

## ***Interactive comment on “Ground cover rice production system facilitates soil carbon and nitrogen stocks at regional scale” by M. Liu et al.***

**Anonymous Referee #1**

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This paper investigates a novel technique namely Ground Cover Rice Production System (GCPRS) and its effects on Soil Organic Carbon (SOC) and nitrogen stocks since this techniques can increase rice yields in areas with lower temperature and water supply. The article is of significance given the critical issue of increasing rice yields in future without compromising its sustainability (with the its negative environmental impact only briefly touched upon in the conclusion). This paper has several scientific issues before it can be published.

Scientific issues The main issue is in the interpretation of the results and ‘direct’ conclusion that this technique ‘facilitates’ SOC and N stocks as stated in the title. The results are not so clear cut for both and more importantly there is a high chance that independent variables may have confounded the results. This is because there is a

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lack of information on the soil samples: what soil types are we looking at (a range?), what elevation? What past land use if only recently turned into rice production? who and why were they chosen? Have they been irrigated the same way? Some results in Fig 2 would suggest some Clay content variation for example. Surprisingly (or not) bulk density doesn’t seem to show much variation at all. Information on fertilisation is confusing. Was there application of manure and the application between the two system is not comparable (150 vs 180 kg N ha<sup>-1</sup>) the latter being for Paddy system which most likely received manure as well. Such general information is critical to permit a sound discussion and proper conclusions. The second main issue relates also to the proclamation of a conclusion, namely root biomass increase due to GCPRS influencing soil nutrient acquisition) from a method which is only tested at one site. Again confounding factors could be at play (as well as weather during that particular year!). Overall, as well as additional information in the M&M section and re-writing of the discussion, the manuscript would also benefit from additional details in the statistical section as well as editing for ease of reading and grammar. Other general comments: 3650 L16: ‘reducing water demand by 50-90%’. This is a very wide range with no reference to back it up? 3650 L23: how is making and using more plastic and leaving it in nature reducing the environmental footprint. Be more specific here what kind of benefits is gained. Also how about its atmospheric impact? 3651 L 11: 1935 reference? Anything newer? 3651 L14 how about CH<sub>4</sub> emissions? 3651 L24 the impact of higher aeration and soil temp on SOC mineralization has been widely looked at recently (update reference Stanford 1973) 3652 first paragraph belong to M&M 3653 L 20 How wide is the range of soil type? All sub-tropical kind of soil? Information on what kind of soils are being sampled is totally omitted. More information on depth to hardpan would be required as discussed further. 3653 L8: how is the fertiliser applied to the GCPS and for Paddy, how many applications per year? Manure is mentioned in the discussion but not in the M&M. 3653 Is it a short-duration or long-duration variety? 3655 L22 which site is this? 3656 L16. ‘except for C stocks at 0-20 cm depth’ as at that depth, concentrations are significantly different according to Fig 1c 3656 L25 Mention that the root biomass is

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from the one experimental site. 3657 L8 and Fig 7: is this correlation real, very low R<sup>2</sup>? 3657 L18 explain here what are s+c and LF as not explained in M&M. Also in Fig 8. Need to be introduced in M&M 3658 L11 Hardpan is mentioned here in the context of the study for the first time. It would be beneficial to give some information on its depth in such soil. 3658 L14. In our study. . . then followed by 2 references. Do you mean these studies or do they match these studies? 3658 L29 - 3659 L2. The arguments don't follow up congruently. Separate micro-nutrient and need to go deeper (this is not to avoid toxicity effects as Fe is oxidised) and explain separately the N nutritional balance. 3659 L6 . again what depth is the hardpan at? 2659 L15-25. "This indicated. . ." not significantly different so how do you conclude this? Where is the higher OM in put coming from and while we have no information on the soil types samples, why do you assume clay minerals as a factor in both system? Also there is no higher SOM stability according to the fraction s + c so argument not valid. 2661 L8 suggest remove 'environmentally sound' as the sentence below explain this technique does pollute the environment! Fig 3. Why refer to previous publication for further details? Why CAGB, no need for such abbreviation?

Fig 4. This figure doesn't show the N-fertiliser treatment. Is it amalgamated. Please inform both in the M&M and in the graph.

Technical corrections Abstract L1: Full stop after 'scarcity' and start new sentence with 'However, . . . Abstract L10: 'typical of' instead of 'for' 3650 L4 'grown on c. 29.9 million ha' 3650 L10 'production increase' instead of 'increasing' 3657 L8 'compared with Paddy'. Remove 'in' Supplement material: Table heading should read 'Township' instead of 'Towship'

Please also note the supplement to this comment:

<http://www.biogeosciences-discuss.net/12/C486/2015/bgd-12-C486-2015-supplement.pdf>

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