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Comment

## ***Interactive comment on “Soil organic carbon dynamics under long-term fertilizations in arable land of northern China” by W. J. Zhang et al.***

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Received and published: 29 October 2009

**General comments** While this paper addresses an important topic, it does not convey the new information precisely. The main shortcoming has to do with the discussion section where the authors failed to justify the reasons their several results. For instance: 1. Why the application of manure has no significant effect on the above-ground C biomass at most of the sites (Page 6547; Line 26-27)? 2. Why there is a decreasing trend in SOC under the inorganic N fertilization at most sites (Page 6550; Lines 22-23)? 3. Why results indicate that soils high in clay in mid-temperate has higher conversion rate than that in the warm temperate area with low clay content. ...what is the role of clay content? 4. Why for all treatments organic C contents in corn and wheat roots were taken as 39.9 g/kg and 44.4 g/kg, respectively (in the M& M Section)?

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The challenge for this paper will be to show its novelty and uniqueness relative to other studies conducted in other parts of the globe. The authors should concentrate on 1. Why significant negative relationships were found between the conversion rates and climatic conditions? This point should be discussed in the introduction and conclusion sections. 2. What are the conclusions and suggestions for future research related to the above-mentioned fact! Thus, I urge the author(s) to change focus and concentrate on the above mentioned aspects during the write-up and their suitable explanation with clear hypotheses and objectives. Please indicate/stress how this work differs from others and why it is needed in introduction. The overall language (English) of this paper is not strong.

### Specific comments

#### Abstract.

Please start with a single sentence. ...Why this study was needed? Line 1, long-term experimental sites.. Line 9 and elsewhere, all sites instead of all the sites.

Introduction Page 6541, lines 8-10, lines 20-23 and elsewhere) the references are not in a proper sequence. Page 6542, line 5, topsoil instead of top soil. Why did not you mention about the role of climatic conditions on SOC sequestration in China?

M&M. I suggest not using abbreviations to denote several places. It is very difficult for the readers to remember!

Information related to depth of sowing, spacing and seed rate is needed. The experiments were conducted earlier. Then why did you use present tense in this section?

Page 6543, line 11, continuous instead of continues. Why CK was used to denote control treatment? Why not simply control? In which year the samples were taken? Were they not in the same time? The plot sizes are huge? How did you sample the representative soil sample?

Available K estimation by Shi (1976) looks odd! I cannot understand the logic behind

Eq.(1)! Any ref.?

Results.

Page 6547, line 1 and elsewhere. . . . decreasing trend instead of decline trend! What are the properties of the desert soil? Page 6548, lines 3-5, revise the sentence.

Page 6548, after table 4, reference of table 7 has come in the text. Where are the contents related to the other tables? The sentence. . . 'Table 7 illustrates that' reads very monotonous. No need of all these words. Page 6549, lines 16-20, these lines would better suit in the discussion section. Page 6548, lines 1-3, pl. be consistent in using either C or carbon. So many 'there are' and 'there is' in this section.

Discussion. In some instances the statistical inferences were ignored. Only discuss the similarities or lack thereof based on statistical inferences. Restructure the discussion section, refocus it so as to address the objectives. The discussion section should integrate all results to explain concept; hypotheses, and objectives. I suggest to use mineral fertilization instead of inorganic fertilization throughout the ms.

Pl. avoid we, our etc. . . Punctuations should be properly given when 'whereas' is used. Page 6552, line 1, what is recommendable? Lines 19-20. . . Is there any doubt? Page 6553, line 1, the conversion rate of 31% is really very high? Why so? Did you measure C data twice to double check it?

Conclusions. Pl. give stress on the novelty as suggested.

Table 3. Footnotes can go to the text. Why not SI units were used? Table 4, column 5. . . is it organic C content in manure or C addition by manure? I think the first one is correct. If so, it is not clear. I suggest all columns should be clearly written. Table 5. SOC indicates soil organic carbon. Table 6. Did you test significant differences across sites? Table 7. Why negative correlation in NPK treated plots? Title is not clear! What is SOC vs. fertilization time? Table 8. Surface means at what depth? When these samples were taken? Fig. 2 and 4. These figures may be enlarged. SI units should be

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used. Fig. 3. Estimated average annual C input instead of averaged annual C input. Fig. 6. What is the 'n' in these figures? Fig. 7. Why a and b are in bold? How did you calculate conversion rate of C input and annual accumulative temp.? Pl. mention these in M&M section.

Finally, this manuscript can be improved by undergoing thorough revision and streamlining. I recommend that this paper would be acceptable/published in 'Biogeosciences Discussion' after major revision.

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Interactive comment on Biogeosciences Discuss., 6, 6539, 2009.

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