

Comments to the Author

This manuscript focuses on nutrient budgets and nutrient use efficiency, present a global database of country-level budget estimates for nitrogen (N), phosphorus (P) and potassium (K) in cropland. This study introduces improvements over previous work in relation to key nutrient coefficients affecting nutrient budgets and use efficiency. Results highlight the wide range in nutrient use and use efficiencies across geographic regions, nutrients, and time. However, before acceptance, several issues deserve attention, as outlined below.

General:

- (1) The necessity and innovation of the article should be presented to the introduction.
- (2) This study is not explicitly addressed in its exploration of the global farmland nutrient budget versus nutrient use efficiency, as many studies have been conducted in this area;
- (3) In the process of calculating cropland nutrient budgets and nutrient use efficiency, many coefficients are used consistently, which may lead to great uncertainty;
- (4) For the input of organic nitrogen, the CF value of organic fertilizers is the same as that of synthetic fertilizers, which may cause certain deviations in the results;
- (5) Whether to consider adding a part, compared with other research methods, the necessity and innovation of this study.
- (6) The discussion section lacks sufficient elaboration on key findings and the content appears too vague.
- (7) Show more self-criticism towards your methods, discuss all limitations of your findings.

Specific:

(8) Line 50-55 “We see two main rationales for estimating nutrient budgets on cropland. First, cropland is typically where nutrient flows and related environmental impacts are highest, and cropland budgets and derived indicators such as the surplus are therefore more likely to capture potential pollution hotspots. Second, permanent meadows and pastures present some particular method challenges, primarily due to lack of global data on productivity and biological N fixation” Please add relevant references.

(9) Line 100-115 “For the majority of countries, due to lack of specific information, default cropland fraction estimates of 100% were used for N, P, and K, thereby assuming all fertilizers were applied on cropland area.” Is there evidence to support this hypothesis?

(10) Line 115-120 It is assumed the same CF values for SF are used to apportion nutrients from manure from livestock to cropland to cropland. For example, the proportion of animal manure returning to the field like horses seems to be very low, and the rationality of this parameter is doubted.

(11) Line 175-180 Fraction of livestock manure applied to cropland, The uncertain of livestock manure should also be considered.

(12) Line 360-365 N inputs from the current study were 'mid-range' compared with the other studies but N outputs were generally greater than those estimated from other studies, This result requires careful interpretation.

(13) Line 360-375 Compared with previous studies, only nitrogen analysis, lack of phosphorus, potassium analysis

(14) Line 405-410 NUE values were generally greater than those made by other studies, this result requires careful interpretation.