

## ***Interactive comment on “Nitrous oxide emissions from crop rotations including wheat, rapeseed and dry pea” by M. H. Jeuffroy et al.***

**D. Murphy-Bokern (Referee)**

donal@murphy-bokern.com

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### **General:**

This paper reports important research that was well conducted. It is covered by the scope of the Journal and so I recommend it be published with revision.

The question addressed concerns the effects of different cropping systems (rotations) on nitrous oxide emissions from soils, ultimately driven by the processes causing fluxes in reactive nitrogen used by the plants, either provided by fertiliser or by biological nitrogen fixation. The paper rightly points to the scarcity of research results on effects of rotations and the uncertainty surrounding emissions driven by reactive nitrogen from biological nitrogen fixation in particular.

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### **Specific:**

Introduction: The introduction would benefit from careful editing. The authors should check if the IPCC method is based entirely on an emission factor applied to fertiliser N alone as implied in lines 23 – 25 of p. 9291 (I'm not certain myself so I just suggest they check this).

The potential sources of nitrous oxide in the context of rotation with legumes in them are not clearly described as a background to the research. The paper covers the various potential sources, but a clearer description for non-specialists readers would be very useful perhaps by describing a nitrogen supply and use cycle: fixation (synthetic and biological), soil processes prior to and lead to root uptake, and residue decomposition.

Methods: There is some repetition between this section and the subsequent section on treatments. The description of the soil is confused – confusing loam with silt. I think this section should describe the site and the management of plots. How many plots, plot dimensions, measures to prevent inter-plot effects.

The description of the treatments could be tightened. In particular it is not clear if the N0 treatments are embedded in the relevant rotation plot which is otherwise fertilised or if the N0 treatments have their own plots. The treatments and their application to plots in blocks could be presented in a much more straight-forward way.

### **Results**

Fig. 1 is practically impossible to read because the data points and text elements are so small.

The graphs are a useful summary of key elements of the data. The authors might consider presenting a table of total cropping year emissions data for each year and each of the treatments set out in tables 1 and 2, along with the N0 data. This would make the overall data resource more transparent for readers. The same could be done for soil mineral N after harvest.

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## **Discussion**

It would be useful if the reader was provided with some orientation of the structure of the discussion.

4.1: The heading is unclear – what is this section about: the effect of crop species or the effect of rotations? The early sections do not deal with the effect of crops – rather the characteristics of the site.

Section 4.2 is a very important section and is well written. The last paragraph however belongs in another part of the discussion.

Section 4.3 is confused and confusing – it draws on existing LCA models to attribute a crop rotation saving to peas arising from a combination of reduced fertiliser manufacture, use, and reduced diesel use in application etc. The problem is the research presented does not support the analysis directly. This section needs rewriting to more clearly set out the discussion based on the research results presented supported separately by consideration of other effects (e.g. manufacture savings) presented separately and clearly. The section also uses IPCC data for emissions even though the research provided high quality data from the measurements. So there seems to be little need to use the IPCC emission factors to estimate the rotational effects of reduced fertiliser application in crops after peas in this case. The LCA effects of the rotations could be estimated on the basis of the data presented supported by assumptions for fertiliser manufacturing and application emissions. This would link this LCA approach (which is useful) better to the research data presented.

Section 4.4

This section seems rather hastily completed and is worth expanding.

### **Language and text editing generally.**

The text would benefit from both a thorough revision and editing for language purposes. It reads as a paper which is not quite finished and I think the authors would do them-

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selves a justice by revising it thoroughly for structure, the logical flow of the arguments presents, and some language aspects.

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