

Response to reviewer 1, 10 August 2026

Serious gaming as climate service co-production: developing S2S forecasts for the Norwegian agricultural sector

<https://doi.org/10.5194/egusphere-2026-2194>

Reviewer 1 comments	Response
The manuscript entitled “Serious gaming as climate service co-production: developing S2S forecasts for the Norwegian agricultural sector” focuses on the development and implementation of a serious game called “Melkeværet”. This work is clearly relevant for the readership of the journal. However, I see a number of points that the authors should address.	We would like to thank the reviewer for evaluating our manuscript. We appreciate the constructive feedback, and have considered the points raised. Please find our detailed, point-by-point responses to each comment below.
First important formal point: I noticed that part of the work seems to have been published as a technical report in 2024 by the same group of authors (Title: “Melkeværet. A serious game to bridge climate service providers and agricultural users”), but this finds no mention in the reference list or the acknowledgements. Some of the article’s figures are identical to the ones presented in the technical report; some parts of the reported methodology and results are clearly an earlier version of this manuscript. Publishing first results as a report is common practice as is later writing a much more elaborate article about the same work. But in any case, some kind of reference towards this earlier publication is necessary.	Thank you for pointing this out. We agree this is important, and will include a reference to the 2024 technical report in the introduction and the reference list, to state that this manuscript builds upon and elaborates on the work presented in that report.
General feedback:	
I thought about which audience(s) your article might address and I am not sure if you had the same ones in mind, but I came up with 2 groups: (1) People interested in learning how to communicate specific weather forecasts (here S2S forecasts) to specific groups (here: farmers), and (2) people interested in the communication of climate-related topics through serious games. I have to admit that I rather belong to the second group. I assume that group 1 readers can already gain many insights on their questions and I think that this might have been your prioritised audience. However, since your title starts with “serious gaming...” and you report on a really well-designed game, I think it would help to introduce some more aspects of your methodology and evaluation, in order to make your interesting work more accessible for this	We thank the reviewer for identifying the two target audiences. We agree that the manuscript should better cater to readers interested in the serious gaming methodology. To achieve this we will restructure Section 2 to make the methodology, design choices and evaluation more transparent and accessible.

readership. Some aspects already appear in the text, but I suggest a little restructuring to make them more visible.	
Unfortunately, the methodology is not explained transparently. The game evaluation seems to be structured in a somewhat mixed-method approach: a partly quantitative questionnaire with open answers plus observation by researchers. However, the questionnaire is shared, but the answers on the closed questions are not reported. Maybe answers of the only open-ended question (last question of second questionnaire) have been used for the results, but this is not clearly communicated. Furthermore, the authors do not state how the researchers that were part of the game sessions proceeded. Did they carry out an observation? Did they use any kind of protocol for this? The methods applied should be described in section 2, the results in section 3 and the interpretation in section 4. It seems like often results and interpretation are mixed and it is unclear from which steps the authors derived these findings and their interpretation. Sometimes interpretation is given in the results section and sometimes suddenly new results are being introduced in the discussion section (I'll comment some examples below). As far as I see, the journal does not require a division of results and discussion, so you could consider having a combined Results & Discussion (section 3) before a Conclusion (section 4). If you decide to keep your current structure, please make sure to keep both parts better separated.	We appreciate the reviewer's constructive feedback on our methodology and manuscript structure. We will revise Section 2 to improve transparency (see above). Specifically, we will describe (in the methodology) how the researchers' observations were carried out during the gaming sessions, and provide more details on how we used the questionnaires in the game sessions as well as in this manuscript. Regarding the occasional overlap between reporting findings and interpretations, we agree that this needs to be addressed. We will evaluate your suggestions during the revision process and decide whether to combine into a joint section, or maintain the current structure but ensure a strict separation between the two.
Minor aspects per section:	
Abstract:	
The abstract gives a good overview of your paper. It would help to add the serious game's name Melkeværet into the text directly, so that anyone interested in finding out more about the specific game knows which game you are focusing on.	For sure, we will add the name Melkeværet directly in the abstract.
1 Introduction	
The structure of this section into 2 subsections makes absolute sense. You could consider dividing 1.2 into 2 sections: the last 2 paragraphs give an overview on your approach and the aim of this research; therefore, you could simply introduce a new subheading after l. 85.	We agree with this helpful suggestion, and will divide Section 1.2 and introduce a new subheading, "Aim and focus of this research", after line 85. Furthermore, this new subsection is an ideal place to include the reference to the 2024 technical report mentioned in an earlier comment.
l.40ff: The use type categorization by Ray and Webb was not known to me	We agree that the initial explanation is too brief, and will expand the

before. From reading this 1 sentence it does not become clear. These 4 use types do not seem to be so easily separable, I would assume a big overlap. It is also not clear if people are meant to belong to only one of these use type groups, which would probably not make sense. If you really want to use this theory/concept in your work, please explain it better. (See also comment in section 4 on this)	description of the framework in the Introduction to better define the four use types. The types are not mutually exclusive, and a user can belong to multiple groups simultaneously depending on the context. We will also ensure that this aligns with our elaborated framework in the Discussion section, where we discuss this overlap and propose a fifth use type based on our findings.
I.60-75: In this subchapter some terms are named but not always clearly defined. The topic of “co-production” (later in the text “co-development”?) is mentioned, but it does not come across if this framework has been fully applied or not in this research. Serious games are defined in I.67-68; it might help to give a reference for this definition. In I.69 and multiple times later in the text the authors write about “gaming simulations”, which is confusing. It is not clear if the authors understand “gaming simulation” as a part of “serious gaming” or if this another concept. I personally would find it easier to follow if you stick to one term throughout the whole article (preferably serious game).	Thank you for highlighting these ambiguities. We will clarify our use of co-production/development, provide a reference for the serious games definition, and become more consistent in our terminology regarding serious games and game simulations.
I.85: As said above, it might help readability to start a new section after this called “Aim/focus of this research” or something like that.	Agreed (see above).
I.100-105: This is a long preview of what is to come in the next chapter. This is probably an individual question of style; I think it could be shortened. Especially since I.107-109 also have a little preview of what is to come in the chapter, which is a bit repetitive.	Thank you for pointing this out. We will shorten the preview paragraph (lines 100-105) to avoid repetition with the subsequent lines (107-109).
2 Methodology	
This section is quite long and has many subchapters and sub-subchapters, which is a bit confusing. There is some repetition. Through some restructuring I think it would be easier to grasp. Most readers probably expect to read about (1) when, (2) where, with which (3) sample (participants), and with which (4) methods research was carried out. The first three questions are only addressed marginally often in text parts which have another focus. It would help if you started with a concise section 2.1 which could be called “Sample and setting” and answer these 3 central questions.	We agree that the information regarding when, where and with whom the research was carried out needs to be more prominent and easily accessible. However, to maintain the chronological logic of our work (first developing the game, then executing the game sessions), we will introduce this “Sample and setting” overview at the beginning (or before) the subsection detailing the game sessions (Section 2.2), rather than at the very beginning of the methodology chapter.
The question on methods applied is a more complex one. The authors describe the design process in much detail (however sometimes only the results of some of the steps, not the questions behind it), but it is unclear which methods were applied to explore and analyse this process (see general	As part of our revision of Section 2, we will expand the description of the game design process (Section 2.1) to present the underlying questions and the methods used to collect and analyze feedback during the game test and refinement phase (Section 2.1.4.).

point above on this).	
Chapter 2.1: The figure is very helpful in understanding the process, but it looks strange that there is just one sentence mentioning but not describing it. In the following chapters (2.1.1 etc.) it seems like the outcome of these steps are described, but not always the procedure of the pertinent step. Fig. 1 suggests that in the Game scenario definition (please keep the same wording in the subheadings/text) agricultural experts were involved. In 2.1.1 however, this is not mentioned. Make sure to share who actually worked on the scenario definition (where, when, who).	We will add a more thorough description of the design process to accompany Figure 1. Furthermore, we will expand Section 2.1.1. to describe the actual procedure behind the scenario definition, specifying the involvement of agricultural experts. We will also ensure the subheadings match the wording in Figure 1.
For readability it would help if firstly (2.2?), the design process is described step by step (following fig. 1) and after that (2.3?) the actual serious game is described step by step.	Thank you for the suggestion. We mean that the manuscript is already structured this way.
I.118: The summer 2018 example is given but not explained. “Still engraved in Norwegian farmer’s memories” does not tell the reader (who might not be a Norwegian farmer) what actually happened. Replace this with a short mention of specific impacts of this drought.	We agree. We will replace this phrase with a brief, factual description of the impacts of the 2018 summer drought, to provide better context for international readers.
I.129-131 (and also following figure titles): Please shorten titles and especially do not introduce new information here, which is otherwise not mentioned in the text.	Yes, we will shorten the figure titles and ensure that all relevant information is moved into the main text.
I.134-135: It is unclear what Yr or YR means (same thing with different writing?), this abbreviation is not introduced.	The correct writing is Yr, not YR. This is not an abbreviation, but the actual name of the public weather service in Norway. We will write this explicitly.
I.157: The mention of the questionnaire is confusing. As said above, please explain methods and materials used in the beginning. Furthermore, there is a strong repetition in chapter 2.2.3. Do not report on the same thing twice.	We agree that the current placement is repetitive. As part of our restructuring, we will consolidate the explanation of our data collection methods (including the use of the questionnaires) into the new “Sample and setting” overview at the beginning of Section 2.2. Consequently, we will also remove the repetition currently found in Section 2.2.3.
Chapter 2.2.1 could serve as an opening section of chapter 2, if you restructure a bit.	As addressed in our previous responses regarding the structure, we will consolidate this information into a new “Sample and setting” overview at the beginning of Section 2.2.
Figure 4 can be deleted as it does not share much relevant information. Furthermore (as said before) it is a bit difficult if the authors share relevant information only in the figure title, here: “Please note that in almost all cases,	We will delete Figure 4 and describe the participant details, including clarification of their dual roles, directly in the main text.

agricultural advisors and representatives are also farmers themselves.” This proves the figure as somehow misleading, because this double role (being a farmer and also an agricultural advisor/representative) is not displayed properly. If 45 out of 60 participants of the game sessions are farmers and some of them also had another role, please write this in the text. The figure takes much room and shares little information. Furthermore, the authors shared no figure and also no information in the text on the participants of the game scenario definition step, which would have been just as relevant for the article.	
3 Results	
Throughout the text the terminology is not concise: please stick to “participants” if you refer to the participants (at the moment you jump between farmers, farmer participants, and participants: if it is important to mention that especially the group of farmers among the participants did or said something differently to the other groups, make this clear).	We will review the manuscript and be more consistent and clear in how we refer to different roles (e.g. participants).
As said above, the methodology is not clear and most findings are reported without any mention of the underlying data, meaning: no quotes are given to explain the formulated findings. Please include quotes and also make a note on the source of the pertinent quote (e.g. written answer from questionnaire or statement from the gaming session).	We will review our observation notes and include direct quotes with source references where available. However, we will also clarify in the methodology that our findings are primarily based on the researchers’ observations and interpretations of the participants’ actions and discussions during the game sessions, rather than verbatim transcriptions.
One general thought: even though the authors understand their study as a co-development process, the results reported only circle around the last step of this process, the gaming session.	This is a good point, we agree there can be some more details included about the co-development stages. We will include this in Section 2.1 (Design process of Melkeværet), especially to describe better how agricultural stakeholders were involved (see Figure 1).
Figure 8: This seems to be part of the method/material section, not a result?	We agree that Figure 8 is better positioned in the method/material section. This will be changed accordingly. In the Results section, we still refer to this figure in-text.
l.326-329: This is a bit repetitive to the text before. Please shorten.	Agree, and we will sharpen all sections of the Results in order to communicate more clearly the key findings. This also refers to the reviewer’s earlier suggestion to be more clear in the use of quotes.
3.4: This is a very interesting and relevant subsection. It might also be a good start for the results section.	In a revised version, given the other improvements to be made in the Results section, we will consider where section 3.4 may fit best. We do agree in that using it as first paragraph in section 3.1 could work well.

4 Discussion	
In my view, especially the first 2 pages (p.16+17) there are some results shared, that were not presented before. Also as said above, it is a bit tricky sometimes to divide the presentation and interpretation of findings, therefore it would be a possibility to have a combined results & discussion section. If not, these 2 existing sections should be clearly separated.	Thanks for pointing to the need to be more sensible in dividing between presentation and interpretation of findings. In a revised version of the manuscript, we will most likely still have separate sections for Results and Discussion, but will ensure that no new results are included in the Discussion.
The paragraph starting in I.346 on Ray & Webb's theory are confusing. The authors write on "Confirming Ray and Webb's findings [...]", but in the text and also in Table 1 they did not confirm the whole concept, as it seems? I think it is great if researchers use (established) theories/models/concepts in their work, but in this case, I do not find it fitting. Either the theory and the findings are explained better or this reference is taken out.	We chose to keep the reference, but we will improve the explanation of the concept both in the introduction (see comment above) and discussion. Furthermore, we will rephrase the wording in Section 4 to clarify that we are applying and adapting their framework to categorize our findings, rather than confirming their entire concept.
I.350-351: The mention on "situational awareness" in quotation marks is a bit confusing. Maybe restructure to something like "..., farmers may want to gain situational awareness (...) by consulting ...", if this is the intended message of this sentence.	Thank you, this is a good suggestion that strengthens the text. We will clarify better what is meant here with situational awareness (i.e. a holistic overview of the most likely prevailing weather regimes in the months ahead).
Chapter 4.3 is very interesting and the authors could position it earlier.	Thank you, we will consider this suggestion, provided other modifications to the Discussion section.
I.439: It is unclear for which statements these 2 sources (Flood et al., 2018; Vigna et al., 2024) stand, the sentence before seems to be about the game itself?	The sources are used to back up the positive impact of a collaborative setting where people feel safe to contribute with their viewpoints and expertise. We will rephrase to clarify.
Appendix A – Questionnaire: If none of the results of these questions are given in the text this questionnaire is not necessary. If maybe only results of the open-ended last question are given, it is enough to give this question in section 2.	In the light of previous comments about (not)including results from the questionnaire, we will in a revised version first consider if there is room for providing more survey results, and then decide if Appendix A is still relevant, or if it can be deleted.
I.550: There is no statement on data availability here. Comment on the questionnaire data and the observation notes here, even if these data are not shared in a repository or elsewhere.	We will provide a data availability statement that aligns with what we are to provide.