



EUBCE 2024

32nd European Biomass Conference & Exhibition

EXPERT WORKSHOP ENVIRONMENTAL SUSTAINABILITY OF CROPS FOR BIO-BASED INDUSTRIES IN EUROPE

Wednesday 26 June 2024 - 12.00-15.45 Room Samena

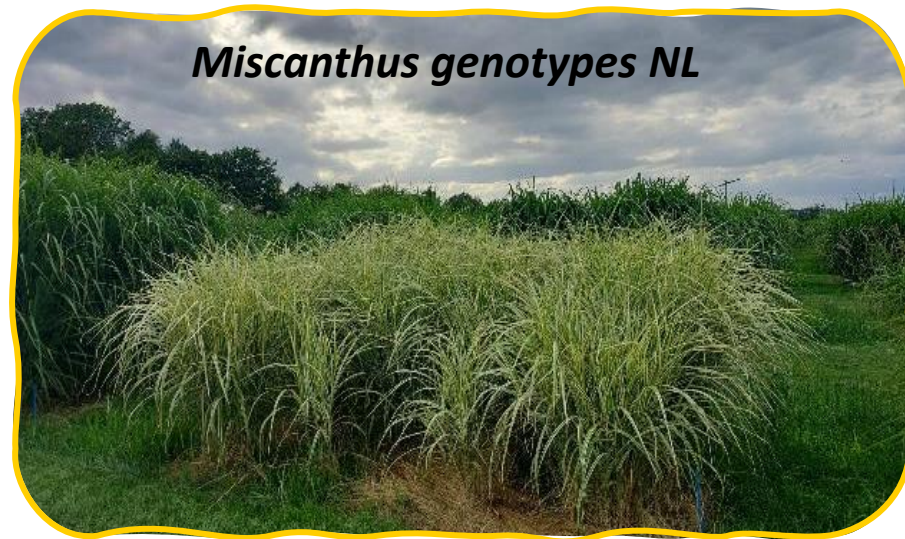
Berien Elbersen

Wageningen University Research -

Wageningen Environmental Research

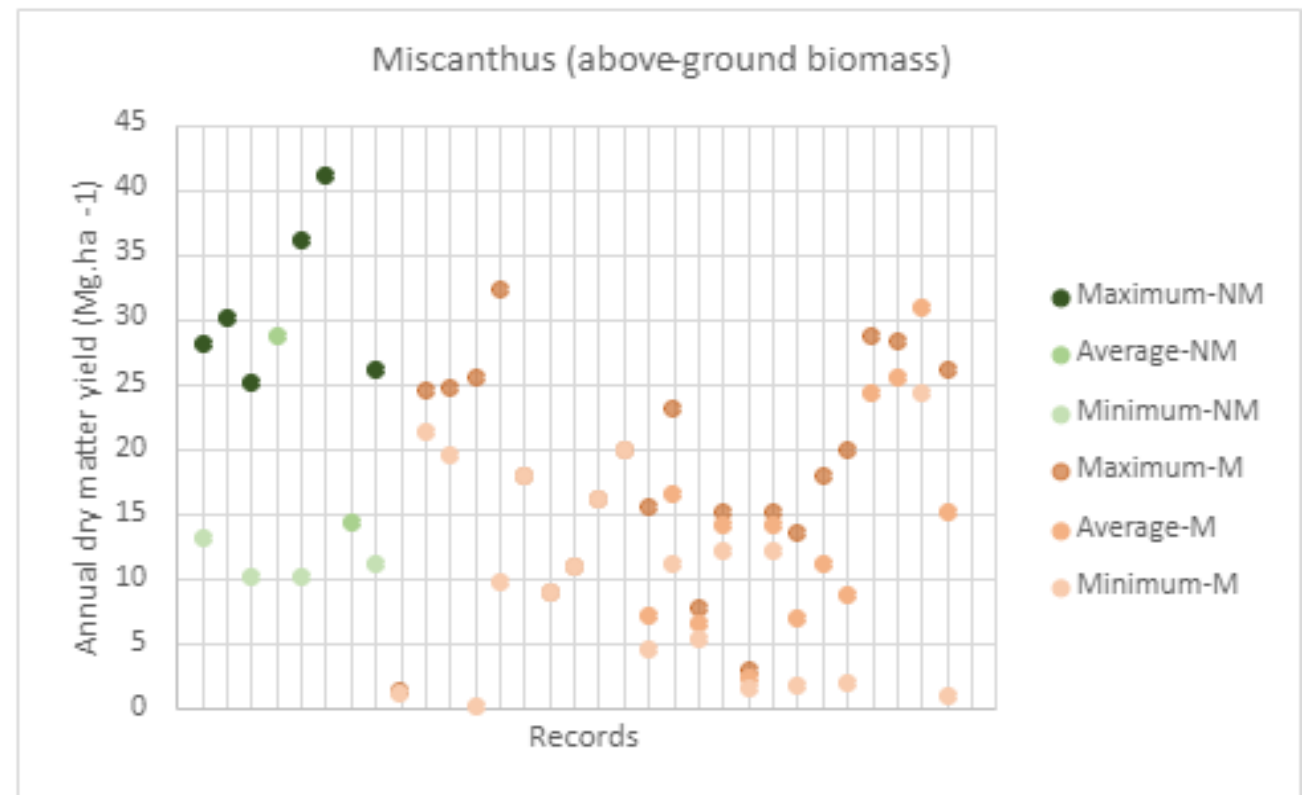
Question 1: Select the 1-2 types of primary crops used in industrial biorefineries producing bio-based chemicals, materials, products that you will present: what are the volumes or areas of such crop(s) in the EU and what are the uses (e.g., final products, intermediate chemicals, etc.)?

Miscanthus - *Miscanthus × giganteus* J.M.Greef



Current area: approx. 30,000 ha (EU27 2023) Energy crops reported by Eurostat – majority miscanthus

Uses: See GRACE project: PEF, Miscanthus pannels, insulation material, Advanced fuels etc.



Question 1: Select the 1-2 types of primary crops used in industrial biorefineries producing bio-based chemicals, materials, products that you will present: what are the volumes or areas of such crop(s) in the EU and what are the uses (e.g., final products, intermediate chemicals, etc.)?

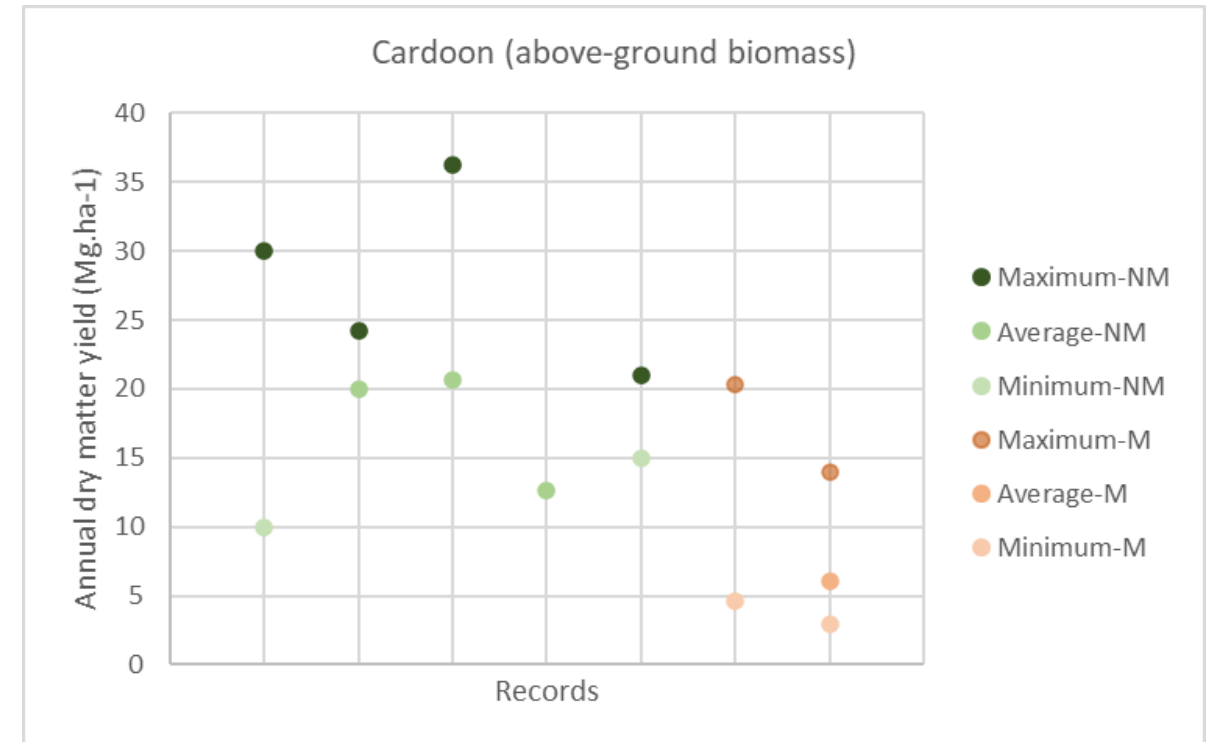
Cardoon - *Cynara cardunculus* L



Produces biomass and oil

Uses: Oil seed: biodiesel, bio-chemicals

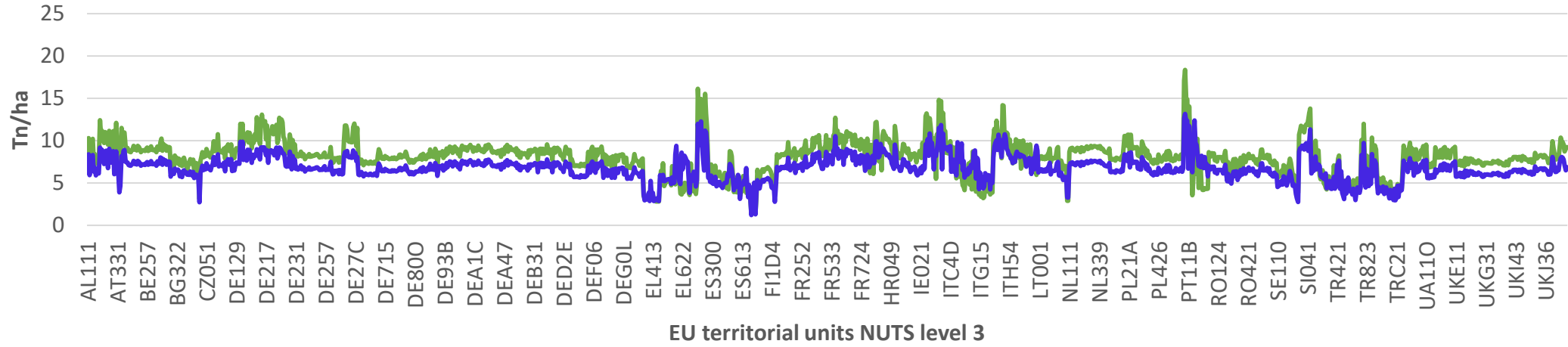
Biomass: paper pulp, green forage and extraction of active compounds for pharmaceutical uses



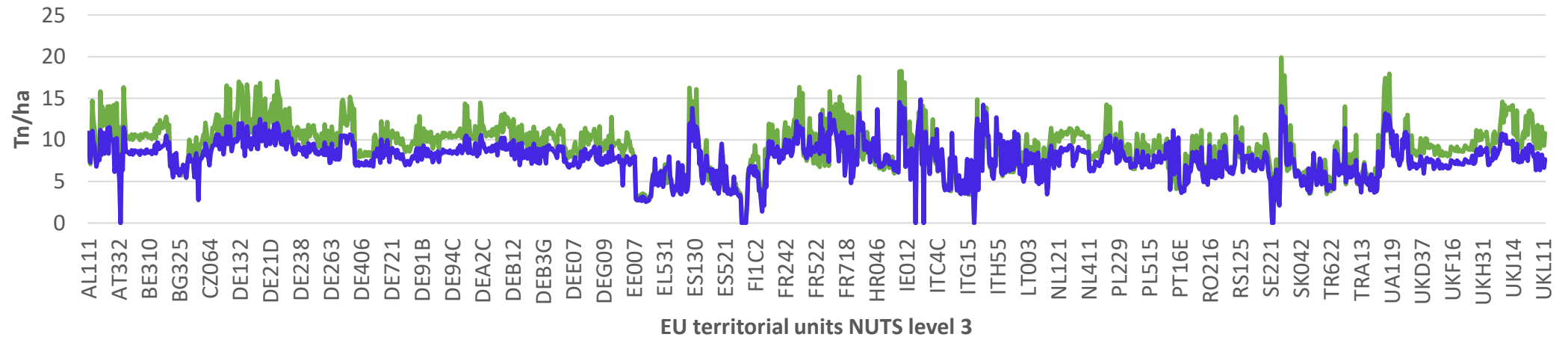
BIKE-project, Deliverable 2.2



Historic (2020)



Climate Change Scenario (2050)



— Miscanthus — Cardoon

Historic climate data from the JRC-MARS data base on a 25x25 km grid

Climate change: GFDL-ESM-model forecasting under SSP5- 8.5 – 2050 (CHELSA Data Base)

Historic 2020

Legend

Miscanthus

Tn/ha

0 - 3

4 - 6

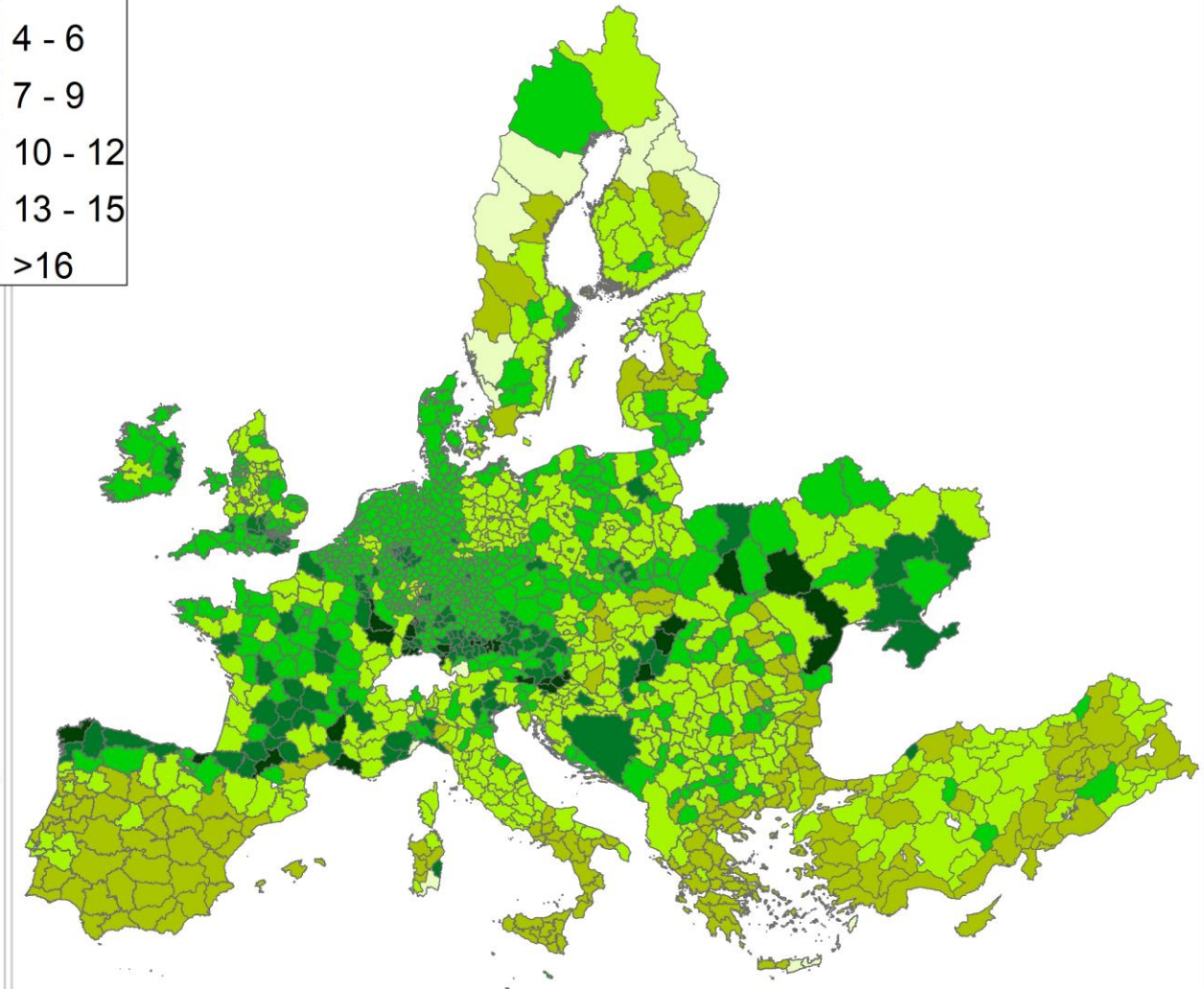
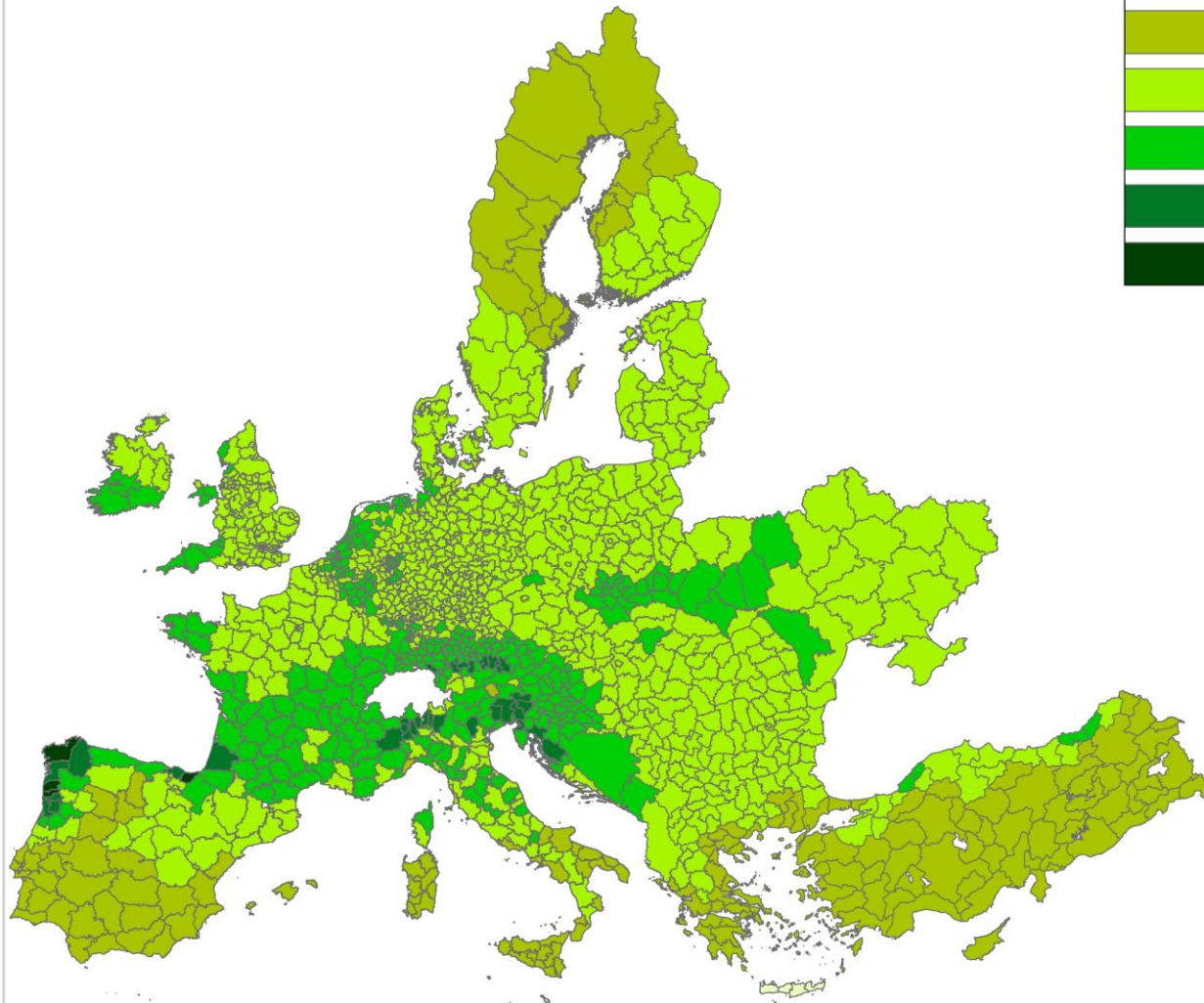
7 - 9

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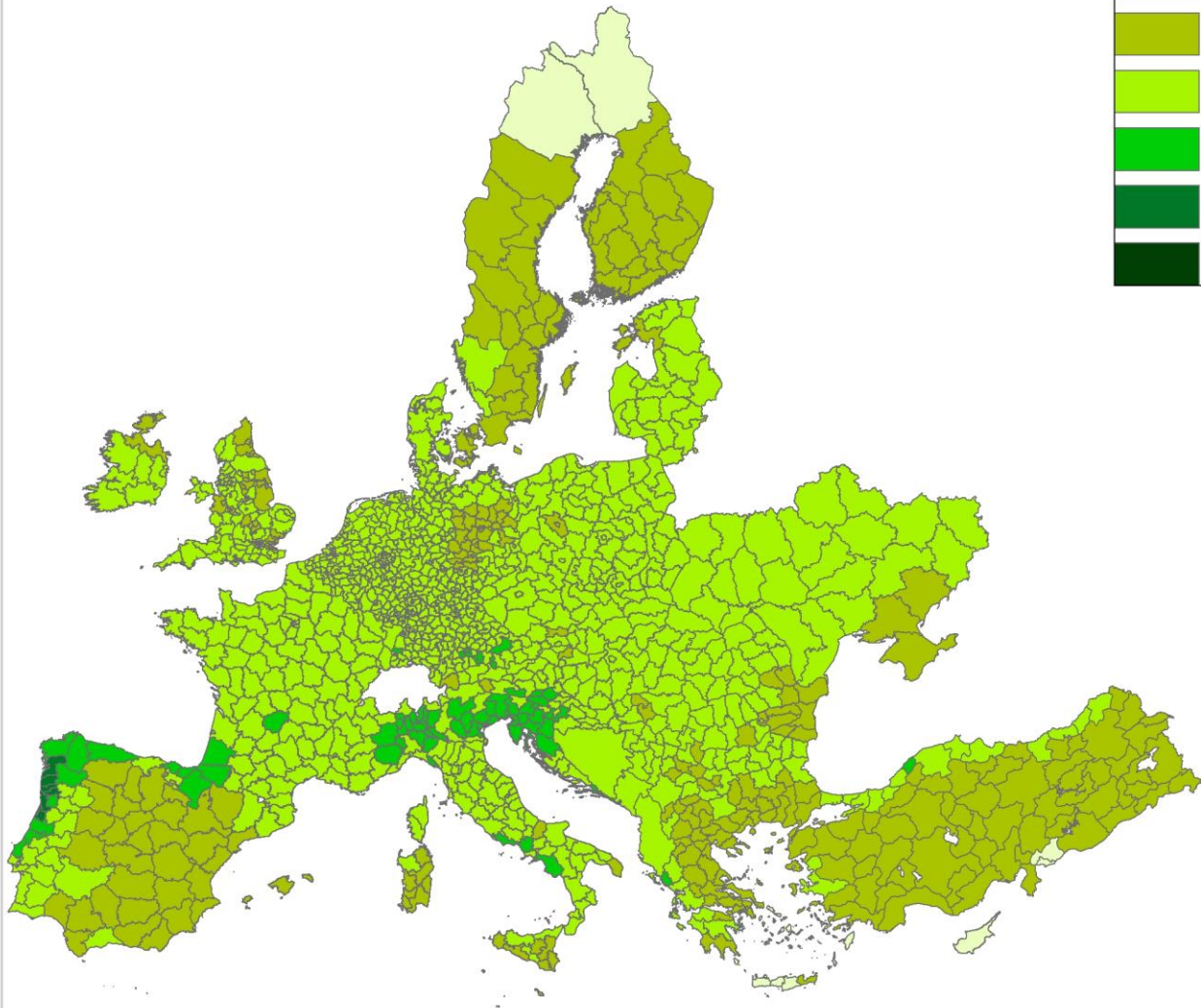
13 - 15

>16

Climate Change 2050



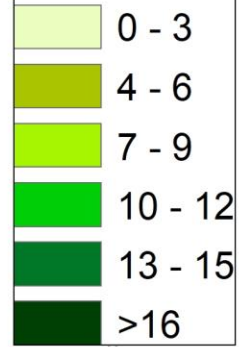
Historic 2020



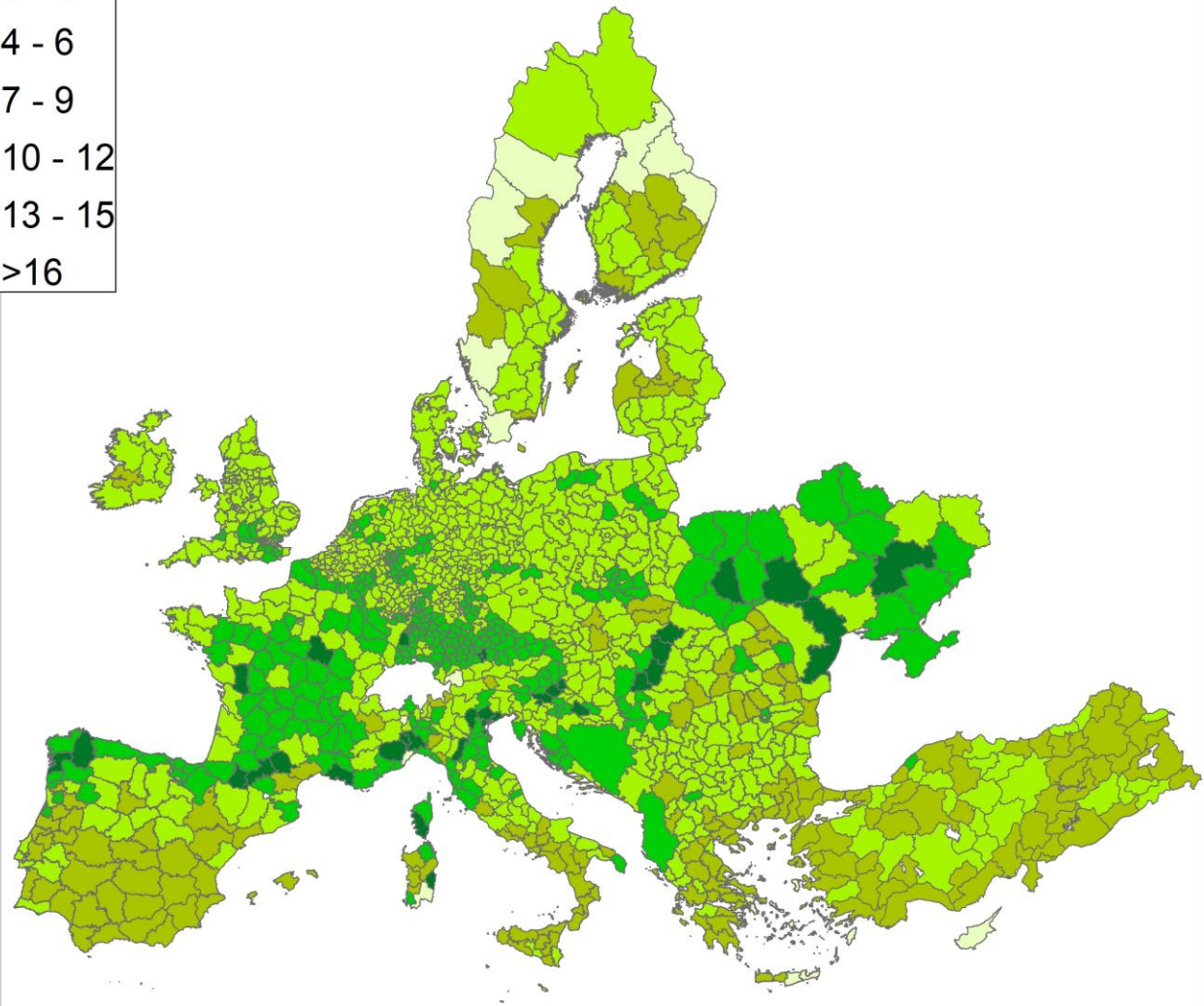
Legend

Cardoon

Tn/ha



Climate Change 2050



Question 2: What are the main relevant environmental impacts related to the cultivation of the selected crops?

Miscanthus

- Suitable to be grown in marginal lands
- Perennial crops are effective in reducing soil erosion and building up soil carbon. The continuous ground coverage, the low soil disturbance, and the large rooting systems are reasons for this.
- Low nutrient leaching. The deep and well branched roots make that they hold large amounts of water and nutrients. Nitrogen uptake from air and/or through fine root system and/or translocation of nutrients to the root system before the crop is harvested.
- C4 photosynthetic group: more water efficient which implies that it transpires less water per unit biomass.
- Biodiversity: provides shelter to animals, create landscape structural diversity.
- Can also deplete water resources through deep routing if scarce water availability

Cardoon

- Multipurpose: biomass and oil
- Very suitable to be grown on marginal, degraded lands
- Very resilient crop through deep rooting (3 m). Can grow with limited water and on poor soils.
- Very effective in reducing soil erosion and building up soil carbon. The continuous ground coverage, the low soil disturbance, and the large rooting systems are reasons for this.
- Low nutrient need and leaching
- C4 photosynthetic group: more water efficient which implies that it transpires less water per unit biomass.
- Biodiversity: pollinator (nice flowers) and provides shelter to animals, create landscape structural diversity
- Can also deplete water resources through deep routing if scarce water availability

Question 3 - What are the main 'best available practices/technologies' to grow such agricultural crops minimizing the impacts and maximizing the benefits for the environment?

- Grows on marginal lands that are abandoned or degraded
- Cardoon is more suitable for degraded land as it is more resilient than miscanthus
- In very drought circumstances ($P/PET < 0.5$) better to go for cardoon
- Miscanthus higher yields but also more demanding in terms of water
- Miscanthus is established through rhizomes (costly)
- Cardoon is established through seeding
- Both can be harvested with existing machinery

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