



© Carmen Schmid

# FURTHER DEVELOPMENT OF HIGHER TIER METHODS FOR THE LULUCF SECTOR OF THE AUSTRIAN GHG INVENTORY

ERWIN MOLDASCHL, CARMEN SCHMID, BRADLEY MATTHEWS, MERLIN MAYER, BETTINA SCHWARZL, ELISABETH SCHWAIGER AND PETER WEISS

JRC LULUCF WORKSHOP 2023

ISPRA 11-12 MAY 2023

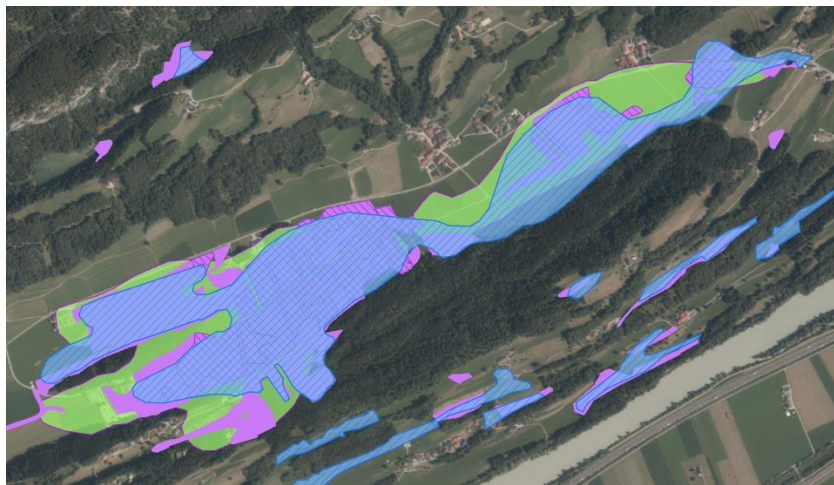
PERSPEKTIVEN FÜR UMWELT & GESELLSCHAFT **umweltbundesamt**<sup>U</sup>

# Priorities for improving LULUCF methods

- Areas and emission factors for drained organic soils
- Woody biomass outside of Forest land
  - Biomass in Settlements
  - Non-cultivated woody biomass in Cropland and Grassland
- SOC stock changes for Grassland remaining grassland



# DRAINED ORGANIC SOILS



- Implementation of system to assess accuracy
- Hierarchy of soil data
- 10 m grid assessment

## Planned Improvements:

- Project Duration: until May 2024
- Literature review of emission factors
  - Stratification into land use, drainage depths and nutrient status
- Compilation, analysis and combination of available related geographic data
  - Moor-cadastre from 1911 & 1935 from archives
  - Financial soil valuation
  - Agricultural Soil mapping information
  - Drainage maps
  - Forest research project data and geological substrates
- Compilation of results for new GHG estimates

# BIOMASS IN SETTLEMENTS

## Guidelines:

- Tier 2a - Crown cover area method

EQUATION 8.2  
ANNUAL BIOMASS INCREMENT BASED ON TOTAL CROWN COVER AREA

$$\Delta C_G = \sum_{i,j} AT_{i,j} \cdot CRW_{i,j}$$

Where:

$\Delta C_G$  = annual carbon accumulation attributed to biomass increment in *Settlements Remaining Settlements*, tonnes C yr<sup>-1</sup>

$AT_{ij}$  = total crown cover area of class  $i$  in woody perennial<sup>1</sup> type  $j$ , ha

$CRW_{ij}$  = crown cover area-based growth rate of class  $i$  in woody perennial type  $j$ , tonnes C (ha crown cover)<sup>-1</sup> yr<sup>-1</sup>

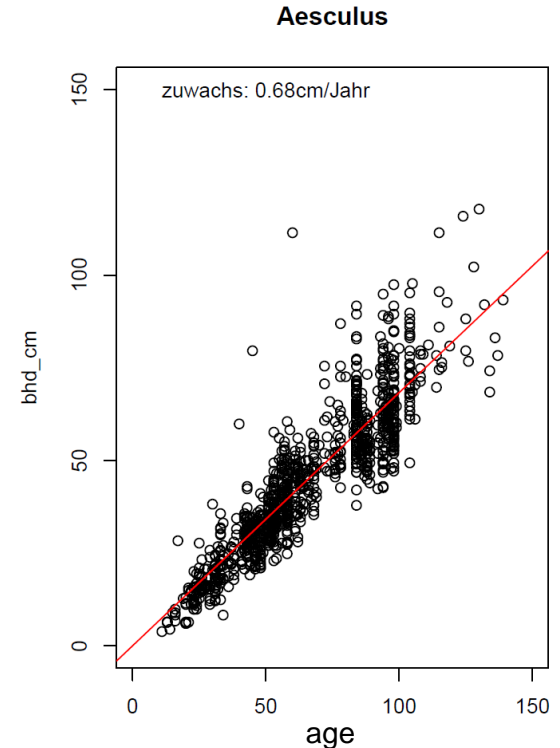
## Methods Austria:

- EF: Tree cadastre data
- AD: Shrub and tree crown layer from Land Information System Austria (LISA)



# CALCULATION OF INCREMENT AND STOCKS

- Single tree data
  - Biomass expansion
  - Calculation of C content per tree
- **Average standing stock**
  - Weighted average due to species occurrence
  - Per ha crown cover
- **Increment as the relation between age and circumference/height**
  - Weighted average due to species occurrence
  - Per ha crown cover



# IMPLEMENTATION INTO INVENTORY

## LUC to/from Settlement

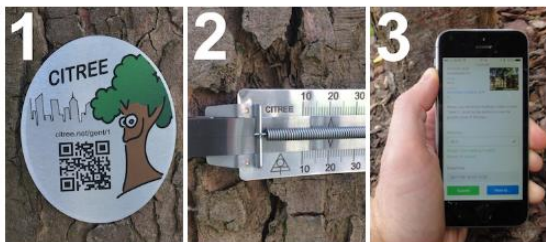
- From Settlement
  - Loss of Biomass Stock before LUC
- To Settlement
  - Accounting Increment until average biomass of Remaining stock reached
  - 15 Years needed

## Settlement Remaining Settlement

- Equilibrium of increment/planting and pruning/removals
- Crown cover
  - For the moment static CC
  - Planned: incorporation of crown cover changes (every 3 years full mapping of AT)

# PRELIMINARY RESULTS

- More knowledge about city trees needed
  - First Increment measures done already in Austria



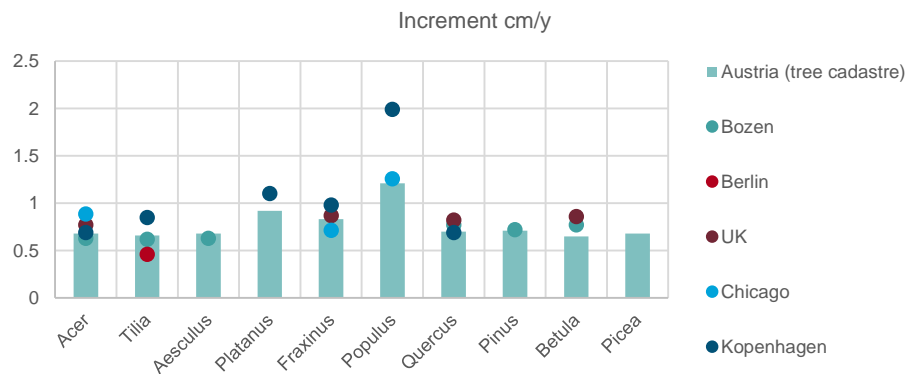
[www.citree.net](http://www.citree.net)

Region	Default annual carbon accumulation per ha tree crown cover [tonnes C (ha crown cover) <sup>-1</sup> yr <sup>-1</sup> ]
United States (global default)	2.9 <sup>a</sup>
Australia	3.6 <sup>b</sup>

<sup>a</sup> Nowak and Crane 2002; average of 10 US cities.  
<sup>b</sup> Brack 2002; modelling analysis in Canberra.

Preliminary Result Austria

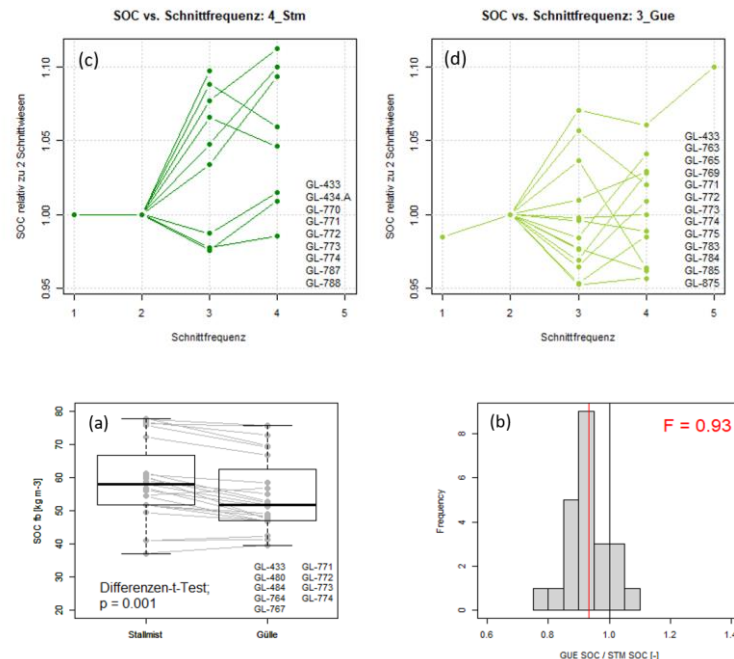
2.79



Bühler et al. 2007, Russo et al 2014, Dahlhausen et al 2017, Vaz Monteiro et al 2017

# SOC STOCK CHANGES FOR GRASSLAND REMAINING GRASSLAND

- Impact identification of management factors on carbon allocation
  - Cutting frequency, fertilisation
  - Manure increases C content
- Examination of long term experimental plots on grassland management and repeated surveys on grassland mineral soils
  - 38.000 Soil samples and 37% of Austrian Grasslands
- Cooperation with AGES and HBLFA Gumpenstein
- Found patterns in contrast to observed carbon allocation in grassland mineral soils: Possible other factors greater impact than management
- Equilibrium Assumption SOC GL-GL
- More research needed before inclusion in inventory on basis of sound estimates





# NON-CULTIVATED WOODY BIOMASS IN AGRICULTURAL AREAS

- Start 2023
- ETC/ULS LULUCF task - crown cover rd. 1 % of Austria
- Establishment of emission factors for trees in agricultural areas
- Tree cover from remote sensing

