EFFECTS OF DIFFERENT LAND USE DATA ON BIODIVERSITY METRICS IN AGRICULTURAL LANDSCAPES: TOWARDS (GEO)DATA FITNESS FOR USE

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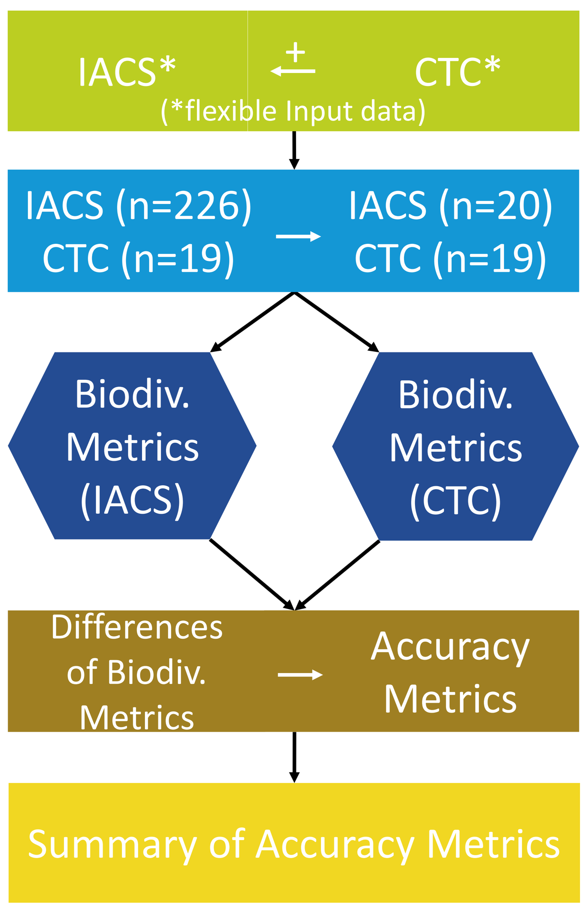
BACKGROUND

- Public crop type information like Integrated Administration and Control System (**IACS**) data are partly restricted for Germany.
- Freely available Crop Type Classifications (**CTC**) derived from remote sensing imagery represent crucial input data for agricultural biodiversity metrics.

GOALS

- Analyzing effects of different input data in the form of IACS and CTCs (Schwieder et al., (2022) (**SWD**)) and Preidl et al., (2020) (**PRE**)) for the Number of Crops (**NoC**) and the Shannon Evenness Index (**SEI**) by data quality metrics (**R², RMSE**) for Lower Saxony (**LS**) and Brandenburg (**BB**) 2017 – 2019.
- Differences between the two presented CTCs due to:
  - spatial discrepancies (resolutions)
  - different sampling schemes
  - different input data
  - number and definition of classes
- Designing best practice guidelines and algorithms for data fitness for use assessment.

METHODS



Zonal Statistics: Majority voting of CTC on IACS geometry

Aggregation: Assignment of IACS classes to CTC classes

Calculation of Biodiversity Metrics: Number of Crops and Shannon Evenness Index for IACS and CTC per hexagon as reference unit

Calculation of Accuracy Metrics: R², RMSE of the differences of biodiversity metrics for IACS and CTC

Application Matrix: Summary of accuracy metrics in tables and figures

Fig. 1: Method workflow for flexible input data (e.g. Crop Type Classification (CTC), IACS) to compare biodiversity metrics by accuracy metrics.

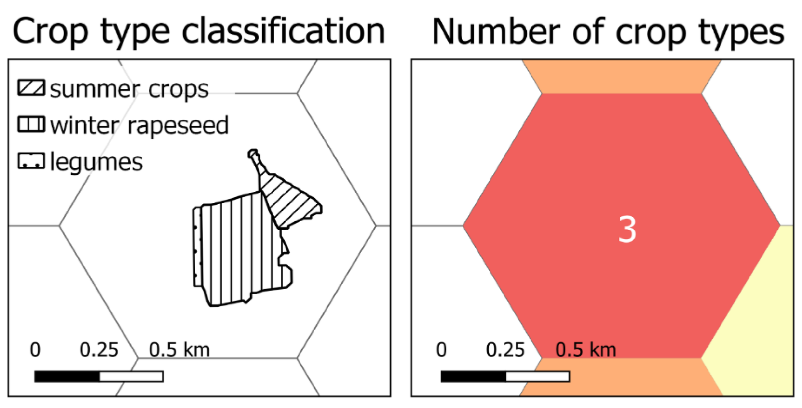


Fig. 2: Application example for biodiversity metric Number of Crops

CONCLUSIONS

- For the first time, area-wide biodiversity metrics are deviated from remote sensing-based Crop Type Classifications and are evaluated through a data fitness for use approach.
- **IACS data can be replaced by freely available remote sensing-based Crop Type Classifications, which can be used in regions where IACS is not available.**

OUTLOOK

- The flexible workflow is an approach to generate information on data usability from a user perspective.
- Within the FAIRagro project, a multidimensional application data matrix framework will be built, formalized and transferred to additional quality metadata.

FAIRagro

RESULTS + DISCUSSION

Difference Number of Crops (IACS – PRE)

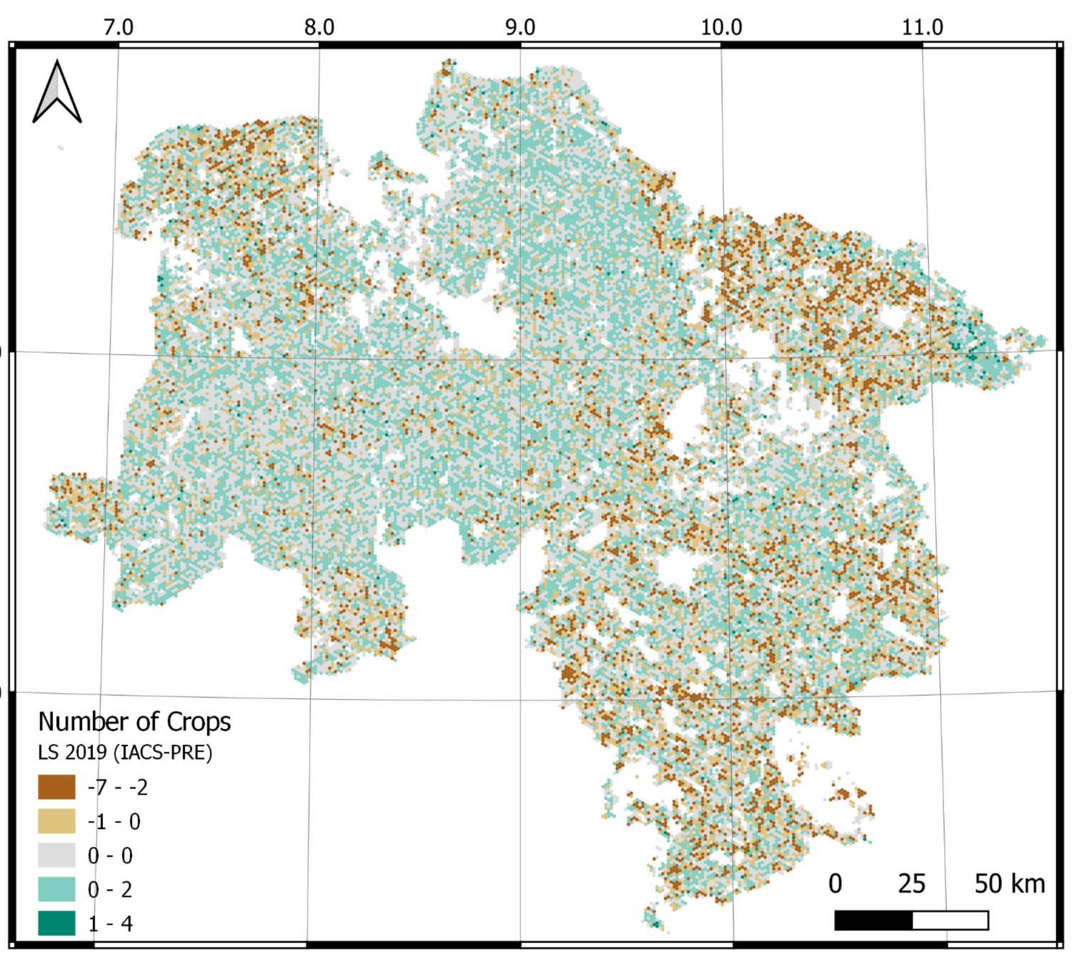


Fig. 3: Difference of Number of Crops (NoC) per hexagon (n = 46,543) of Preidl (PRE) subtracted from IACS for Lower Saxony 2019. Positive differences (green): NoC according to IACS is greater, negative differences (brown): Preidl data generate a greater NoC per hexagon.

Number of Crops (IACS – PRE)

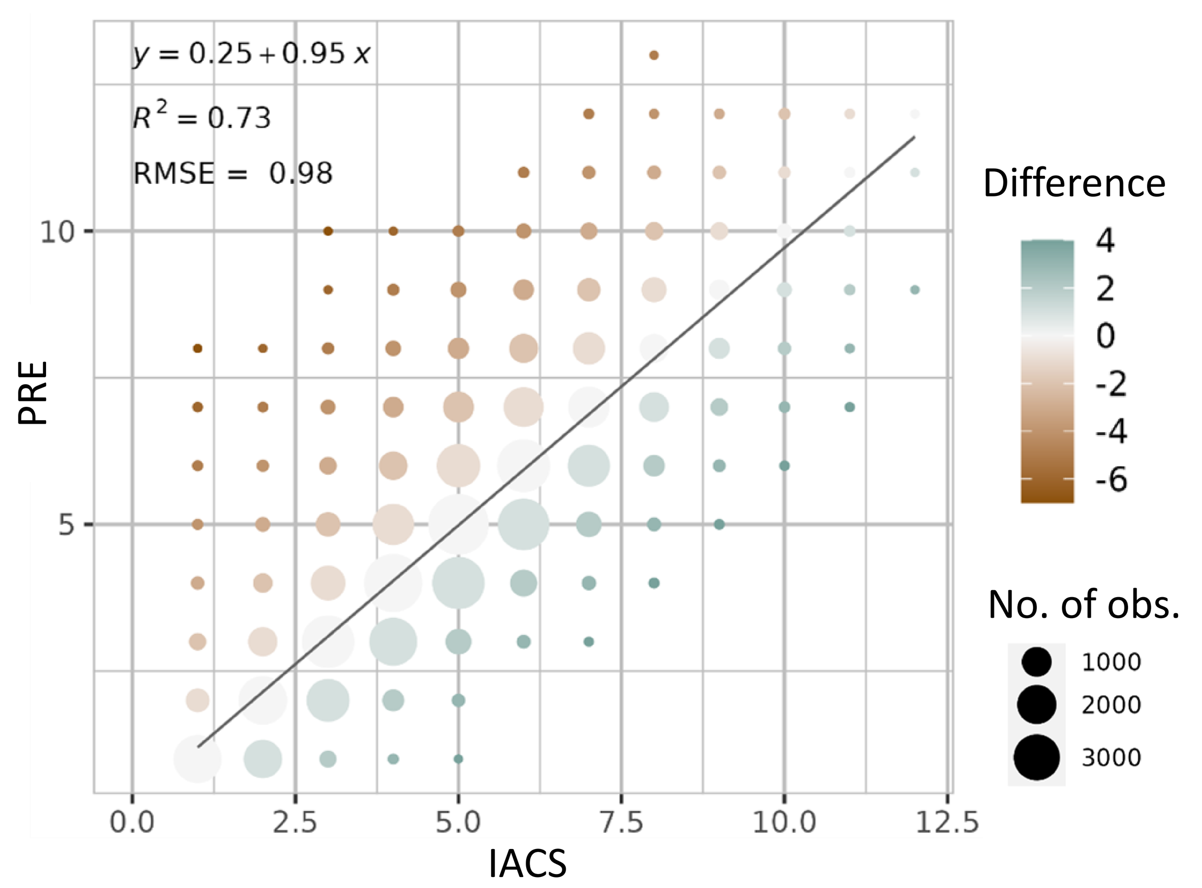


Fig. 4: Difference of Number of Crops (NoC) (n = 46,543) from Preidl vs. from IACS for Lower Saxony 2019. Positive differences (green): NoC according to IACS is greater, negative differences (brown): Preidl data generate a greater NoC per hexagon.

Shannon Evenness Index (IACS – PRE)

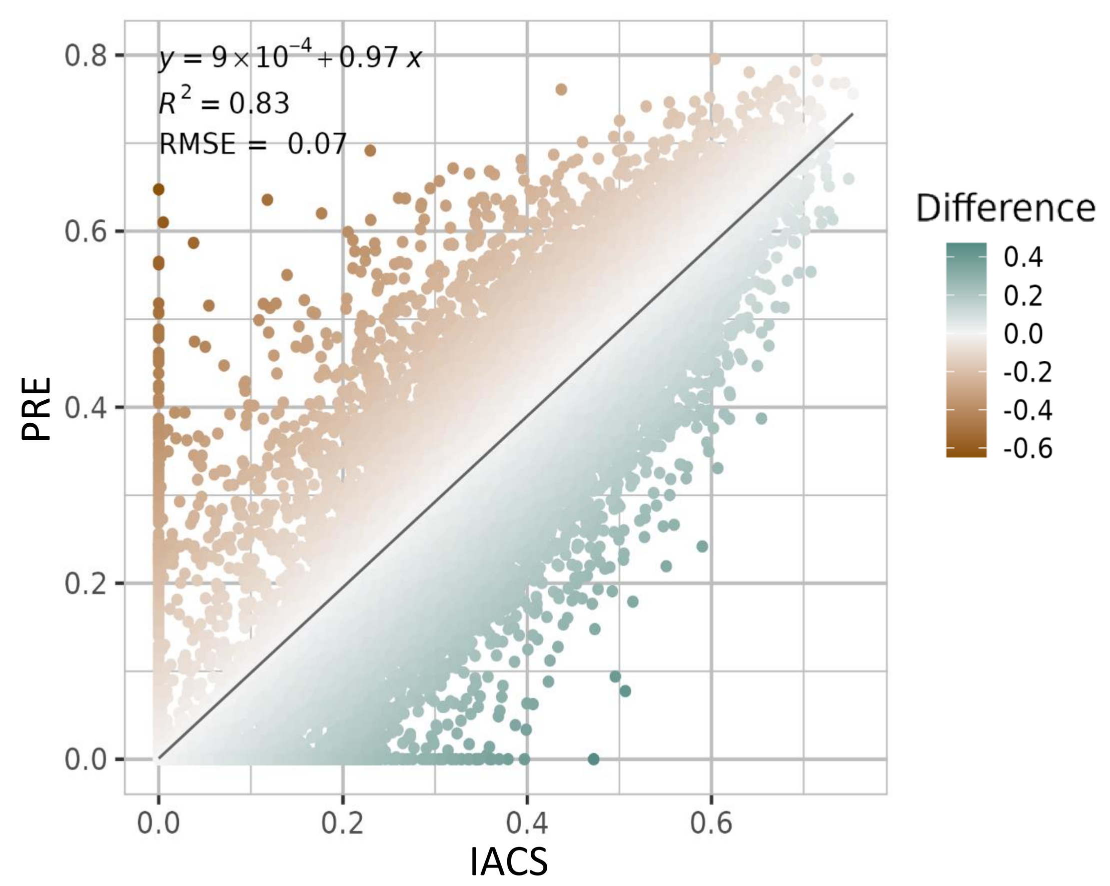


Fig. 5: Difference of Shannon Evenness Index (SEI) (n = 46,543) from Preidl vs. from IACS for Lower Saxony 2019. Positive differences (green): higher SEI values for IACS, negative differences (brown): higher SEI values for Preidl (PRE).

Summary of Data Quality Metrics

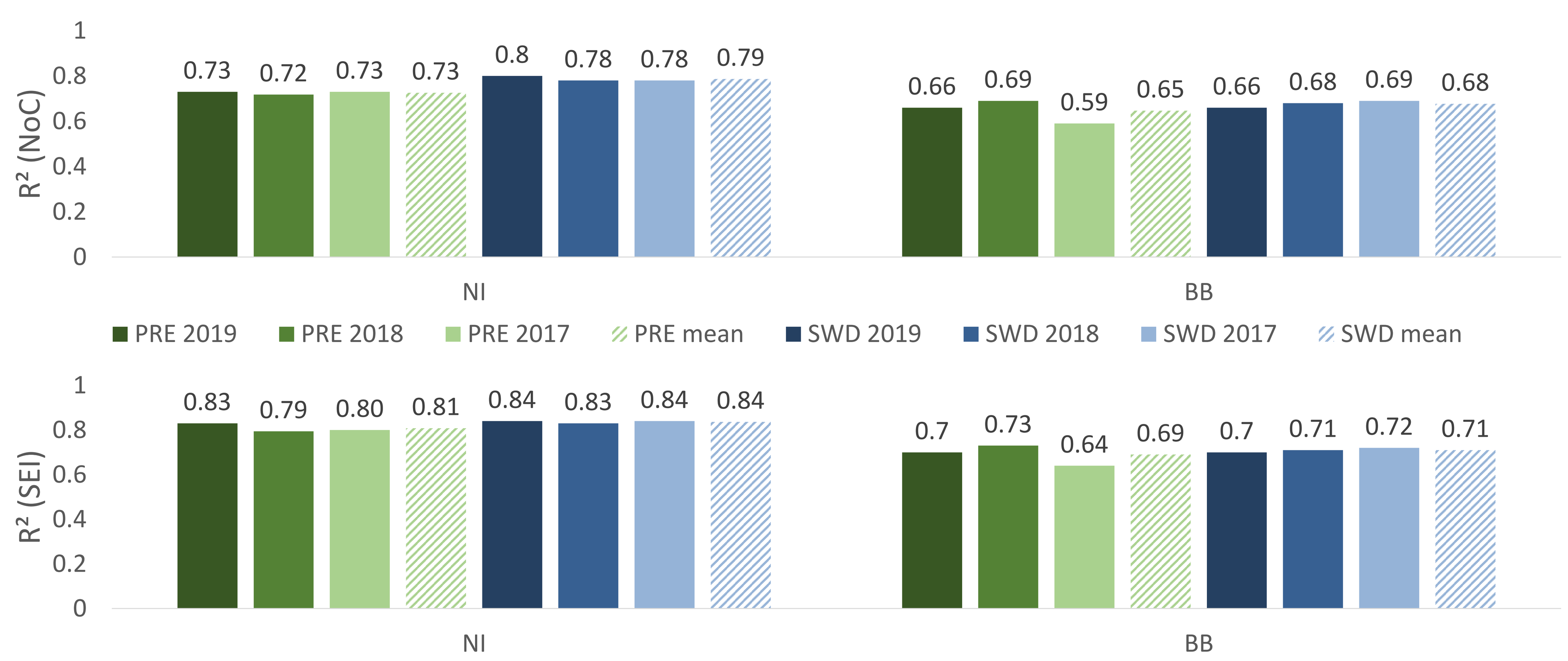


Fig. 6: Data quality metric R² as a measure of the similarity of the Number of Crops (NoC, top) and Shannon Evenness Index (SEI, bottom) based on the Crop Types Classifications (Preidl (PRE): green, Schwieder (SWD): blue) versus based on IACS for Lower Saxony (left) and Brandenburg (right) 2017-2019.

- Derivation of **area-wide** biodiversity metrics based on Crop Type Classifications (Fig. 3).
- Comparison of biodiversity metrics based on PRE and IACS show that the most frequent difference is 0 (Fig. 3-5)
  → highlights hexagons with **no discrepancies** between the input data
- Summary of Data Quality Metrics (Fig. 6):
  - higher R² values for Lower Saxony than for Brandenburg
  - higher R² values for SEI than for NoC
  - higher R² values for SWD than for PRE
- **High correlation** for the Number of Crops (Fig. 4) and the Shannon Evenness Index (Fig. 5) for PRE and IACS as input data for Lower Saxony and Brandenburg for 2017 – 2019. (Fig. 6)

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