

Review on:

“Changes in soil quality due to converting *Pinus* to *Eucalyptus* plantations and subsequent successive *Eucalyptus* planting in southern China”

Authors:

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This study addresses an important topic – assessing the effects of land use change on soil quality and properties. I agree with the author’s statement that this topic hasn’t been studied sufficiently. The authors examined the effects of converting *Pinus* to *Eucalyptus* plantations and a five-year rotation of *Eucalyptus* planting, on the bio-chemical properties and quality of the soil. They evaluated these effects by comparing five sites comprising: (a) the original *Pinus*, (b) *Eucalyptus* that replaced the original *Pinus* (1st generation), (c) a second generation of *Eucalyptus* after clearing the 1st one, (d) 3rd generation, and (e) 4th generations, assuming that these sites represent different stages in time. The paper is concise and well written, but some parts were unclear to me and some information is missing. I have several comments that should be addressed in major revisions:

General comments:

1. The title of this paper is a bit long. I suggest changing to something like; “Changes in soil quality after converting *Pinus* to *Eucalyptus* plantations in southern China” or “Converting *Pinus* to *Eucalyptus* plantations alter soil quality in southern China”.
2. The objectives or questions to be answered in this paper should be more concisely presented in the Introduction section following your results (see suggestions below).
3. Using different fields as representative of stages in time, or as you called it “space for time substitution method”, is not straightforward but could be addressed with some caution. For example in the Results section, when comparing between sites avoid writing phrases like ‘XX increased from 1st to 2nd generation’, say instead ‘XX was higher in 1st generation, compared to the 2nd generation’. Only in the Discussion section you can suggest that these differences might express changes over time. Please rewrite it over the entire paper.
4. The Materials and methods section is unclear and should be reorganize (see specific comments and suggestions below).

Abstract

P2780 , L8, L14: You mentioned SQI only twice in the abstract, you should use the full name “Soil quality index”

P2780 , L13: “Soil total and available potassium were significantly lower...” - add values in parenthesis for “lower” and “higher”.

Introduction

P2780 , L26: delete “caused by deforestation”, this is not the only cause for land degradation. Also, add “is a serious problem affecting...”

P2781 , L2: delete “as well as produce timber”. This is superfluous.

P2781 , L3: change “or” by “and”

P2781 , L9: “...may exhaust soil nutrients and decrease soil quality.” – add reference.

P2781 , L15: change to “physic-chemical”

P2781 , L17: change to “A soil quality index (SQI) was proposed for quantifying...”

P2781 , L26: change “Some studies...” to “For example, it was reported that...”

P2781 , L29 – P2782, L3: change “However, other studies...” to “It was also found that the conversion of...in other places (Binkley et al. 2004).”

P2782 , L4: write “soil organic carbon” instead of “SOC”.

P2782 , L8 - 9: change “In order to...” to “Here we assessed the effects...”, and “we selected adjacent...” to “by examining adjacent...”

P2782 , L13: change to “soil quality index using the principal component analysis”

P2782 , L15: Rephrase clarifying your questions or objectives, something like “Following the above, we tested the effect on soil’s bio-chemical quality after: (1) converting...(2) successive *Eucalyptus* plantings with rotation time of five years...”

Materials and methods

A Fig showing the area in which the study was conducted could contribute much to this paper. I would also recommend adding pictures of the different sites (i.e. MP and G1-4).

This section (2.1) should be rearranged, whereas you explain first about the Pinus area. Then, what constitute each one of the 4 plots (i.e. G1-G4) : (a) age of Eucalyptus planting, (b) time since the first Eucalyptus generation, (c) vegetation cover in each plot, and (d) treatment including how it was planted (seedling or sprouts, etc.). All this information exists in this section but it is not properly arranged, which make this section a bit confusing.

P2782 , L25: change to “...lateritic red soils derived from arenaceous shale with a profile depth of more than 80 cm. Soils’ pH range from 4 to 5”

P2783 , L1: Please rephrase this sentence, it is unclear what this *Pinus* area served for, and what do you mean by rotation. I suppose that you meant that the *Pinus* was used to produce oil and there was a clearing and new planting every 30 years, but I’m not sure.

P2783 , L3: This is unclear. The *Eucalyptus* was planted there or there was a natural encroachment process and also planting?, please clarify this.

P2783 , L1-3: mention the species name for the *Pinus* and *Eucalyptus* as you did in P2782, L10-11.

P2783 , L8: change to “1200 – 1600 trees ha⁻¹”. Your error range is of 400 trees per ha there is no reason to present a greater accuracy than 100 trees ha⁻¹.

P2783 , L9: delete “without plowing”, it is superfluous.

P2783 , L14: change “put” to “added” (also in L17 instead of “applied”).

P2783 , L25-27: Please delete, this is superfluous. Write instead “Three 20 m X 20 m plots were sampled in each site...”

P2784 , L1-4: move it to section 2.1 (see my previous comment on section 2.1).

P2784 , L9-10: Please delete this sentence “The soil samples were immediately...laboratory.”

P2784 , L11-13: change “Some soil...” to “Soil samples were stored at 4C...activity analysis, or air dried for chemical analyses.”

P2784 , L24: change “was put in” to “were added to”

P2785 , L13-14: change the title to “Calculation of the soil quality index”, and also in L14 change “SQI” to “The soil quality index was...”.

P2785, L15-P2786, L-14: This all section is unclear and should be rearranged. You used three different criteria to define your MDS, and three steps for calculating SQI. Please add an explanation justifying why you used these criteria.

P2786 , L24-P2787, L5: “We acknowledge...Therefore” This should be at the end of this section and try changing to something like “Although the three...” and delete “Therefore”.

Results

When first time in this section mention the complete name, e.g. in P2787, L14: change “SOC, TN and AN” to “Soil organic carbon (SOC), Total nitrogen (TN) and alkaline hydrolytic nitrogen (AN)...” do so for other features over the entire section.

P2787, L16: change “decreased” with “lower” and do so over the entire section. It should be “They were...*Pinus* plantation, and significant lower in the 1st...”

P2787, L17: change to “Fig. 1a-c” (see comments on Figures below).

P2788, L1: same as above change to “Fig. 1e”.

P2788, L5: change “among” to “between” and “Fig. 1e” to “Fig. 1f”

P2788, L7: change to “Fig. 1g”.

Figures should be mentioned in consecutive order in the text and organized that way.

P2788, L9: write the complete name e.g. “microbial biomass carbon (MBC)” do so over the entire Results section when first time mentioned.

P2788, L10: MBN was not significantly higher in MP compared to G plots so please delete this sentence. Again change “decreased significantly in the 1st...” with “was significantly low in the 1st...” (See general comments above).

P2788, L12: change to “...3rd and 4th generations (Fig. 2a).”

P2788, L13: change to “Soil MBN was only significantly lower in the and 2nd generation (Fig. 2b).”

P2788, L13-L16: Please delete this you already wrote it above.

P2788, L18: change to “MBC/MBN ratio was only significantly higher...”

P2788, L24: change to “Fig. 3b and c” or “Fig. 3b,c” (see comments on Figures bellow).

P2788, L26: change to “Fig. 3d-f”

Figures should be mentioned in consecutive order in the text and organized that way.

P2789, L3: change subtitle to “Changes in soil quality index”

P2789, L4-6: If pH was not significantly different and is not an indicator for soil quality so why do you show or discuss it? Please delete this and also delete Fig. 1a (see comments on Figures bellow).

P2789, L6-L11: the following: “Three PCs were selected...soil quality indicator scores (Table 2)” should be in the Methods and materials section above (see also comments on Tables bellow).

Discussion

P2790, L20-25: You did not test the effect of litter or herbaceous vegetation on nutrient depletion by preventing weathering or physical erosion, so delete or provide the appropriate References.

P2790, L20-21: change to “...and nutrient leaching (Yu et al. 2000a). In our study sites, herbaceous vegetation was treated with herbicide during the first three years of the *Eucalyptus* planting exposing the uncovered soils to erosion”.

P2790, L23: change “litter layer in *Eucalyptus*...” to “litter cover in the *Eucalyptus*...” and “could not offer” to “did not offer”.

P2791, L4: change to “of the soils’ physic-chemical...” instead of “to the soil physic-chemical...”

P2791, L4-6: change to “These could have been the cause for the bio-chemical depletion observed in soils that underwent *Pinus* to *Eucalyptus* conversion.”

P2791, L11: change to “...and litter production is small, increasing as the plant get older (Xu, 2000).”

P2791, L12: The phrase: “The short rotation...” is unclear, something is missing here.

P2791, L15: change the title to “Increase in soil quality in the 3rd and 4th generations of *Eucalyptus* planting” (see general comments above).

P2792, L4-6: add Reference to this statement.

P2792, L10: change to “Our results suggest a recovery in soil quality after the 3rd and 4th generations of *Eucalyptus* plantings (Fig. 4).” Delete the next words “however, we could...lack of data”, it is superfluous.

P2792, L15: delete “in future research”.

Conclusions

P2792, L17: change to “Findings from our study suggest that...*Pinus* to *Eucalyptus* plantations, partially recovering in the following 3rd and 4th generations.” Delete the following “though it was...plantation.”

P2792, L20-22: change to “might have been contribute to the changes observed in the soil quality during the successive...” The “U” shape is not clear here and there is no further evidence for this behavior nor you have enough replicates to support this.

P2792, L24: change to “...such as maintenance of litter and herbaceous cover and reduction of soil disturbances during...the next planting rotation...to maintain soil quality.” Delete these three words: “during plantation management”.

Tables

Table 1: is unnecessary. I suggest removing it or adding it as supplementary information.

Table 2: present it in the Methods section after your explanation on the PCA and linear scores method (see comment on P2789, L6-L11). Also, I think that you present significant figures far beyond the accuracy that you can actually measure (Please see the following article (section 3): http://www.elsevier.com/_data/assets/pdf_file/0008/145943/2014-01-15-Manuscript-preparation.pdf).

Figures

Figure 1: Change to “Soil chemical properties...in the *Pinus* and the successive *Eucalyptus* plantations. MP, G1...”

You should arrange your figures in a consecutive order as they are mentioned in the text, i.e. (b) should be (a)

(c) should be (b)

(f) should be (c)

etc. (see comments above)

Also, delete Fig. 1a. If it is not significant and does not contribute to SQI so you should not present it.

Figure 2: Also here change to “Soil microbial... in the *Pinus* and the successive *Eucalyptus* plantations. MP, G1...”

Figure 3: same as in Fig. 1.

Figure 4: change to “Soil quality index... in the *Pinus* and the successive *Eucalyptus* plantations. MP, G1...”

Please delete the curve line from the plot.