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 lack of information on the soil samples:

what soil types are we looking at (a range?), what elevation?

>> Information on the elevation of the sites was already provided in the Table S1 of the submitted version. We have added an additional information on soil type for each site in Table S1. As mentioned earlier, we have also tested the influence of the variable "soil type" on the GCRPS effect (not significant, Table S3) and we provide the related information in the revised version. The elevation range was too small to have an influence in this study, with most sites concentrated at medium elevation.

What past land use if only recently turned into rice production?

>> This is obviously a misunderstanding – rice was grown on all sampled sites for more than 40 years. This information was already provided in the submitted version and is better highlighted in the revised version.

Who and why were they chosen?

>> The previously mentioned "experienced staff members" who assisted in the site selection have been working in the Department of Agriculture in Shiyan with close interaction with the farmers in the individual villages for more than 20 years. The site selection process was as follows: Information on topography, geology, soil type, and land use was collected from Shiyan Agricultural Bureau to identify a large set of potential villages and sites. Then, villages and potentially suitable paired sites were visited and information on agronomic parameters (e. g., transplanting data) and the time since conversion from Paddy to GCRPS cultivation as provided by the local extension staff was compared with the related information collected from farmer interviews. When information on the site history was unambiguous, the sites were selected. We continued the site search until a representative set of paired sites with respect to elevation and geology was gained for the target region, resulting in the 49 paired sites. An extended summary of the farmer's interviews is available in Table S2 in the revised version. We have added all this information to the revised version.

Have they been irrigated the same way?

>> We are not sure if this question refers to differences between Paddy and GCRPS cultivation or differences across sites within a cultivation system. Paddy and GCRPS have system-inherent differences in irrigation as outlined in the manuscript. For example, for the Paddy system, the field is maintained flooded with about 3-5 cm water layer until two weeks before harvest. For GCRPS cultivation, the soil remained almost water-saturated but without standing water during the first week after transplanting. After this initial stage, the soil was kept between 80-90% of its maximum water holding capacity for the remaining growing period.
Potential site differences within a cultivation system: Generally there is extension staff in the villages ensuring that the guidelines for irrigation are followed. However we cannot exclude that there were deviations, also in previous years. But this was also the reason why we chose 49 pair sites.

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-1) 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.
>> We conducted farmers' interviews to learn about general field management practices and there were no major differences in manure or synthetic fertilizer applications across treatments. One exception was that GCRPS fields receive fertilizer in one dose at the beginning of the vegetation period, while Paddy received split application of fertilizer. We provided the fertilization information in more detail in the revised version. The absence of significant variations in soil bulk density is a common observation for such soils.
Refs:
Li, Y. S., Wu, L. H., Zhao, L. M., Lu, X. H., Fan, Q. L., and Zhang, F. S.: Influence of continuous plastic film mulching on yield, water use efficiency and soil properties of rice fields under non-flooding condition, Soil Till. Res., 93, 370–378, 2007.

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.
>> It is actually true that, unfortunately, and due to logistic reasons it is just not possible to sample root biomass at all investigated sites. However, the observed effects of GCRPS cultivation on the root system at one of the sites was consistent with earlier independent publications (e.g. Li et al., 2007; Thakur et al., 2011; Uga et al., 2013). Nonetheless, we have further outlined the limitations of this single site sampling approach for root biomass in the revised version. Large parts of the discussion were rephrased for the revised version, and the

statistics section was extended, now providing the details requested by all reviewers. Furthermore, the manuscript was again checked in detail by a native speaker and co-author of our paper, Dr. David Pelster.

Other general comments:
3650 L16: 'reducing water demand by 50-90%'. This is a very wide range with no reference to back it up?
>> Yes, it is a very wide range of reported reduced water demand, which was found to depend on the precipitation, soil type and cultivation duration. We added two references in the revised version.

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?
>> This topic is already discussed and mentioned in the manuscript, specifically in the conclusion section. We are sensitive to this issue and we state more clearly in the revised version that the GCRPS technique may be environmentally suitable for further expansion only if biodegradable films are used. We hope that publication of this manuscript further increases the awareness of the pollution of landscapes with plastic films.

3651 L 11: 1935 reference? Anything newer?
>> New literature reference was added in the revised version.

3651 L14 how about CH4 emissions?
>> CH_4 emissions were found to be significantly reduced under GCRPS cultivation compared to Paddy cultivation, however we found increased N_2O emissions (Kreye et al., 2007; Yao et al., 2013) that did not outbalance the gain of reduced CH_4 emissions (Yao et al. 2013).

3651 L24 the impact of higher aeration and soil temp on SOC mineralization has been widely looked at recently (update reference Stanford 1973)
>> This is correct. However, there is a lack of information on it for the innovative water-saving GCRPS. We have revised this part in the new version.

3652 first paragraph belong to M&M
>> Revised as suggested – we have moved this paragraph to the M&M section.

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.
>> We now provide information on soil types for each sampling site (see revised Table S1 in the revised version). The soil types are: Dystric Cambisols, Haplic Luvisols, Dystric Regosols, Calcaric Regosols and Eutric Gleysols. The depth of the

hard pan is located in 20-40 cm and was not influenced by the cultivation technique.

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.
>> Because the plastic film covers the soil surface, topdressing is not used for GCRPS, i.e., farmers apply all the fertilizer before transplanting. The day before transplanting, compound fertilizer containing about 150 kg N ha^{-1} was applied to the soil surface in a single dose and incorporated into the soil by ploughing. The soil surface was then levelled and covered with a 5 μm transparent film (Liu et al., 2013). For Paddy, an average of approximately 100 kg N ha^{-1} was applied as compound NPK fertilizer to the soil surface and incorporated to a depth of 20 cm before transplanting. At both tillering and grain filling stages, additional doses of 40 kg N ha^{-1} were given as urea in order to increase rice milling quality and protein content (Wopereis-Pura et al., 2002; Leesawatwong et al., 2005) and yield. Thus the total N application for Paddy systems was approximately 180 kg N ha^{-1}. In the revised version we have extended this section to provide all this information.

3653 Is it a short-duration or long-duration variety?
>> It is a middle-duration (about 140 days) cultivar that is used for both GCRPS and Paddy. We have added this information to the Introduction section of the revised version.

3655 L22 which site is this?
>> It is a site in Fang County where we took 22 paired samples for regional evaluation and our well-managed long-term experiment located (Tao et al., 2015). In the revised version, we are specifically marking this site on the location map.

3656 L16. ‘except for C stocks at 0-20 cm depth’ as at that depth, concentrations are significantly different according to Fig 1c
>> Revised as suggested in the revised version.

3656 L25 Mention that the root biomass is from the one experimental site.
>> Thanks for the good editorial comment that helps to clarify this – we revised as suggested.

3657 L8 and Fig 6: is this correlation real, very low R2?
>>Yes, this is correct. The very significant P value at comparably low R^2 values is explained by the large sample size (N=465).

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
>> We have added sentences to explain physical fractions to the M+M section of the revised version, as well as to the Figure caption of Fig. 6 in the revised version.

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.
>> In the revised version, we provide information on the depth of the hardpan in the Introduction section.

3658 L14. In our study: : : then followed by 2 references. Do you mean these studies or do they match these studies?
>> We mean these studies, as they were conducted in the same experimental framework. The sentence has been rephrased in the revised version to clarify this.

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.
>> In line with your comments, the sentence was split in the revised version to clearly separate these topics.

3659 L6 . again what depth is the hardpan at?
>> Hardpan is located in 20 - 40 cm. This information was added in the revised version.

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.
>> We have eliminated such a conclusion, as we agree that these data do not justify the conclusion that GCRPS provides greater SOM stability than Paddy systems. The section has been reorganized.

2661 L8 suggest remove 'environmentally sound' as the sentence below explain this technique does pollute the environment!
>> For clarification, we have changed this sentence to "environmentally sound……, given that biodegradable films are used in order to prevent soil and landscape pollution"

Fig 3. Why refer to previous publication for further details? Why CAGB, no need for such abbreviation?
>> The abbreviation will be omitted in the revised version, as well as the reference to a previous publication.

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.
>> Yes, data are amalgamated across fertilizer treatments. This is because root biomass was neither affected by the N fertilizer rates nor by the interaction of N

fertilizer rates and the cultivation system. We have added this information to the figure caption in the revised version.

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’
>> Many thanks for the thorough reading. All this was revised as suggested in the new version.