

Comments on manuscript “Economic optimal nitrogen application rates for rice cropping in the Taihu Lake region of China: taking account of negative externalities” by Xia and Yan

This manuscript reports a case study on optimizing fertilizer application rate for rice production in Taihu Lake area in China. The manuscript focused on economic analysis with the life cycle method. The results presented in the paper could be potentially useful for the policy makers or managers. However, I'd like to regard this is a counting study with little scientific innovation. I am not sure if the manuscript is very suitable to be published in the natural science-oriented journals such as Biogeosciences.

The major defect of the paper is lack of scientifically sound basis. All the evaluations are based on several empirical equations describing the environmental impacts of fertilizer production, transportation and field application. However, the authors didn't provide adequate research evidence to prove the reliability of the equations. For example, there are five equations shown on pages 6288-6289 for quantifying effects of fertilizer application rates on yield, N₂O, NH₃, N leaching and runoff loads. The equations are copied here as follows:

$$F_{\text{yield}}(N_{\text{rate}}) = (-0.032 \pm 0.005) N_{2\text{rate}} + (16.6 \pm 1.8) N_{\text{rate}}$$

$$T_{\text{EN}_2\text{O}}(N_{\text{rate}}) = (0.31 \pm 0.05) \exp(0.0048 \pm 0.0005) N_{\text{rate}}$$

$$F_{\text{NH}_3}(N_{\text{rate}}) = (0.18 \pm 0.03) \times N_{\text{rate}}$$

$$T_{\text{LTN}}(N_{\text{rate}}) = (1.10 \pm 0.21) \exp(0.0038 \pm 0.0006) N_{\text{rate}}$$

$$T_{\text{RTN}}(N_{\text{rate}}) = (8.29 \pm 2.11) \exp(0.0042 \pm 0.0009) N_{\text{rate}}$$

I tried making calculations with the equations and got strange results as follows:

Fertilizer rate, kg N/ha	yield, kg/ha	N ₂ O, kg N/ha	NH ₃ , kgN/ha	N leaching, kg N/ha	N runoff, kg N/ha
50	750	3	9	1.3	193
100	1340	38	18	1.6	2305
150	1770	415	27	1.9	14031
200	2040	4577	36	2.4	43610
250	2150	50454	45	2.8	69220
300	2100	556163	54	3.4	56109
350	1890	6130685	63	4.2	23227
400	1520	67579620	72	5.0	4910

I am not sure if I made mistakes in the calculation due to my ignorance in math. Anyway, I hope the authors could double check these equations as they were used as foundation for the entire assessment.

I suggest the authors take serious efforts to improve the manuscript, especially its scientific basis, and then try to submit it to an economy-oriented journal.