

## ***Interactive comment on “Assessing winter cover crop nutrient uptake efficiency using a water quality simulation model” by I.-Y. Yeo et al.***

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Overall

My understanding is that the authors simulated nitrate losses in the German Branch watershed with SWAT for row crop agriculture either with or without a cover crop of either rye, wheat, or barley. Authors calibrated SWAT on 1992 -1993 flow and weather data and validated using 1994 – 1995 date. I’m unsure what they used for land cover – presumably it was based on 2008 NASS data, but how the crops were rotated in the different years was not specified. No information is given as to how SWAT simulated forest and non rowcrop land in the watershed. The water quality analysis for the cover crop treatments were run for the period of 1990 – 2000 apparently using a 2-yr corn-

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soybean rotation, but again details are lacking or contradictory as the authors also imply that simulations were conducted for fields that were used to grow more corn than soybean. Overall, I like the concept of the study and the paper is mostly written clearly, but more detail of the methods used must be given before I can evaluate the soundness of the approach.

#### Specific comments

L239. You state that the cover crop was “harvested” in April, but in Table 4 you state that the cover crop was chemically killed. Which practice did you simulate? Or did you simulate harvesting the cover crop in the SWAT model as a surrogate for chemical killing because SWAT does not allow for chemical killing?

L254. I am confused by these last few sentences. If I understand, the 100% early planting was in fact 50% early in corn and 50% late on soybean. If true it is misleading to keep calling this the early planting scenario. But you also state that 100% early planting simulations were run just for corn fields and the results found only at the field level not the watershed, which again confuses me as I thought this was a watershed scale simulation study. A clearer explanation of what was done and what is being compared is critically needed.

L274. Looking at the figure, I'd think that it was September 1994 that was an outlier not August as stated here.

L285. It is difficult to compare modeling successes between studies because such things as number of HRU's and timeframe being modeled are probably not the same. Thus, I wonder if the reported “improvements” are real and meaningful.

L291. You state this also earlier, but I think this statement needs a reference. Although, intuitively it is logical to think that cover crop effectiveness should be linearly correlated with cover crop biomass production, I am unaware of any study documenting this and know that research we have conducted with rye does not substantiate it. Thus, a ref or

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two is required.

L292. Again I interpret the period from 1991 -2000 as a 10 yr period not 9 yr as stated later.

L320. I think the minimum is from the comparison of RE with BE not RL as done here.

L352. I don't understand why there is a slope break at 60%. Do you have an explanation for this? Is it real or a modeling aberration? Does this have something to do with your using only corn fields when looking at more than 50% adoption of early cover crop planting?

L365. Replace "3.0 – 18.8 kg/ha" with "3.0 – 33 kg/ha" to agree with the results for WL shown in Fig 8.

L369. Change "28 % - 87%" to "25% - 80%" to agree with results shown in Fig 8.

L387. Again does "harvesting" mean chemical killing?

L390. This statement about fields more frequently used for corn really confuses me. My understanding and what is shown in Table 4 is that 50% of the agland in the watershed is assumed corn and 50% is assumed soybean and that all agland is assumed to be in a 2 yr corn-soybean rotation. Than how did you generate data for a field that is used more frequently to grow corn?

Technical comments

L189. You give an 11 yr range (1990 – 2000) but state it is a 10 yr range – I find this confusing.

L260 Don't capitalize "Validation".

L345. Add "6" after "Figure".

Table 1. Define DEM.

Table 2. I don't understand how you have a range for the calibrated values of LAIMX1

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and LAIMX2? You also need to include in caption describing what is meant by the “Reference” column. It is unclear to me if the parameters in Table 2 are being calibrated for each land cover, soil type, HRU, or some combination. Please give more information in the M&M as to how you calibrated a watershed model with 6 land covers, 4 soil types and over 400 HRU’s.

Table 4. What is the meaning of the \* and \*\* used in this table?

Table 5. The units for PBIAS (%) should be shown in table. RSR, NSE, and P-bias need to be defined in table caption.

Fig. 1. Label the location of the German Branch watershed.

Fig. 2. Figure caption should identify this as the German Branch watershed. Also the caption states that there is no soil type A in the watershed while in the paper you state it composes less than 1%. Which is true? For what year is the land cover shown for? Is it 2008 as inferred from Table 1? During the SWAT simulations were the row crops alternated between corn and soybean as inferred by table 4, but never explicitly stated in your M&M?

Fig. 3. This figure adds little to the paper and should be deleted.

Fig. 4. Are nitrate load units kg N or kg NO<sub>3</sub>? I assume nitrate as N, but you are unclear. If figure starts on Jan 1992 than the outlier for flow is in Aug not Sept. 1994.

Fig. 5. Can you re-draw figure so I can see the ranges for the Hively et al data for each crop? Rather than just showing the 9-yr average predicted biomass production, why not show the range in production over the simulation period as well?

Fig. 6. Again is this NO<sub>3</sub>-N or NO<sub>3</sub> as stated? Define treatment abbreviations in caption. The losses shown here are greater than measured for the watershed shown in fig. 4. How were the forested lands and other crops handled in SWAT during the calibration process shown in Fig. 4? Are these results for 100% adoption of covercrops on corn and soybean fields?

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Fig. 7. Define treatment abbreviations in caption. Are these results just for corn fields? Or for corn and soybean fields together?

Fig 8. These nitrate loads are much greater than shown in Fig 6 or Fig 4. How can the winter losses be greater than the whole year losses?

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 14229, 2013.

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