Downscaled Crop and Management Intensity Map for the EU

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Introduction

Reducing agriculture's environmental impact while sustaining yields is a key EU policy challenge.

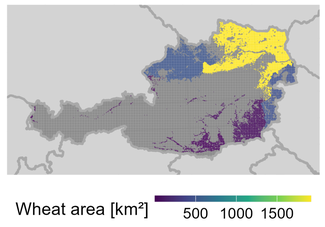
Nitrogen use drives soil loss, pollution, and biodiversity decline. Impacts vary regionally, so spatially explicit data are vital.

We present a harmonized mapping method combining crop type and management intensity at 1×1 km resolution, aligned with statistics.

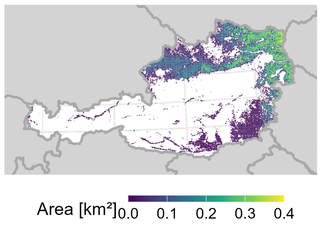
Output: Dataset for 10 crops in EU-27 (2000, 2010, 2018), plus wheat case study for Austria.

Data

- **Land Use & Management (LUM):** From CORINE, refined with JRC irrigation and energy data to classify intensity.
- **Crop Probabilities:** From Baumert et al. (2024), using satellite, climate, and soil inputs.
- **Yields & Emissions:** From EPIC-IIASA, calibrated to LUM classes (LAMASUS project).



Regional wheat stats (AT NUTS2)



Agricultural areas (AT NUTS2)

Method

Arable land from LUM is aggregated to 1×1 km cells i and classified into five intensity levels. Total area per cell: total $\text{area}_{i,t} = \sum_l \text{area}_{i,t,l}$. Crop probabilities $P_i(c)$ allocate this area to crops c, with residual class *OthAgr*: $P_i(\text{OthAgr}) = 1 - \sum_c P_i(c)$.

Area Harmonization

Regional crop areas match Eurostat targets via proportional scaling:

$$P_{i,t}(c)^{\text{adj}} = P_i(c) \cdot \frac{\text{area}_{c,j,t}^{\text{target}}}{\sum_i \text{area}_{c,i,j,t}^{\text{prior}}}$$

This keeps spatial patterns while aligning totals.

Production Harmonization

Grid crop areas × EPIC-IIASA yields × LUM intensities = production. If totals differ, LUM classes adjust iteratively:

1. Find production gap.
2. Check yield gaps by class.
3. Shift LUM intensity ±1 where possible.

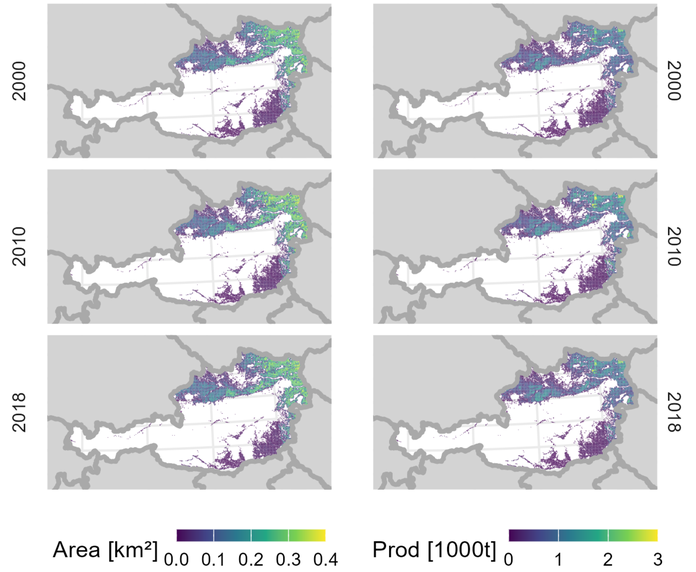
4a. If target reachable, adjust proportionally.

4b. If not, shift all LUMs and repeat.

5. If still unmet, raise flag.

Results

- **Stable patterns:** Wheat in NE Austria.
- **Production varies:** From yield gaps across classes.
- **Harmonized output:** Matches stats with realistic maps.



Austria: Wheat Area & Production (2000, 2010, 2018)

EU-27 harmonized maps linking crops and management, preserving spatial patterns while matching regional statistics.

Zenodo

GitHub

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