

Response to reviewers' comments on the proposed manuscript ESSD-2025-59

We are thankful to the reviewers for their helpful and constructive comments. They have allowed us to improve the quality and presentation of our paper in a way that we hope the reviewers will find satisfactory.

In general, we improved the methodology section by providing further information on the confidentiality requirements. Moreover, we explained more comprehensively the method applied for combining different multi-resolution grid layers and examining the comparison with traditional NUTS 2-level summary statistics. Finally, we revised the text thoroughly to define all abbreviations upon first use, and we added more explanations to terminologies that readers might not be familiar with.

Our replies are provided in *blue italics* below each comment.

Reply on #RC1

Overall, I find this dataset to be a valuable resource. The multi-resolution approach offers more spatial detail than traditional summary statistics over large regions while preserving data confidentiality. However, the manuscript would benefit from revisions to improve the clarity and communication of the methods, results, and conclusions. Additionally, the flow of the manuscript could be refined to enhance readability.

- Consider restructuring the manuscript slightly to allocate more space for the methodology section. In particular, it would be helpful to provide more detail on how the maps were generated and how the analyses were conducted—for example, the statistical link analysis and the comparison with traditional NUTS2-level summary statistics. The results are currently integrated with the discussion, which can be effective when they usually refer to the same figure. However, some parts of the results section could be shortened, and the discussion could be enriched by referencing relevant literature to support the interpretations.

Response: Thank you for your suggestion. We have improved the methodology section by adding further information on the link-analysis, and we have condensed Section 3.2 that presents the deviations of NUTS 2 level summary statistics and grid data. Moreover, we have included additional references from relevant literature to the results and discussion Section (3.1-3.3).

- Figures 9 and 10 are missing scale bars, which would help readers interpret the spatial extent. Additionally, the color bars and legends are too small to read clearly and should be adjusted for better legibility.

Response: We have improved the readability of both figures, and we now include a scale bar in the figures.

- Consider that readers may not be familiar with all domain-specific context; it would be helpful to provide brief explanations where needed and avoid vague or ambiguous wording. Additionally, the manuscript includes a number of abbreviations. Please ensure that all abbreviations are defined upon first use and used consistently throughout the text.

Response: We agree with the reviewer. We have now ensured that all abbreviations are defined upon first use, and we have added further explanations on the terminologies used to be clearer and more precise.

Detailed comments on specific instances can be found in the attached PDF.

- P2 L40 MS: Member States?

Response: We missed the definition of the abbreviation MS in L30 above. This typo has been corrected throughout the manuscript.

- P2 L50: It might be helpful if a brief explanation of context indicators could be added.

Response: We have now explained in the text that context indicators take the form of quantified variables that are used to assess the overall policy performance and provide information on structural, economic and environmental trends.

- P6 Table 1. caption: I think this is UAA. Ensure consistent use of abbreviations and provide the full term upon first mention.

Response: We have revised the use of all the abbreviations, and we have changed the text to utilised agricultural area (UAA).

- P7 L138: Section 2.1 does not appear to clearly describe these confidentiality rules. It would be helpful to explicitly state the confidentiality requirements to ensure transparency and better inform readers.

Response: We have now included a brief description of the confidentiality requirements, and we have included more detailed information in the Appendix.

- P8 L160-161: The example is clear and easy to follow. To further improve clarity, it would be helpful to elaborate on the specific algorithm or criteria used to trigger contextual suppression. For instance, what threshold or condition is applied—such as how small the grid value must be? If this threshold is user-definable, please clarify that as well.

Response: We have added further explanations in the text describing, in detail, the algorithm to produce multi-resolution grids that satisfy the confidentiality rules. Moreover, in the Appendix, we have now provided a flowchart explaining the iterative process of the procedure and the technical aspects of the confidentiality rules and quality assessment of the values. With regards to contextual suppression, we apply an arbitrary threshold of 0.05, which means that if the grid cell contributes only 5% to the total value of the new aggregated grid cell at the next lowest resolution level, then it will be suppressed. We have added this explanation in the methodology section.

- P9 L167-171: This is a very valuable point, but it may be more appropriate to present it in the Results and Discussion section.

Response: We agree with the reviewer, and we have now included the explanation in the Results and Discussion section.

- P9 Section 3 Results: Maybe rename this section to Results and Discussion?

Response: We have renamed the section to Results and Discussion.

- P13 L226: It is not very clear what 'the effect of LDI' refers to. Providing additional explanation would improve its clarity.

Response: Our apologies for not being clear. The effect of LDI refers to the impact on ecosystem structure and function, such as species composition, loss of biodiversity and the alteration in the nitrogen and phosphorus cycles. We have provided additional explanation in this section with relevant literature.

- P13 L227-232: This result from the map is very compelling. However, the argument could be further strengthened by citing relevant studies that support the interpretation.

Response: Good point. We now back up our arguments with references from the relevant literature.

- P19 L314-315: The phrase 'to some extent' is somewhat vague. It would be clearer either to briefly specify the extent or to remove the phrase. Additionally, it would be beneficial to briefly explain how and why 'this economic model is suitable for women's work and lifestyle in such regions.'

Response: We have removed the vague wording and have explained briefly why the economic model is suitable for women's work and lifestyle in the Galicia region. Studies on social entrepreneurship have found that women prefer this corporate model over the more traditional ones, because the cooperative principles, such as cooperation, solidarity, fair and democratic management, equal voting rights, self-assistance and self-responsibility, and social responsiveness, fit well with their individual preferences and their perception to pursue personal and professional development. Moreover, women perceive cooperatives to be less risky due to profit and cost sharing.

- P23 Section 3.2: It is a valuable and strong point that these maps provide more spatial detail compared to summary statistics over a large region. However, this section may be overly detailed in its analysis of specific spatial patterns. Consider condensing the part to improve focus and readability.

Response: We have shortened this part to provide the main messages and to improve the focus and readability.

- P23 L353-354: Providing statistics at a larger spatial scale does not necessarily imply making inferences about individual farm holdings. Rather, such summaries typically aim to represent overall regional patterns. I suggest rephrasing this part.

Response: We have rephrased this part to make our arguments clearer and less ambiguous.

- P24 Figure 9: The color bar is too small to read. Additionally, including a scale bar would help convey the spatial size of the data.

Response: The text size of the color bar has been improved, and we have also now included a scale bar.

- P24 Section 3.3: Consider providing a more detailed description of how the analysis was conducted—for example, how the links between the two maps were classified and whether resolution harmonization was required beforehand. This methodological description would be more appropriate in the main methodology section. Additionally, you may consider calculating the correlation between the two indicators to provide a quantitative assessment.

Response: We have included the description of the link analysis in the methodology section. The overall correlation between organic and grassland area is provided in the main body of the manuscript in Section 3.3. In addition, we have included more details of the correlation analysis in the Appendix.

- P24 L383-385: Is this type of analysis only feasible when the maps of different indicators share the same resolution, or do the maps need to be resampled to a common resolution beforehand?

Response: The different indicators do not need to be resampled as we have developed a procedure to consolidate grids from different datasets with different resolution grid sizes in each location. The final grid size in the common resolution is the lowest available resolution from the selected maps, and smaller grids with higher resolution will be aggregated to the required resolution level. This conservative approach nullifies the risk of disclosing confidential information when consolidating different indicators. The outcome of the merger depends on whether the data are post-processed (i.e., rounding or suppressed cells due to noncompliance with the confidentiality rules). We have added this information in the methodology section along with a new figure (Figure 2 in Section 2.2) illustrating the consolidation process.

- P25 Figure 10: The legend is currently too small to read clearly. It may also be helpful to include a scale bar, so that readers can better understand the size of the maps and pixels.

Response: You are right. We have improved Figure 10 in Section 3.3 by restructuring the presentation of the bivariate maps and the legend. As suggested, the figures now also include a scale bar to better understand the size of the maps and the grid cells.

Reply on #RC2

Overall, I find this dataset to be a very useful resource. While the use of multi-resolution also has its limitations in terms of combining it with other datasets of different spatial resolutions, it offers more spatial detail that can be extremely useful for policymakers and researchers alike, while preserving data confidentiality. I can definitely see many potential uses of the dataset.

In terms of potential aspects where the manuscript could be further improved, these include:

- In the first paragraph of the introduction, to provide context to those readers who may not be familiar with the multiple CAP reforms (e.g. MacSharry; Agenda 2000) it could be useful to briefly describe these.

Response: Thank you for this suggestion. We have now outlined a few of the major reforms of the CAP, such as MacSharry 1992, Agenda 2000, Fischler 2003, Ciolos 2013, and the post-2020 reform to provide more context about the main achievements and timeline of the CAP.

- I would find it useful to have a brief summary of the confidentiality requirements either in the text or as an annex. I think that laying these out clearly in the manuscript would provide stronger motivation for the use of the method.

Response: This is a good point. We have included additional information about the confidentiality requirements in the main body of the manuscript in Section 2.2. Moreover, we have included a flowchart showing the rules that are applied in the creation of multi-resolution grids in the Appendix. Where the rules are not satisfied, the grid cell sizes must be increased as implemented in the multi-grid solution (unless their impact is smaller than a certain limit).

- I agree with the third point of the first reviewer of ensuring that all abbreviations are defined and not assuming that all readers will be familiar with all domain-specific knowledge.

Response: We agree with the reviewers. We have now ensured that all abbreviations are defined upon first use, and we have added further explanations on the terminologies to be clearer and more precise.

In addition to these points, there are two more small aspects that caught my attention:

- In some cases, it seems that pixels go across borders to non-EU countries. In Northern Ireland, for example, a fairly large share of the country seems to be covered, which I found odd. I assume that all data is for Ireland and that it occurs as a result of lower resolution in the Northern parts of Ireland. It may be useful to have a footnote or note somewhere explaining this.

Response: You are right. In some cases, such as in the share of arable land, the multi-resolution grid approach produces a lower resolution, so some grid cells that are part of Ireland appear to cover parts of Northern Ireland at the boundaries between the two countries. However, these grid cells correspond to data from Ireland. We have included a note below each figure in Section 3.1 (3.1.1-3.1.7) to explain this point.

- Website: The current sentence reads: "The gridded data from the different layers can be downloaded as a zipped file, and the viewer is publicly accessible at the following experimental data website: Eurostat." I do not know whether this is what was originally intended by the authors, but it could be useful to put the actual website link instead.

Response: This is a typo. We have corrected this in the manuscript, and we have provided the actual link to the website.

END