Dear Reviewer, We would like to thank you for you detailed feedback on this piece of work. The table below attempts to summarise the major concerns that were outlined. We have numbered these, however, they do not completely align with the original numbering as we have broken a few comments into separate responses for clarity within the reference table. We have not included specific responses to the minor comments, but we will ensure that each is addressed in the next draft.

Each row in the table below includes an issue number, a summarised reviewer issue, a response and action to be taken by the authors.

Table of Requested Edits: Reviewer 1

Reviewer Major Requests			
Number	**Issue**	**Response**	**Actions**
1	The paper lacks a discussion of the model framework chosen, and it does not put this in the context of existing Integrated Assessment Models (IAMs) or other model types	The suggestions made by the reviewer are noted and an additional section developing the modelling context will be added.	• Additional section on modelling context
2	To date, the main GHG mitigation measured proposed by the Irish agri sector is improving production efficiencies (genetics, protected urea, multi-species swords, feed additives etc) e.g., represented in the Teagasc MACC. It is not clear to what extent these are taken into account in the input parameters.	The input parameters that are varied in the current version of GOBLIN are explicitly mentioned, but perhaps this has not been made clear enough in the text. In terms of productivity increases, some efficiency gains are implicitly accounted for through the inclusion of beef and dairy productivity increases. However, the addition of explicit MACC technologies has not been included in this as it would seem more prudent to	• Detaill impact of future research on EFs • Elaborate on the inclusion of levels of technical abatement

		include differing level of technical abatement, rather than specific technologies. However, there is additional work on-going that will produce additional emissions factors (such as grass-clover sward research), The potential of this research can be elaborated on in text. In addition, greater detail on the approach taken regarding the inclusion of levels of technical abatement can also be elaborated on.	
3	the way the results and scenarios are presented read far more as a simulation tool rather than backcasting.	This point is noted and additional clarifications will be added. The GOBLIN calculation engine is a tool that allows for simulation of outcomes based on parameter inputs. However, the randomisation of those parameter inputs enable back-casting by filtering target-oriented outcomes. Multiple pathways to comply with biophysical climate neutrality provide input for next set of socio-economic screening by stakeholders (i.e. a single answer form the model is not desirable). The model also generates nutrient loss results that can be compared.	• Additional clarification in text.

		Thus, randomised simulation modelling provides a richer, non-biased dataset of potentially climate neutral scenarios which can then be further analysed by stakeholders using different criteria and potentially parallel (e.g. economic) analyses.	
4	Given that land use is not only fundamentally important for carbon sinks and food production; it is also essential to host and enhance biodiversity. Ireland has declared a biodiversity crisis and it is not sufficient to deal with climate change without also dealing with the very poor quality of biodiversity. Some forms of grazing (more extensive systems) are compatible with greater biodiversity, like some forest models. I think it is important for a land use model to work towards explicit incorporation of biodiversity, otherwise there is a risk that climate and food production will come at a cost to nature. Similarly, an explicit output of the model could be nitrate runoff, to highlight water pollution.	This point is well made, however, the objective for this first version of GOBLIN was the generation of various land use pathways that have the capacity to reach "net zero". Once this data set has been generated, they can be assessed in terms of additional impact pathways. Though this additional analysis was beyond the scope of this first iteration of GOBLIN, the quantification of additional impact pathways (including biodiversity) is already being explored for future iterations. A clearer explanation of this current limitation, and future research and development area will be added in the text. It should also be noted that, though not explicitly focused on within the model, enhanced biodiversity outcomes could be inferred from scenarios that have higher proportion of	• Additional information in text

		native broadleaf species on mineral soils and scenarios with a greater proportion of drained organic soil rewetting. However, the actual biodiversity benefits are not currently quantified within this version of the model. In relation to water quality, GOBLIN treats N inputs using same functions as NIR, assuming c.10% lost to waters. This can be improved in future e.g. using a per hectare mass-balance approach. This functionality will be used when interpreting future outputs.	