REFEREE REPORT(S):  
Referee: 1  
  
COMMENTS TO THE AUTHOR(S)  
Rotating Maize Reduces the Risk and Rate of Nitrate Leaching  
 HR Pasley et al.  
  
This paper describes an important topic of leaching rates from cropping systems based on long-term experimental data combined with modelling. The way the authors used the Apsim model to structure and organize their thinking about continuous maize and maize-soy cropping is elegant. The paper is well organized, and reads easily, and is concise and to-the-point. However, I have some major problems.  
  
I wonder how to interpret the following sentence from 4.3: “As such, our leaching model can be applied across multiple sites and years to determine the degree to which increasing the N fertilizer rate impacts the leaching load but should not be used to calculate the total leaching load from multiple sites/years at a given N rate”. Does this mean that we should not take the absolute numbers of leaching? I do not quite understand why it is “as such”. However, perhaps the major concern is that apparently “year” is a variable in the analysis. The year of the experiment is meaningless, and should be replaces by variables such as precipitation and other variables that describe what the difference is between years.  
  
A further concern is why the model does so well for yields some of the experiments and so poor (IN2) for some others (Suppl. Figure 2), while nitrate leaching (Suppl. Fig. 5) looks pretty good. This is strange and needs discussion, for example in section 4.3. In this section I also miss a discussion on the robustness the model results for AONR  
  
I have some minor comments and questions, which I will list below in the order in which they occur in the text:  
  
Line 167: add figure  or table reference where we can see these results.  
  
Line 222-225: add figure  or table reference where we can see these results.  
  
Figure 2: I know what a violin is, but do not know a violin plot. This requires some more help to readers like me: what is on the X axis? What are the bars within the violins? What are marginal estimated responses at the rotation level? And what are marginal estimated pivot points?  
  
Does the model predict yields 0-8 tonnes/yr for 0 N rates? That sounds like something to be very worried about.  
  
Figure 3: what is rotated soybean and what is rotated maize. Nowhere in the text has this been explained, so I have no idea.  
  
  
Referee: 2  
  
COMMENTS TO THE AUTHOR(S)  
Fig. 2 has color code mixed up, in the text at least? 2a, 2b looks to have continuous maize in orange and rotated in blue, but description has reversed? And this color code is swapped in Figure 3.  
  
Regarding text lines 229-234 and their correlation with Fig. 2c. Using just a quick calculation, continuous maize at 100 kg/ha N (below the breakpoint) would leach 8 kg N, rotated maize at 100 kg/ha would leach 10 kg/ha. And in the text, it is stated that more No3-N was leached from rotated plots. Those text lines would match if blue was rotated (but your figure description states orange).  
  
Also, Fig 2c, Above the breakpoint, for example, at 200 kg N/ha, your text implies that continuous would be at 120 kg/ha leached, and rotated would be at 80 kg N/ha leached. At 300 kg N/ha applied, continuous maize would leach 180 kg N/ha, rotated 120 kg N/ha. Are you sure your trendlines are correct? At 200 and 300 kg/ha they show still almost the same amount of leaching, which doesn’t compute.  
Perhaps your model is extrapolating too much and should be more limited to the experimental values (fertilizer applied) used? And perhaps, limit Figure 2b and 2c X axes, too.  
  
Could you possibly add a column with range of N fertilizer values used in the different states at least to Figure 1?  
  
  
If the average AONR for continuous maize was 111 kg N/ha, and rotated at 70 kg N/ha (lines 211-212), how could a ‘leaching breakpoint’ of only 46 kg N/ha (line 239) be 66% above 70kg/ha? Similarly, how can 17 kg N/ha be 16 % above 111? Please clarify.  
  
  
Figure 3 is really funky, as the Y axis really isn’t plotting the N rates, but, a distribution of observations? The N fertilizer rates should be placed on the figures similar to the a, b, c of Figure 2, not be on the Y axis. And these were hypothetical observations from your model, correct? Please state as such on the Figure legends (and other legends as appropriate).  
  
Line 295 states that ‘Our simulations found that soybeans experienced more drainage and leaching that maize (rotated or continuous) (Figure 3).’ To me, on Figure 3, the soybean plots have moderate (in-between) levels of leaching. More than rotated, but less leaching than continuous maize. Please clarify  
  
  
Supplementary Table 3- could you please give us non-soil people a clue as to your table header acronyms? I can guess about half of them. But I shouldn’t be guessing.