

We would like to thank the reviewer for the helpful comments, which allowed us to improve our manuscript. We present below the detailed responses on how we have addressed the comments.

“Lines 83-84: Clover is not a grass – please revise the sentence.”

Yes, we revised this sentence.

“Line 109: Was only the zero point of the CO₂ channel of the LI-7200 calibrated? No calibration of the span and/or the H₂O measurements? This is the only point in the Methods section that worries me a little bit, because from my experience I would say that this type of analyser requires a complete calibration about once a year.”

Yes, we agree and clarified the calibration procedure in the revised MS. The gas concentrations were regularly checked by measuring the CO₂ zero and span gases and comparing the H₂O data to molar ratio calculated from Humicap data. CO₂ concentration was calibrated with zero and span gases when needed. There was no need to calibrate H₂O gas during the measurement period.

“Line 144: I had expected that the data coverage would have been described in more detail here: Was it spread evenly across seasons and/or times of the day? The temporal distribution of the gaps can have a considerable effect on the reliability of the gap filling and potential biases. Later I realised some comments on this in the appendix, but I would recommend adding a sentence or two about this in the main text.”

We added a few sentences about the distribution of gaps in winter- vs. summertime and day- vs. nighttime to the revised MS. Nighttime data coverage for the whole CO₂ data set was 33% and for the H₂O data 11%. Daytime data coverage for CO₂ was 55% and for H₂O 49%. Summertime (from April to September) and wintertime (from October to March) data coverage for CO₂ were 48% and 38%, and for H₂O 41% and 16%, respectively.

“Line 266: Regarding the relation to ‘mean soil moisture’ it is important which soil depth is referred to. Please add this information to the ms text.”

Yes, we added the information about the depth of soil moisture measurements.

“Line 322 ff: I am not really sure about the definitions of the expressions of CO₂ exchange used here and in the subsequent paragraphs (this comment refers also to the ‘uptake’ mentioned in lines 338 and 340 – is this NEE or GPP or something else?). How is for instance the ‘total carbon balance’ defined, when for example comparing it to the nomenclature used by Kutsch et al. (2010) in AGEE 139, 336-345: Is it net biome production NBP? Or full field balance or farm gate balance? Please clarify.”

Indeed, the carbon balance represents NBP as in Kutsch et al. (2010). We clarified this in the revised Section 2.5 *Carbon balance* to which we added a definition of the system boundaries adopted in our study. We defined the study system as the agricultural field ecosystem. Concerning the CO₂

uptake term on lines 338–340, we emphasized that the net uptake of atmospheric CO₂ is meant here.

“Line 345: Strictly speaking, the enhanced root system wouldn’t directly enhance carbon uptake, but enhance water availability and avoid drought stress, thereby indirectly enable a higher GPP (but also enhance respiration?!). Please explain this effect more accurately.”

We added a more accurate description that the effect is indeed indirect.

“Line 353: I think the reference to Pirasteh et al. is a very odd choice given that this effect has been well known and understood for many decades.”

We updated the reference here to Löffelholz (1921).

“Lines 361-363: With respect to the WUE analysis, I strongly recommend an additional approach to disentangle transpiration from total ET in order to make the statements on WUE more meaningful. I understand that the ET components were not measured separately, but assuming that soil evaporation can be neglected in a grassland with complete canopy cover, the data set could for example be split into rainy and rainless days, and the rainless days be analysed separately. This would enable an alternative calculation of WUE from GPP and T if it is further assumed that, on rainless days, interception evaporation can be neglected, too.”

We agree. We found that most of the rainy days were already eliminated from the analysis as we used only the days when the latent heat flux was greater than 30 W m⁻². However, we further modified the filtering and removed all the rainy days. As a result of this change, 10 more data points were eliminated, and the results were affected very little. The relationship between WUE and LAI (Fig. 5) was not affected. Below updated Figure 6.

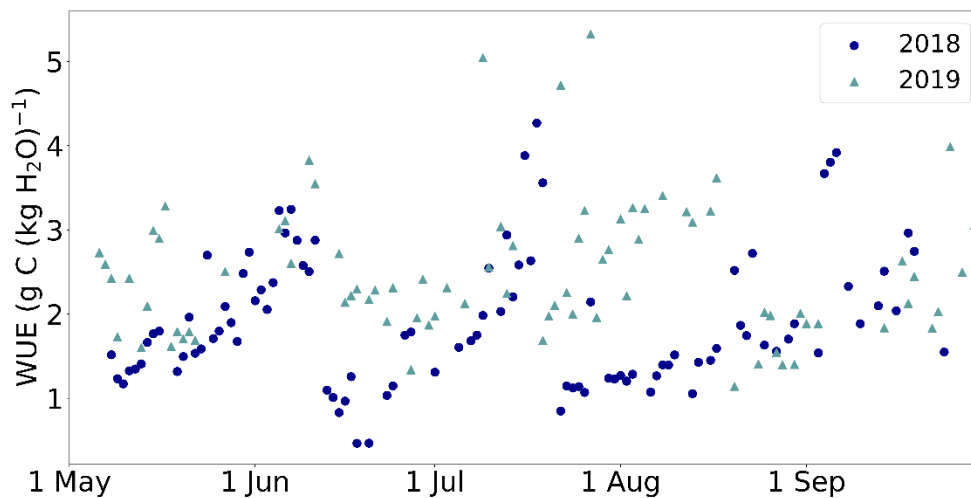


Figure 6. Daily water use efficiency (WUE) during two growing seasons.

“Line 395: The last “the” has to be deleted.”

Yes, that was deleted.

“Line 396: See above: Which processes or flux components are exactly included in the expression “management flux”? I think the answer to research question no. 3 on carbon sequestration and offsetting carbon emissions depends strongly on the definition of the boundary of the system under consideration (ecosystem – field – farm gate?).”

Management flux means the sum of positive outflow as yield and negative inflow as organic fertiliser. The term was clarified in the revised text (this line and earlier). Concerning the carbon sequestration of the field, it is true that its estimation depends greatly on the definition of the system boundary. We clarified the system boundary in Section 2.5, as described above, by defining the study system as the agricultural field ecosystem. We also added a sentence to the discussion to highlight that the carbon balance is affected strongly by the carbon fluxes caused by fertilisation and harvests.