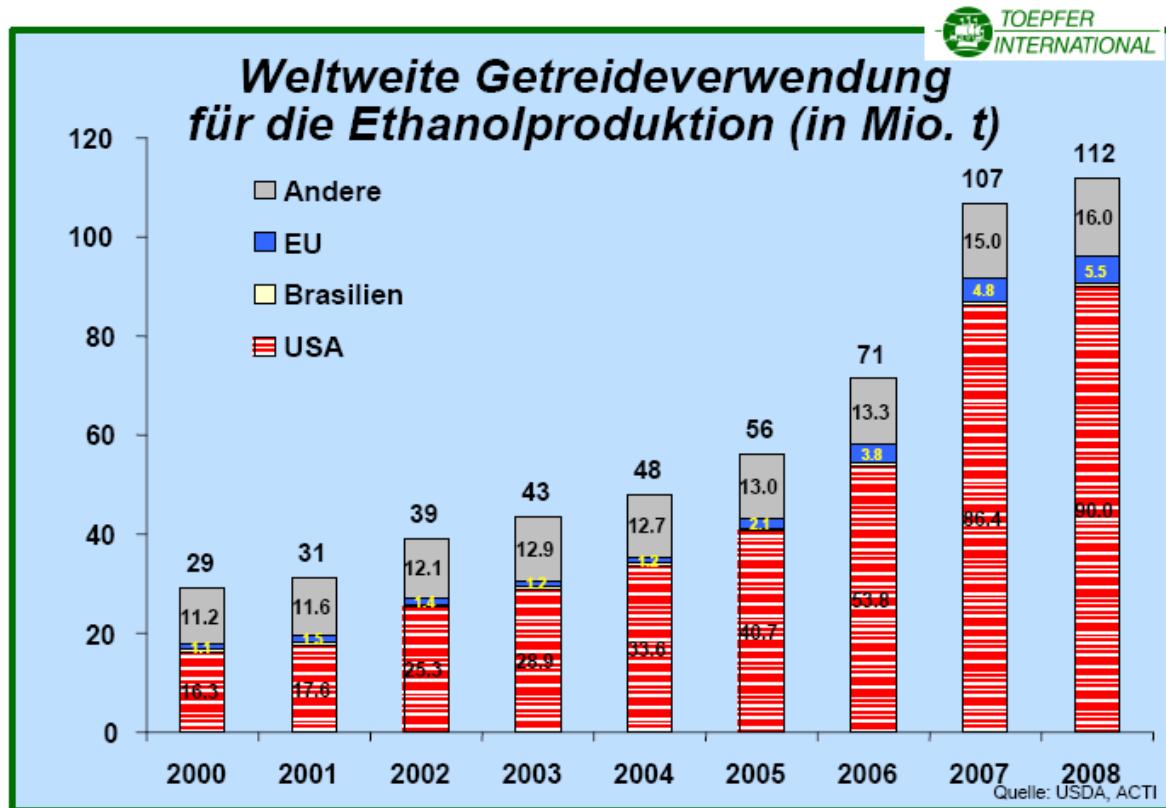
Trends of intensification in land use: Increasing demand for biomass

- increasing demand for bio-based raw materials for energy production:
„regrowing raw materials“ in the EU



Trends of intensification in land use: Increasing demand for biomass

- increasing demand for bio-based raw materials for energy production:
„regrowing raw materials“, worldwide

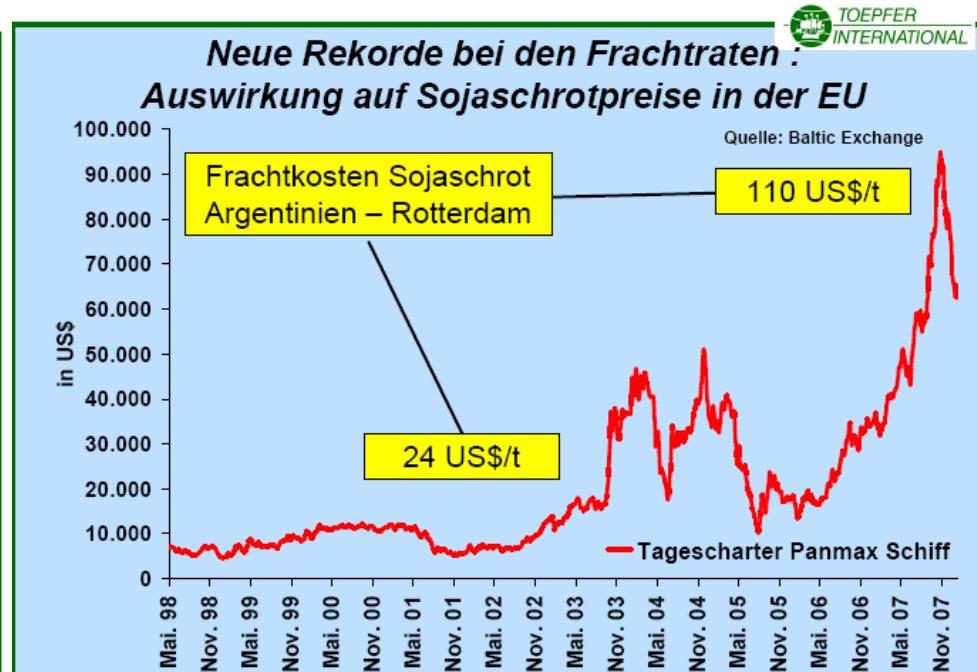
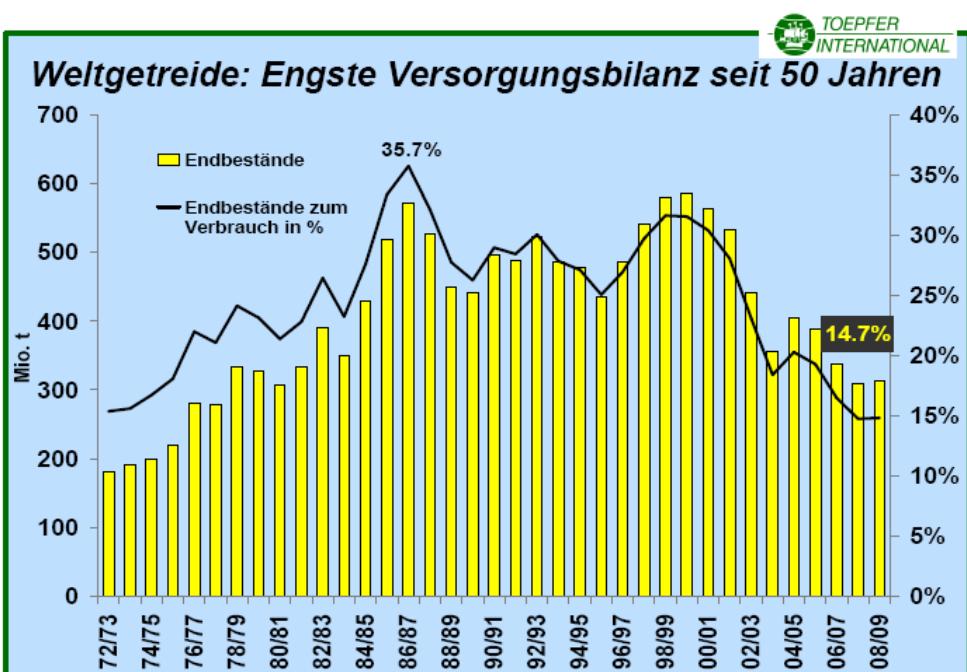


Trends of intensification in land use: Increasing prices



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- increasing prices for crops because of
 - supply and demand gap
 - other reasons (e.g.: increasing freight charges)



Soil protection by sustainable land use



Possible incentives and measure programmes with area wide implications
that support the land owners and land users will promote

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- soil management measures
- humus management
- land cover (e.g.: viticulture, pomiculture, intertilage)
- cultivation on terraces
- “landscape elements” (e.g.: bosks, tree rows, hedges, balks)
- green manure
- irrigation practices
- environmentally balanced (less intensive) grassland management
- reforestation
- ...