

## **Comment on soil-2021-17**

Paul Hallett (Referee)

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Referee comment on "Significant soil degradation is associated with intensive vegetable cropping in a subtropical area: a case study in southwestern China" by Ming Lu et al., SOIL Discuss., <https://doi.org/10.5194/soil-2021-17-RC1>, 2021

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This is an extremely valuable paper. The authors provide a strong argument about socioeconomic drivers that have resulted in large increases in vegetable production. The environmental impacts are enormous, and it is clear that best farming practices are not being followed. A particularly useful aspect of this study is the use of commercial farms so that information is gleaned on both practice and impacts. The spatial coverage is impressive, providing a valuable dataset for a large body of potential follow-on research.

A general comment, which may complicate the study, is that the variability between farms is not described or discussed. The Tables could benefit from including either the range or statistical error in fertiliser application rates and soil properties. Are some farmers using much less fertiliser but achieving similar yields? Are some farmers using fertiliser application rates that are much higher than the averages presented, and what are the impacts?

There are some specific comments to address below, but this is generally a very well prepared paper that is also extremely valuable.

Specific Comments:

Unnecessary use of acronyms. Referring to the treatments as Vegetable and Paddy-Rape would be easier to follow.

The survey, which is an important and novel component of this paper, is not mentioned.

Line 20 – is it due to decreased residue incorporation or lack of paddy cycle?

The comparison between paddy and vegetable is not clear at the end of the Abstract.

## Introduction

Line 37 – mixing up % and 'times' in the same sentence, which makes it harder to follow.

Line 40-44 – disconnected paragraph

Line 48 – the impact of paddy production on C storage is not adequately described. There is a major change from this system to upland vegetable production.

## Materials and Methods

For this study it is very important to characterise the soils, including their classification, dominant mineralogy and parent material. You should be able to get this from available soil survey data. You have described the soil as an Ultisol, but this is quite general. Readers need to be aware of the capacity of the soils to adsorb nutrients. Shallow soils affect some of this province, but I am not sure about this specific region. An idea of soil depth would help.

Line 89 – be clear that this is on commercial farms.

The experiment design and approaches are all good. You need to give details on how bulk density was measured and be clear whether your 20 cm intervals incorporate the whole depth (which I assume it does) or just an interval defined by a core size.

## Results

Although the data are presented clearly, this section could be more compelling. The amount of N application under vegetable production is staggeringly high. You could start by just mentioning N and stating the kg ha<sup>-1</sup> y<sup>-1</sup> amounts for different systems first and then use this to introduce high fertiliser use for other nutrients too. Table 1 gives no

indication of variability, which is important to understand the commercial practices in place. If some farmers have much lower inputs, this is important to get across.

Line 160'ish – the downward movement of P & K gives stronger reason to describe these soils more.

## Discussion

This is excellent. I really like the start that describes what the farmers, which is then followed by the impacts.

Line 223 – nice start! This is a good guide on what to do elsewhere to make the paper more compelling.

Line 224 – whenever dealing with a soil depth, don't use 'higher' or it can get confusing.

Line 226 –I think not having a paddy cycle may be a big factor that is not being adequately considered.

Line 242 – you are deviating away from vegetable production, where conservation agriculture may be less feasible. Only use practical solutions for the farming system. If CA is ok for vegetable production, you need to cite evidence for this rather than maize. What about better use of residue management from the vegetable crop or other practices? The discussion on alternative management strategies is weak. Can you obtain any further analysis from your data? Are there some farms using much lower fertiliser inputs who are maintaining yield or do they all apply very high rates of fertiliser? Can you do a simple cost-benefit based on the rising cost of N fertiliser vs. yield benefits?

Line 261 – be clear if these studies were for the same region and/or soil type.

Line 274 – Good argument on P impacts to rhizosphere, but do you think in a highly tilled, high nutrient system, AM will feature? You need to include more on the adsorption capacity of the soil in the region.

Line 287 – remind readers of the pH value.