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# *Interactive comment on* "Soil nutrient content in relation to women's agricultural knowledge in the urban gardens of Kisumu, Kenya" *by* Nicolette Tamara R. J. M. Jonkman et al.

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Dear Referee, we would like to thank you for taking the time to read this paper and writing your review. Based on your feedback and that of the other reviewer we hope to revise our manuscript. With this reply we hope to address your specific concerns and comments.

General Comment: The case study combines in an innovative way soil nutrient analysis with farmer interviews. This approach is very useful in order to derive management recommendations that are feasible to the farmers. However the research questions should be formulated more clearly and it should be explained how they were developed



from existing literature. Being a case study, it is important to explain which general conclusions can be made from the results.

Reply: More than creating management recommendations, this case study is meant to create insight among scientists and policy makers alike, and show that when recommendations are made they must be tailored to more than the soil/environment – the receiver and their socio-economic situation are equally if not more important. We received similar feedback from the other reviewer regarding our research questions and we realize that we may have formulated the main research question too broadly for the scope of the research. We will reformulate the research question based on the advice given. We wish to emphasize that, while indeed a case study, the sites and setup were carefully selected in close partnership with the local stakeholders (research organizations, NGO's and the women groups themselves) to ensure a representative case study for a phenomenon that is wide spread throughout the developing world. We realize that we did not explain this well enough, and will elaborate the selection process in a revised version.

Comment 4. Is the paper of broad international interest? The relevance and relation to results and questions of international research still needs to be better explained. There is a growing body of research on urban agriculture in Africa, which is not sufficiently mentioned (see e.g. Orsini et al. 2013, Hamilton et al. 2014 –>please see the reference list in the supplement). Regarding Gender Analysis it would be interesting to analyse whether the plots managed by women have a different soil nutrient status than those of men (see literature on Gender Gap in agricultural Productivity) and what constraints women face in their production (access to resources and time issues, ("triple burden" childcare, production and community tasks)

Reply: The direct comparison of men and women was not within the scope of this study. Instead we focused on analyzing the interplay of soil fertility, management practices, and knowledge transfer and decision making processes in urban farming women food entrepreneur groups. The rationale to focus on women food entrepreneur groups

is that they are very important in the developing world, yet chronically understudied scientifically and insufficiently recognized by societal stakeholders such as policy makers and NGOs. Though we have tried to use international research to show the relevance and relation of our case study in the broader context we may not have been entirely successful in achieving this. We would like to thank the reviewer for providing us a list of interesting references that we will certainly use to expand and strengthen our manuscript in our revisions if we are given the opportunity.

Comment 5. Are clear objectives and/or hypotheses put forward? I think your question "how does women's knowledge influence soil nutrient content through their management" is not quite clear. Do you propose the hypothesis that higher knowledge will lead women to apply more effective management practices and the soil nutrient content will be higher? Consider that knowledge of a technique does not equal implementation of the technique. There might be financial or time constraints and also cultural and individual factors that influence a person's decision to use a certain agricultural practice. Your results show that an advocated technique (intercropping) leads to lower soil nutrient content, did you propose that the women using this technique had less or more knowledge?

Reply: We found that the choice of whether to apply the intercropping technique was actually not based on knowledge, but rather that there was a socio-economic motivation as you also suggest. We may have failed to convey this well enough in the present version of our manuscript and will correct this in our revisions. We found that women's knowledge does impact their agricultural management practices, which in turn influences their soil's nutrient content – however their main motivation for choosing one management practice over another was based on personal circumstances. The women practicing intercropping had incomplete knowledge regarding the technique, leading them to improperly apply it, however this improper application led to an improvement of their finances by yielding an additional crop to sell, which gave incentive to continue. The soil in this urban garden is of sufficient quality and fertility so



that there is no noticeable difference in crop quality for the women regardless of their chosen management technique. Again, we will more clearly explain this in a revised version.

-Continued Comment 5- Maybe it could be an idea to structure your objectives like this: Aim: Derive recommendations for soil management in urban gardens in Kisumu, Kenya Questions: a) What is the soil nutrient content? (Discuss whether the results you are found are favourable or nonfavourable for agricultural production, should the nutrient content be raised? Might leaching be a problem etc.) b) Which of the recommended soil management practices (suggested based on evidence of agricultural science) are feasible to the women farmers? c) What are research gaps and limits of current agricultural extension activities?

Reply: The suggested restructuring, while very interesting, falls beyond the scope of this case study. Such a comparison would constitute an entire new research project in its own right. As explained before, it was not our aim to create recommendations for soil management – rather we sought to understand the motivation and the knowledge base of the women farmers of the urban gardens and their impact on the soils nutrient status. The feasibility of other management practices were not included in this study and as the reviewer suggests above and is shown by this research such recommendations cannot be done based purely on soil science/agricultural research if you would like to see implementation.

However, based on our research we can formulate recommendations with respect to the current management practices for the groups involved in the present case study. The nutrient content in their urban gardens is sufficient considering the current practices, crops grown and management schemes. The farmers do not use mineral/artificial fertilizers and leaching is a minimal problem. Therefore, we can conclude that the current practices are sustainable and there is no pressing need to change to maintain the status quo. With respect to intercropping, correct application (as opposed to the incorrect application performed by the groups now) would not be expected to lead to

higher crop yields, as N contents are already sufficient for the crops grown. As per the reviewers suggestion, we will include a more detailed reflection along these lines in a revised version.

Comment 6. Are the scientific methods valid and clear outlined to be reproduced? There is still information missing: What method did you use to choose the sample plots? In how far are they representative for the area? Regarding the interview results, there is not sufficiently stated which information was gained from the 2 women farmers cultivating the sample plots, the women group and the mixed group. Did the two women farmers cultivating the plots participate in the FGD? Why did you choose to organize a female and a mixed group instead of a female and a male group, which would have allowed for comparison of male and female knowledge?

Reply: This paper describes a case study that has been carefully setup with the local partners from scientific institutes and NGOs with a vast experience in the area, and indeed with the women farmer groups themselves. This in itself is in our view a unique approach that, by extensive use of the local expertise, ensures the case study is representative of a typical urban gardening situation that can be found abundantly throughout Kenya, sub-Saharan Africa and indeed the developing world. We realize we may not have explained the selection process and representability of the case study well enough and aim to do this if we are given the opportunity to revise.

It is clear, based on both this review and the 2ndÂň, that we have not been diligent enough in describing the results of the interviews and the focus group discussions – the raw data of which was not included in the dataset for privacy reasons. The two women farmers whose fields were used in the soil analysis also participated in the interviews and focus group discussions – we look to make more use of this data in the revisions if given the opportunity. It was beyond the scope of this case study to directly compare male and female farmers, which is why there were no separate meetings with only male farmers.



Comment 7. Is the soil type/classification adequately described? In your abstract and introduction you refer to nutrient deficiencies in Kenyan agricultural soils and poor soil management as one possible cause. Yet your results are that soil nutrient content is high for both sample plots. Did you record the amount of fertilizer and organic material that was applied to the fields by the farmers? Are the plots examples of high input vegetable production and thus difficult to compare to the average (rural) agricultural soils? (see Predotova et al. 2011; Lompo et al. 2012). Is the overall decline in agricultural productivity in Kenya also observed in Urban agriculture?

Comment 8. Are analyses and assumptions valid? See above

Reply: The nutrient content is high in the recorded urban garden likely due to the richness of the soil's parent material, not necessarily due to the farmers application of manure. Exact amounts of manure/compost were not noted, but an inventory was made of fertilizers used, as well as fertilization methods and frequency. The case study is meant to be representative of a typical urban gardening situation and as such can't be directly compared to the rural soils. Production and demand for vegetables from urban gardens are high, but the soils and crops are very different from rural areas. There is no evidence of decline in productivity, rather the opposite – this is one of the ways in which urban gardening differs from traditional (rural) agriculture.

Comment 9. Are the presented results sufficient to support the interpretations and associated discussion? I think the presentation of the soil nutrient analysis is clear. Please try to document the interview results more clearly. What are interview results, what are FGD results? E.g. how many of the participants know that plants need nutrients from the soil? With which questions did you measure technical knowledge?...

Reply: As noted at point 6, we hope to be allowed to more fully incorporate the interviews and focus group discussion results in our revision of the manuscript as this is something that was noted as missing by both this reviewer and the 2nd reviewer. Only a selection of the acquired data was included in the paper. The interview data and

the data from the focus group discussion was more extensive than shown and was not included in the attached dataset for privacy related reasons. In revisions we will more fully incorporate these results, whilst continuing to respect privacy.

Comment 10. Is the discussion relevant and backed up? Be careful not to mention new results in the discussion part (page 9, 6-15) and do not discuss your results in the results section (p.12 12-14).

Reply: We would like to thank the reviewer for pointing out these instances, we shall correct them.

Comment 11. Are accurate conclusions reached based on the presented results and discussion? I think the conclusion is written very clearly, could you add your conclusion whether intercropping is useful or not? When you mention gender-differentiated knowledge, could you specify in your results what knowledge was specifically male or female? Did men have less sensory knowledge than women? Did men have more technical knowledge than women? What could be advantages of the traditional practical and sensory knowledge these women have? Do you have results whether male and female farmers apply different techniques and have different yields?

Reply: The usefulness of intercropping is largely dependent on ones goals and techniques. As the women are currently doing the intercropping does not improve their soil quality, however it does have positive effect on their financial situation. Considering the richness of their soil there is no direct reason to discourage these farmers from their current practices. Unfortunately it is not possible for us to show the direct differences between the soil nutrient condition of the men's fields and the women's fields or their technical knowledge as no separate male fields were tested, nor were they included in the interviews. This was simply beyond the scope of this case study – though objectively it would be very interesting to see if such differences could be found. While we lack sufficient data to include the roles of men in the paper, we have noted that men tend to have more access to capital and means, meaning that their practices often dif-



fer from that of women on that basis and because of this they also have a different view of agricultural problems.

Comment 12. Do the authors give proper credit to related and relevant work and clearly indicate their own original contribution? You clearly indicated your own contribution. Please have a look at the FAO State of Food and Agriculture Report 2010-2011 "Women in Agriculture- Closing the gender gap for development" and Doss et al. 2018 regarding women having lower yields than men in dev. countries (p. 3, l 15)

Reply: We did note from literature that women generally have lower yields than men in developing countries, but that this often has to do with a lack of access and means on the side of the women. We will note your reference and see to include it in our revisions.

Comment 13. Does the title clearly reflect the contents of the paper and is it informative? For me nutrient content in relation to knowledge is not clear (see point 5 above)

Reply: As stated at point 5, the knowledge of the women does not directly influence their choice of management practice, rather their socio-economic situation generally does. The knowledge of the women does however impact the way they implement their chosen management practice, which in turn influences the soil nutrient content. We hope we will be able to convey this more clearly if given the opportunity to make revisions to the manuscript.

Comment 14. Does the abstract provide a concise and complete summary, including quantitative results? The introduction part in the abstract could be shorter and should mention urban agriculture.

Reply: A valid point, we will include that during our revision of the manuscript.

Comment 15. Is the overall presentation well structured? I think starting the introduction with the global relevance of your topic would help to understand your research aim.

Reply: This is a difficult point as our other reviewer notes that they consider our introduction a bit too broad, we will have to consider how to more carefully balance this in our revisions.

Comment 20. Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated? Please clarify the legend of figures 1a-f, available, exchangeable and total (Does total include available and exchangeable?, then the color scheme is misleading).

Reply: We would like to thank the reviewer for pointing this out and will attempt to make the figure more clear in the revisions. The total does in fact include the available and exchangeable.

Comment 21. Are the number and quality of references appropriate? Please see the references below.

Reply: Overall we would like to again thank the review for their valuable comments and also their included list of refer

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