

Response to Anonymus Referee #1 (RC1) to

preprint egusphere-2024-2504: "Effects of moss restoration on soil erosion and soil water content in a temperate vineyard"

Thank you very much for your thoughtful and positive review. We really appreciate the time and effort you put into your valuable and helpful feedback. Please find the answers to your comments in the table below. We will also incorporate them into our manuscript.

Reviewer comments	Authors responses
<p><i>"This manuscript proposes moss restoration as a strategy for reducing erosion in vineyards, and presents the results of a plot-scale field experiment implementing the technique. Moss restoration, bare soil, and grass cover crop are compared, and the rates of runoff, erosion, and infiltration are measured using three simulated rainfall events. The paper demonstrates potential for moss to reduce runoff and erosion, and also identifies gaps for future research. Overall, the quality of the writing is very strong, and the content is presented very clearly. The introduction is particularly concise and comprehensive, to the great benefit of the manuscript."</i></p>	<p>Thank you for the overall positive feedback!</p>
<p><i>"While the central findings of runoff and erosion are solid, the manuscript could still be improved with changes to the data presentation and discussion. The most serious shortcoming of this manuscript is the conditions of the field trial itself. The study site previously had mixed grass and moss in the inter-row, not fallow or cultivated soil as in standard practice. Thus the initial soil conditions may have been different than typical vineyard soils. As the manuscript describes, the weather during the beginning of the trial was unusually warm and dry, leading to challenges establishing the moss mats. Combined with the fact that the "moss" treatment was implemented by spreading moss-impregnated burlap over the soil, it is difficult to disentangle the effects of the burlap from the moss, especially in the first two rain simulation events."</i></p>	<p>We are aware of the difficulties to disentangle the effects of the moss itself and the underlying jute fleece and we mentioned this already in lines 318 – 321 of the original manuscript. However, we will discuss this issue in more detail at this point.</p> <p>Regarding your comment on the initial soil conditions in the vineyard, we would like to point out that our rainfall simulation experiments did not take place in the inter-row (between the rows of vines) but in-row (between the vines within a row). In this area of the vineyard, the soil is typically not tilled, but is treated with herbicides to control plant growth so that the soil surface remains undisturbed. We will include photos of the vineyard in the revised manuscript to help readers visualize the location of our treatments in the in-rows.</p>
<p><i>"The manuscript could be improved by discussion of how widely-applicable moss could be to vineyards, given the range of aridity experienced in wine-growing regions."</i></p>	<p>We agree that discussing the applicability of moss restoration to vineyards across diverse wine-growing regions is important, particularly given the variation in aridity. In the revised manuscript, we will expand the discussion to address this point.</p>
<p><i>"The experimental design and results clearly demonstrate the runoff and erosion rates for the various treatments, but the treatment of</i></p>	<p>Additionally, we have a continuous dataset with air temperature (15 cm above soil surface), soil temperature (2 cm and 6 cm</p>

<p><i>long-term soil moisture is lacking in the present manuscript. The introduction identifies that concern about water competition is a primary barrier to implementing cover crops, but the data presented in the manuscript does not effectively characterize the water use of the three treatments. Soil moisture data is only presented for 3 points in time, and at 5 millimeter depth. This zone is particularly sensitive to recent weather, and is not necessarily representative of the water availability to roots. The formulation of hypothesis 3 and presentation of 30-minute time series of water content during simulated rain does not capture the important hydrological properties of the treatment."</i></p>	<p>below soil surface), and soil water content (approx. 14 cm below soil surface) captured every 5 minutes for 21 months (described in lines 137-140 of the original manuscript). These data are currently being analyzed and are too extensive to be included in this manuscript, which is why we decided to publish these data later in a second manuscript. Based on your comment, we decided to focus this manuscript on the effects of moss restoration on surface runoff and soil erosion, and also on the measure of using moss mats in vineyards for erosion control itself. We will therefore move the information on the soil water content in a reduced form to the supplementary material.</p>
<p><i>"Hypotheses 1 and 2 are very strong, but hypothesis 3 seems less strongly motivated. From the data collected for soil moisture at 5mm, perhaps there could be some analysis of infiltration rate at the surface that would be interesting. But I would suggest that hypothesis 3 and the associated data could be moved to the supplement, and the discussion could be relatively unchanged. This could also allow the information in figures 1 and 2 to be streamlined or moved to the supplement."</i></p>	<p>As already mentioned before, we will exclude hypothesis 3 from our manuscript and show the respective data in the supplementary material. However, we will keep at least Figure 1 in the manuscript, as the information about the weather conditions before the moss mats were installed is important to understand their development at the study site.</p>
<p><i>"The introduction very nicely identifies the state of knowledge for moss restoration and erosion. However, I think the readability would be improved by specifically acknowledging knowledge gaps, especially those that will be addressed in this study."</i></p>	<p>Thank you for this suggestion. We will revise the introduction to explicitly highlight the key knowledge gaps, such as the very limited knowledge of moss applications in agricultural settings like vineyards and their potential to mitigate soil erosion under different soil management practices.</p>
<p><i>"The introduction rightly identifies water consumption as a major risk of moss/cover crops, but the experiment mostly does not address this topic. I think this would be great to identify as a knowledge gap in the discussion for future work."</i></p>	<p>Following your comment, we will shorten the information on the risk of water consumption by mosses and cover crops in the introduction and move it to the discussion, where we will go into more detail and highlight this aspect as a knowledge gap that should be addressed in the future.</p>
<p><i>"The applicability of moss to vineyards should be better addressed in the introduction. Vineyards in semi-arid regions or mediterranean climates with a long dry season may not be suitable for moss restoration. Could add this information in the sentences starting around line 67."</i></p>	<p>We will mention the challenges of applying mosses in vineyards already in the introduction.</p>
<p><i>"Grape yield is also identified as a major risk, but not addressed in this study. If you are able to comment on this it would be interesting, but</i></p>	<p>Unfortunately, we have no information about the grape yield at our study site and whether it is affected by different</p>

<i>otherwise it should be identified as an area for future work."</i>	management practices. However, when revising the manuscript, we will emphasize the addressed knowledge gaps more strongly and better distinguish them from the knowledge gaps that should be taken into account in the future.
<i>"Along with the risks of water use and yield reduction, another risk that is understated in the current manuscript is the lack of knowledge of how to implement moss restoration in vineyards at scale. This should be treated seriously as a barrier to implementation, and as a knowledge gap which the present work partially addresses."</i>	The large-scale restoration of mosses has hardly been investigated to date, not only in vineyards but in general. We will focus more on this limitation of the method in the discussion.
<i>"The description of the site's geology can be reduced, as the topsoil is the focus of this manuscript"</i>	As suggested we shortened the description of the site's geology.
<i>"Line 54 repace "vines positively influenes soil fertility, for example, it increases the" with "vines can positively influence fertility by increasing""</i>	We changed this sentence as follows: "Additionally, the vegetation cover beneath the vines can positively influence soil fertility by increasing the soil organic carbon content".
<i>"Line 74 replace "they do not require" with "moss does not require""</i>	We changed this sentence as follows: "Unlike cover crops, mosses do not require mowing, thereby reducing maintenance efforts and costs".
<i>"Line 75 add "mosses may thrive in conditions where ...""</i>	We added "may" in this sentence.
<i>"Line 110 "Overgrown with cover crops" is not clear precisely what was done"</i>	We rephrased this sentence as follows: "The vineyard produces the Lemberger vine variety, and the soil between the vines is continuously covered with cover crops such as <i>Lolium perenne</i> , <i>Trifolium repens</i> , <i>Trisetum flavescens</i> , and <i>Achillea millefolium</i> ".
<i>"Line 143 switch to "three rainfall simulations were conducted on April 13..""</i>	We removed "at three measurement times" in this sentence.
<i>"Line 178 "June" should be changed to "October""</i>	Thank you for bringing this typo to our attention! We changed this.
<i>"Lines 216-218 verb tense should be switched to all past tense"</i>	According to your comment we switched to past tense in this paragraph.
<i>"Line 286 remove comma after Especially"</i>	We removed the comma here.