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Dari: Agricultural Systems (em@editorialmanager.com)

Kepada: ediedison950@yahoo.co.id

Tanggal: Kamis, 10 Desember 2020 21.51 WIB

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Journal: Agricultural Systems

Title: Improving economic and environmental outcomes in oil palm smallholdings: The effects of mulching on

soil carbon and yields

Corresponding Author: Dr. Katrin Rudolf

Co-Authors: Nina Hennings; Michaela A. Dippold; Edi Edison; Meike Wollni

Manuscript Number:

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Dari: Rudolf, Katrin (katrin.rudolf@agr.uni-goettingen.de)

Kepada: dippold@gwdg.de; mwollni1@gwdg.de; nina.hennings@forst.uni-goettingen.de;

ediedison950@yahoo.co.id

Tanggal: Minggu, 28 Februari 2021 19.11 WIB

Dear all,

We got feedback on the paper submitted to agricultural system. If I understood Nina correctly, you did not receive the comments which is why I am forwarding them now.

Due to the new job, I haven't had a deep look at them yet.

Best, Katrin

-----Ursprüngliche Nachricht-----

Von: em.agsy.0.715e36.4539c366@editorialmanager.com

<em.agsy.0.715e36.4539c366@editorialmanager.com> Im Auftrag von Agricultural Systems

Gesendet: Dienstag, 16. Februar 2021 03:36

An: Rudolf, Katrin < katrin.rudolf@agr.uni-goettingen.de > Betreff: Decision on submission to Agricultural Systems

Manuscript Number: AGSY-D-20-00953R1

Improving economic and environmental outcomes in oil palm smallholdings: The effects of mulching on soil carbon and yields

Dear Dr. Rudolf.

Thank you for submitting your manuscript to Agricultural Systems. 5 () 1317 13

I have now completed my evaluation of your manuscript. The two reviewers have made/very thorough and critical comments and constructive suggestions for the improvement of the manuscript. After considering their findings and from my own assessment, I would like to reconsider your manuscript following major revisions. I invite you to resubmit your manuscript after addressing all the comments below by both reviewers. Please note that Reviewer 2 has made detailed comments in the pdf of your manuscript too and please address to all those comments during revision. Please resubmit your revised manuscript by Apr 16, 2021.

Please upload a revised version of your manuscript that fully considers all issues mentioned in the reviewers' comments. In your reply to the reviewers, outline every change made in response to their comments and provide suitable rebuttals for any comments not addressed. Ensure that you are modifying the manuscript not solely replying to reviewers. Your revised manuscript may be in tracked changes, or otherwise have the changes marked clearly, so that reviewers can easily move between quoted line numbers in your reply and the revised text in the manuscript.

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Agricultural Systems values your contribution and I look forward to receiving your revised manuscript.

Kind regards, Jagadish Timsina Editor Agricultural Systems

Editor and Reviewer comments:

Reviewer #1:

General:

- 1. The manuscript claims a remarkably high yield-enhancing effect of the recycling of Empty Fruit Bunches (EFB) in smallholder oil palm production in Sumatra. In reading the manuscript it becomes clear that the evidence is of a correlative nature and that a substantial number of differences between the farmers who do and don't, in current circumstances, apply EFB. The authors apply a number of econometric, statistical techniques to deal with this 'endogeneity' issue, but their account is focused more on the supposed 'effect size' of EFB than on an understanding of the political economy of who gets to use EFB and who not. For a paper in Agricultural Systems one would expect more of a systems approach to the use of EfB that considers interacting scales, such as A. Supply and demand for EFB in the regional economy, where the rate of EFB application by farmers using it is 5-10 times the rate at which it is produced (from FFB processing in mills); conventionally nucleus plantations used all the EFB derived from FFB from their own plantations and bought from outside on their own land, prioritizing stands at risk of production decline. Since palm oil mills no longer have the requirement of a nucleus plantation, EFB is available for 'smallholders' but not through a free and efficient market. While the manuscript mentions that EFB is costly in terms of transport, as FFB trucks return empty from the mill, rather than loaded with EFB; a sketch of the (distorted) market for EFB can give insights to what extent EFB is an underutilized resource in the regional economy; B. The farm-scale economics of acquiring and using EFB and the possible substitution for other input costs (such as fertilizer, as EFB has an appreciable nutrient content); C. The soil-plant system, across the management zone concept in oil palm production and the consequences for nutrient, water and carbon balances. As it stands the manuscript deals with a subset of the questions at scale B, makes largely unsubstantiated claims at scale C and ignores scale A, yet concludes that there is a huge untapped opportunity to increase smallholder FFB yield, at a scale that it might help reduce further deforestation. In all this, one really misses the voices of farmers, either using EFB or not, on how they rationalize their choices.
- 2. Maybe authors can be asked in a 'major revision' or 'rejection/stimulated resubmission' mode to make a more balanced manuscript.
- 3. Among the 'confounding factors' discussed under the endogeneity issue it is surprising that the source of planting material is not mentioned, as it has a direct relationship with yield and access to quality planting material can be expected to follow similar rules as access to EFB might have.
- 4. The wider framing of oil palm in relation to deforestation and intensification options ignores the literature, partly derived from the same Sumatran landscape, about a possible 'Pandora box' effect where lower production costs in an open market can be expected to stimulate expansion rather than reduce it. See e.g. Tomich, T.P. et al. 1998. Agricultural development with rainforest conservation: methods for seeking best bet alternatives to slash-and-burn, with applications to Brazil and Indonesia. Agricultural Economics, 19(1-2), pp.159-174.
- and Tomich, T.P. et al. 2005. Balancing agricultural development and environmental objectives: assessing tradeoffs in the humid tropics. Columbia University Press.
- For recent data on the relationship between forest and oil palm, see Purwanto, E. et al. 2020. Agroforestry as Policy Option for Forest-Zone Oil Palm Production in Indonesia. Land, 9(12), p.531.
- 5. The current manuscript combines results and discussion in a single section. It would be cleaner if the 'results' are presented in terms of 'association' between EFB use and yields, and that, after summariszing the various endogeneity tests, a shift to possible 'causal' relations (with words such as 'effects') be restricted to the discussion labelled as such.
- 6. Literature citations in the manuscript are mostly confined to the 'Goettingen bubble', and authors might do more justice to publications outside of their home group.
- Woittiez, L.S. et al. 2019. Fertiliser application practices and nutrient deficiencies in smallholder oil palm plantations in Indonesia. Experimental Agriculture, 55(4), pp.543-559.
- Khasanah, N.M. et al. 2015. Carbon neutral? No change in mineral soil carbon stock under oil palm plantations derived from forest or non-forest in Indonesia. Agriculture, ecosystems & environment, 211, pp.195-206. Pardon, L. et al. 2016. Quantifying nitrogen losses in oil palm plantations: models and challenges.

Biogeosciences, European Geosciences Union, 2016, 13 (19), pp.5433-5452 Pardon, L. et al. 2017. Yield and nitrogen losses in oil palm plantations: Main drivers and management trade-offs determined using simulation. Field Crops Research, 210, pp.20-32.

Chiew, Y.L. and Shimada, S., 2013. Current state and environmental impact assessment for utilizing oil palm empty fruit bunches for fuel, fiber and fertilizer-A case study of Malaysia. Biomass and Bioenergy, 51, pp.109-124.

Specific points

Highlight#1 is not based on this research

Highlight#2: please give conclusions here

Highlight#3: this statement suggests 'causative' evidence, while you only have 'correlative' evidence here

Highlight#4 & 5 add little

Line 73 What do you mean by sequestration beyond increase in stocks?

Line 91 FFB?

Line 95 Please use past tense in describing your methods and results.

Line 154 endogeneity is such a key concept for the paper that it may need some further introduction; any hints on farmers' own rationale for (not) using EFB would be very useful for the storyline. A conceptual figure might help here.

Line 169 How do you know?

Line 265 This 53.7 ton EFB is equivalent with 2*53.7/20 ~ 5 (please adjust) ha from which FFB is harvested, at Line 281 Please avoid terms suggesting a causal link where your data are correlational in nature Line 282 It is the validity of the interpretation, not that of the results that is at stake Line 282 With the spatial data available you might be able to estimate the potential EFB availability per ha for various potential transport distances Line 287 Table captions need to be ahead of the table for ease of the reader Line 288 'association' rather than 'effect'

Reviewer #2:

This is a potentially interesting manuscript that it generally well written and definitely of relevance for the readership of Agricultural Systems. I very much enjoyed the mixed methods approach, and the combination of socioeconomic data and SOC data, and I think that the authors demonstrate a good understanding of the complexity of smallholder oil palm production (although the understanding of the soil aspects seems a bit less convincing and there is some room for improvement).

The manuscript is very heavy on statistics which makes it quite difficult to read - although the authors do a good job in explaining how to interpret the results. I think that the manuscript would benefit (a lot) from a reduction in the amount of data/results that are presented. As a reader I felt somewhat buried in data some of which is of less relevance. The inclusion of organic soils complicates the presentation of results quite a lot, and I really don't think that it makes sense to include these soils in an analysis with mineral soils. Therefore, I suggest to remove these soils from the analysis completely. This is only one suggestion of how the manuscript could be simplified, but further simplifications are needed to make the manuscript publishable.

The very basic soil sampling scheme, the shallow soil sampling depth and the lack of inclusion of other soil properties than SOC, do not really justify the extensive statistical analysis, which I think the authors should somehow acknowledge.

Please present more data on the soil characteristics - including the actual (non-transformed) results of the SOC analysis.

The Conclusion looks like a halfhearted Discussion and the lack of a well-developed discussion section is a major weakness of this manuscript. There are plenty of interesting results to discuss and plenty of literature to discuss the results against (in a designated 'Discussion' section. (In general more (recent) literature must be included).

I have made specific comments in the PDF file. Most of the comments are pointing to weaknesses or issues that has to be clarified or addressed, but the most important comment is that I found the manuscript very interesting and I think that the study deserves to be published.

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Kepada: ediedison950@yahoo.co.id

Tanggal: Jumat, 19 Maret 2021 21.36 WIB

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Manuscript Number: AGSY-D-20-00953R1
Improving economic and environmental outcomes in oil palm smallholdings: The effects of mulching on soil carbon and yields
Dr. Katrin Rudolf
Agricultural Systems

Dear Editor(s),

Please extend the due date of the revision for my above referenced submission.

Comments from the author:
I will require an additional 30 days to prepare my revision.

Thank you very much!

Kind regards, Dr. Katrin Rudolf

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Date: Friday, March 19, 2021 02:36 PM GMT

CC: "Nina Hennings" <u>nina.hennings@forst.uni-goettingen.de</u>, "Michaela A. Dippold" <u>dippold@gwdg.de</u>, "Edi Edison" <u>ediedison950@yahoo.co.id</u>, "Meike Wollni" <u>mwollni1@uni-goettingen.de</u>

Manuscript Number: AGSY-D-20-00953R1

Improving economic and environmental outcomes in oil palm smallholdings: The effects of mulching on

soil carbon and yields Dr. Katrin Rudolf

Agricultural Systems

Dear Editor(s),

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Comments from the author:

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Thank you very much!

Kind regards, Dr. Katrin Rudolf

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Kepada: mwollni1@gwdg.de; dippold@gwdg.de; ediedison950@yahoo.co.id; nina.hennings@forst.uni-

goettingen.de

Tanggal: Minggu, 28 Maret 2021 13.06 WIB

Dear all,

The request for the extension has been accepted.

Best, Katrin

Von: Agricultural Systems <agsy@elsevier.com>

Gesendet: Montag, 22. März 2021 11:29

An: Rudolf, Katrin < katrin.rudolf@agr.uni-goettingen.de>

Betreff: Re: Revision due date extension for AGSY-D-20-00953R1 [210319-018029]

Dear Dr Rudolf,

Good day.

I confirm receipt of this extension request email.

Thank you for the information. From checking the editorial system, I notice that the current due date to submit the revision is 16th April. Based on your email, I have extended the *revision submission* due date in the editorial system (until 16th May).

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Should you need any further assistance, please feel free to contact me.

We are looking forward to receiving the revised manuscript.

Regards,
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Kepada: mwollni1@gwdg.de; ediedison950@yahoo.co.id; dippold@gwdg.de; nina.hennings@forst.uni-

goettingen.de

Tanggal: Jumat, 16 Juli 2021 14.17 WIB

Dear all.

Here are some final good news, in case you haven't received this email yet. Thanks again for your input.

Best, Katrin

-----Ursprüngliche Nachricht-----

Von: em.agsy.0.74a8d7.75ef95fd@editorialmanager.com <em.agsy.0.74a8d7.75ef95fd@editorialmanager.com>

Im Auftrag von Agricultural Systems

Gesendet: Donnerstag, 15. Juli 2021 22:49

An: Rudolf, Katrin < katrin.rudolf@agr.uni-goettingen.de > Betreff: Decision on submission to Agricultural Systems

Manuscript Number: AGSY-D-20-00953R3

Improving economic and environmental outcomes in oil palm smallholdings: The relationship between mulching, soil properties and yields

Dear Dr. Rudolf,

Thank you for submitting your manuscript to Agricultural Systems.

I am pleased to inform you that your manuscript has now been accepted for publication. Congratulations!

Your accepted manuscript will now be transferred to our production department. We will create a proof which you will be asked to check, and you will also be asked to complete a number of online forms required for publication. If we need additional information from you during the production process, we will contact you directly.

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Kind regards, Jagadish Timsina Editor

Agricultural Systems

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Kepada: sfb-indonesien@gwdg.de

Tanggal: Selasa, 17 Agustus 2021 01.02 WIB

Dear colleagues,

According to the CRC 990's publication policy, we would like to announce publication of the following paper in **Agricultural Systems**:

Title:

Improving economic and environmental outcomes in oil palm smallholdings: The relationship between mulching, soil properties and yields

Authors:

Katrin Rudolf, Nina Hennings, Michaela A .Dippold, Edi Edison, Meike Wollni

Abstract: CONTEXT

The area under oil palm cultivation has expanded importantly in South-East Asia. The resulting land-use transformations are associated with environmental degradation such as substantial carbon dioxide emissions. Soil conservation practices can contribute to more sustainable oil palm systems by increasing soil organic conservation practice in oil palm plantations is the mulching with empty fruit bunches (EFB).

OBJECTIVE

We estimated the relationship between EFB mulching and, respectively, yields, SOC and total nitrogen contents, the carbon-nitrogen ratio and the average bulk density in smallholder oil palm plantations. We further analyzed the determinants of smallholders' EFB application taking into account regional market, farm, and plot level aspects, as well as farmers' perceptions.

METHODS

We estimated the relationship between mulching and yields with panel data, and between mulching and soil properties with cross-sectional data. We accounted for the possible selection bias of the decision to apply EFB mulching with instrumental variable estimations. Descriptive analysis was used to analyze the determinants of smallholder EFB use.

RESULTS AND CONCLUSIONS

Our results indicated that in particular the regional supply in EFB and farmers' wealth levels were correlated with smallholder EFB mulching. EFB mulching was associated with 39% higher yields and 19% higher SOC contents. We attribute the higher yields to potentially improved soil chemical functions linked to higher SOC contents, such cation exchange capacity effects, and to an increased K and potentially Mg availability. Since EFB is not available in sufficient quantity to be applied to all plantations, policy makers could identify user groups with the greatest potentials for environmental and income improvements. Site-specific life cycle assessments and yield effects can help to inform such identification.

SIGNIFICANCE

To be splite their growing in portance in the sor plain sector, evidence or the effect of the indings indicate that the smallholder farmers. Because of associated higher SOC contents and yields, our findings indicate that the promotion of EFB mulching as best management practice could potentially contribute to more sustainable oil palm systems. Strengthening inclusive value chains for smallholders, information provision and investments in road infrastructure represent potential policy instruments to increase smallholder EFB application. The identification and promotion of best management practices are important with view to the still ongoing oil palm expansion in South-East Asia, and progressively in other parts of the world.

Datasets: C08, A04, C07

The paper can be downloaded here:

https://www.sciencedirect.com/science/article/pii/S0308521X21001955?dgcid=author We will update the Sharepoint accordingly.

Best regards, Katrin Rudolf

Dr. Katrin Rudolf

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Environmental and Resource Economics
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