Summary of changes made to the manuscript after the first round of revision

In this document we summarise the main changes made in the manuscript following the first round of referee comments. For the complete referee comments (RC1-3) and our full replies (AC1-3), we refer to the online discussion available at: https://doi.org/10.5194/egusphere-2025-2625

Minor changes

During the process of revising this manuscript we (the authors) noted and corrected some minor errors in the manuscript that were not raised by any referee. A new version of the model has also been released (v25.09) that incorporates changes in input data following this review process along with minor changes/fixes in the model code. As such, the manuscript has been revised with the new model version number and reference to the new release on Zenodo. A complete change log is available via the release on GitHub.

Changes section-by-section

Here we summarise the main changes to the manuscript by section. After each point we refer to the referee comment (RC) to which it pertains.

Abstract

- The abstract was slightly revised to improve clarity and flow

1. Introduction

- The opening paragraph was revised to set the work into the context of foresight studies and scenario analysis **(RC2)**.
- A short sentence was added with reference to some of the existing national-scope models that fall into the same family of models as CIBUSmod **(RC1)**.

2. Model description

- Clarified that CIBUSmod uses user-input on e.g. human diets, population size, and processing conversion efficiencies to calculate national demand for crop and animal products **(RC1, RC2)**
- We have clarified what is meant by 'specificity' regarding input data by extending the corresponding paragraph and providing a concrete example **(RC2)**
- *Sections 2.1/2.2*
    - We have changed the order of section 2.1 and 2.2 to make it clearer that the model first calculates demand then find the spatial distribution of agricultural production that can meet this demand under set constraints **(RC1, RC2)**
- *2.1. Calculation of demand for agricultural production (2.2 in original manuscript)*
    - We have revised the paragraph that describes the balancing of supply and demand for dairy fats to make it clearer **(RC2)**
- *2.2. Regional distribution of crop areas and animal numbers (2.1 in original manuscript)*
    - We have revised the mathematical description of the optimisation goal function to show all formulae used and clearly define all symbols **(RC3)**
    - Clarified than constraint C1 is applied on national level **(RC2)** and that any number of the flexible constraints (C8, C9) can be included in a model run **(RC1)**
- *2.3. Crop production systems*
    - Nothing to note
- *2.4. Livestock production systems*
    - Clarified which livestock modules are included in the model and that additional modules may be developed if needed for a specific use case **(RC3)**
    - Clarified the structure of livestock modules in CIBUSmod and that the same module (CattleHerd) is used to model both dairy and suckler cow systems accounting for their differences in feed requirements and production **(RC1, RC2)**
    - Extended the section describing calculation of feed energy requirements for cattle **(RC1, RC2)**
- *2.5. Manure management*
    - Added a short motivation why the mass-balance-approach for calculating manure excretion currently only applies to cattle and pigs **(RC1)**
- *2.6. Plant nutrient management and liming*
    - We have clarified the algorithm used to distribute non-manure organic fertilisers across crop areas **(RC1)**
- *Sections 2.7 – 2.9*
    - Nothing to note

3. Application to a case study – Sweden

- *3.1. Input data and baseline validation*
    - Clarified what data was used for the share of organic food in consumption **(RC2)**
    - Figure 9 and text describing indirect N_2O emissions from leaching have been updated following changes in the leaching factor used to calculate N leaching as a function of N input **(RC1, RC3)**
- *3.2. Scenario example – Re-assessing scenarios for organic farming in Sweden*
    - Figure 13 has been updated following changes in the leaching factor **(RC1, RC3)**

4. Discussion and conclusions

- A paragraph has been added to the discussion that clarifies the intended users of CIBUSmod and its potential application in collaborative foresight projects and in teaching **(RC2)**
- We have added a sentence to explicitly state that the current handling of animal feed rations in CIBUSmod requires that users supply the model with nutritionally balanced diets for the different animals **(RC1)**
- A paragraph has been added to highlight that CIBUSmod cannot be used to assess socio-economic effects of scenarios or the policies/socio-economic conditions required to reach different scenarios. But that results may be combined with other methods and models to perform such analysis **(RC2)**