

We thank the editor for his comments on the paper. We have considered his comments and make the following responses (in blue), which will be incorporated into the final version of the paper. The alterations in the manuscript have been highlighted in yellow.

1. How would an abattoir add nutrients? From the bowel contents of the processed animals? Any data on the effluent of this abattoir (possibly in their permit to discharge waste and/or wastewater)?

The abattoir processes beef, pork and poultry, sheep and goat meat and is located nearly adjacent to the turlough. It is quite likely that wastewater from this abattoir would occasionally seep into the turlough. After a thorough search, specific details of this abattoir's effluent could not be found. In general, wastewaters from abattoirs are understood to consist of 100-150 mg/l N and 100-400 mg/l P (Matheyarasu et al., 2015) although no specific measurements have been taken at this particular establishment due to lack of permission for access. The N and P concentrations in such wastewaters can come from a range of different sources, such as the excrement from the animal before slaughter, the washwater used to first clean the carcass, leachate from removed organs etc. It is difficult to determine how much comes from each source as it will be a function of how well the different parts of the process are contained and hygiene of the establishment which, as detailed above, has not been possible to determine. While the abattoir is relatively large, it is classed as 'low-throughput' by the local authority and it is possible that such a 'low-throughput' abattoir is not required to publish this information. Equally, the abattoir has no licence to discharge from the Irish EPA.

2. In soils, P adsorbs strongly to iron oxide. In aerobic lakes this mechanism would be available. But you attributed denitrification to anoxic conditions in some of the turloughs. Would these act as sinks of P as well?

It is accepted that studies have shown the release of P from Fe and Al oxides under anoxic / anaerobic conditions, however studies carried out thus far on the soils in these turloughs did not found this to occur (as mentioned in the manuscript). This is covered in more detail in the comprehensive study on 22 turloughs across Ireland which is now completed: Waldren (2015).

It should also be noted that the manuscript does not specify that sedimentation and soil uptake is occurring, it only suggested that this could be the most likely explanation for the losses of P observed in surcharge tank turloughs. The attenuation of P within the soil / subsoil will be controlled by adsorption and mineral precipitation which will be dependent on its clay content, as well as the presence of Al, Fe, Mn as well as the presence of Ca. So the losses may be a combination of physical adsorption to Fe and Al oxides and precipitation as sparingly soluble calcium phosphates either in the water column (from the Ca waters in such a karst environment) and/or within the calcareous soils / subsoil in the region which are formed of glacial till derived from limestone.

Hence, although this study indicates that there appears to be a net loss of P within the turloughs, further research is clearly required into the mineralogy of turlough soils and P removal mechanisms, (adsorption, precipitation etc.) under the prevailing hydrochemical conditions in order to provide any more conclusive comments that can be backed up. An additional sentence has been added to

the manuscript in Section 5.3 to express this need for more detailed study into the likely P-removal mechanisms

3. Spelling/grammar errors

These minor errors have been corrected as per the editor's suggestions.

MATHEYARASU, R., SESHADRI, B., BOLAN, N. S. & NAIDU, R. 2015. Impacts of Abattoir Waste-Water Irrigation on Soil Fertility and Productivity. *In: JAVAID, M. S. (ed.) Irrigation and Drainage - Sustainable Strategies and Systems*. Intech.

WALDREN, S. 2015. Ed. Turlough Hydrology, Ecology and Conservation. Unpublished Report, National Parks & Wildlife Services. Department of Arts, Heritage and the Gaeltacht. Dublin, Ireland.