

Dear Editor,

We thank you and the reviewers for the time and care taken in evaluating our manuscript. We greatly appreciate the detailed and constructive feedback provided. In particular, we appreciated the constructive specificity of Reviewer 1's comments. In response to the reviewers' comments, we will substantially revise the manuscript to improve:

- (1) methodological transparency and reproducibility, including expanded descriptions of fraction calculations, sampling design, and modeling approaches;
- (2) conceptual clarity surrounding carbon pool definitions and functions;
- (3) mechanistic discussion linking iron mineralogy, root-derived inputs, and microbial processes to POM and MAOM dynamics; and
- (4) overall readability through clearer terminology, streamlined language, and improved presentation of management variables and survey-derived metrics.

Importantly, we believe the reviewers' comments provide a clear roadmap for strengthening the presentation, methodological transparency, and interpretability of the manuscript. We are confident that these concerns can be fully addressed through revision.

We have responded to feedback from both reviewers in GREEN below.

Reviewer #1:

Summary Notes of what this paper is about: The authors explore the impact that management may have on soil C pools and overall surface soil C stocks. To do this they incorporated as much variability from four classes of soil management practices across 28 farms into a soil health management variable that they were then able to incorporate into a mixed effects model. They focused on assessing how much variability their model could explain rather than the predictive capacity their model could develop. To this end, I think the authors did a very good job introducing us to the pros and cons of their study. My focus is on trying to ensure that the methodology and model development was clear enough for others to use these same methods to recreate this study in different regions with different crops and soil health management practices. Therefore, my overall advice is for authors to make **it a little clearer how they calculated % C pools and how this contrasts from C prop values and mass values**. I would suggest putting together a small table like that used in stable isotope studies where folks use calculations to estimate different C pools (Canarini, A., Dijkstra, F.A., 2015. Dry-rewetting cycles regulate wheat carbon rhizodeposition, stabilization and nitrogen cycling. *Soil Biology and Biochemistry* 81, 195–203). It would just help make the paper much more accessible. I think this kind of study would be insightful to do in other regions with different soil orders, crops, and agricultural practices. Great job! Here are some minor edits I recommend handling before publication:

In our revision, we will make clear calculations of %C vs. proportional C and mass values - we agree that this is an important distinction to understanding the different fractions and the

responses to management that we evaluated. While some equations are presented in the manuscript, we agree that a table synthesizing all calculations of relevant carbon pools will be easier to access and understand. Following the reviewer suggestion, a set of associated tables can be included, as is started below:

Table Xa: List of equations used for estimating different soil parameters.

Fraction description	Equation	Number
MAOM carbon concentration	$MAOM_{\%C} = m_{C,MAOM} / m_{MAOM} \times 100$	(1)
fPOM C proportion	$fPOM_{Cprop} = fPOM_{\%C} * m_{fPOM} / m_{total}$	(2)
...

Table Xb: List of abbreviations used in the equations.

abbreviation	Meaning	Number
$m_{C,MAOM}$	mass of carbon measured in the MAOM fraction by elemental analysis	(1)
m_{MAOM}	total mass of the MAOM sample analyzed	(1)
$fPOM_{\%C}$	fPOM carbon concentration	(2)
m_{fPOM}	Mass of fPOM fraction	(2)
m_{total}	Total bulk soil sample dry mass	(2)
...

I'm assuming you looked at surface soils and I think **it would be good to just emphasize or connect directly that this reflects your lettuce root depths** which would be the zone of influence you wanted to assess, hence you didn't go deeper. You provide the details but don't make a direct connection with the writing. Note, it's not clear to me if this also encompasses the depth of your cover crop plants, it may be shallow enough for catching lettuce rooting impacts but perhaps not for your cover crops where applicable. On this note, you do **on't explain what you mean by functional types of crops**, define this.

Yes, we look just at surface soils (0-15cm). We will make this clearer in the manuscript, and make an explicit connection to shallow rooting depths of lettuce. Cover crops used are more variable and may root below surface soils. Functional crop types are defined in our supplement, but we will bring relevant descriptions into the main text for clarity.

Line 60: You mention MAOM being important for nutrient provisioning but don't support this with literature, the acknowledgment that there is nutrient provisioning from MAOM is a somewhat new development. Example literature:

Liptzin, D. & Silver, W. L. Effects of carbon additions on iron reduction and phosphorus availability in a humid tropical forest soil. *Soil Biol. Biochem.* 41, 1696–1702 (2009).

Spohn, M. Preferential adsorption of nitrogen- and phosphorus containing organic compounds to minerals in soils: a review. *Soil Biol. Biochem.* 194, 109428 (2024).

We appreciate these helpful references and agree that the role of MAOM in nutrient provisioning and nutrient retention warrants clearer support and discussion in the manuscript. We will incorporate these citations to better contextualize emerging perspectives on MAOM as a dynamic reservoir involved not only in carbon stabilization, but also in the cycling and retention of nutrients such as nitrogen and phosphorus.

Similarly, you describe POM fraction C/N ratios but don't reflect on MAOM ratios – you should include this if you want to bring this in as a comment about POM C/N ratios as it feels like you are trying to develop a comparison. Jilling et al 2018 paper “Minerals in the rhizosphere: overlooked mediators of soil nitrogen availability to plants and microbes” is a good reference for this.

We also appreciate the suggestion to more explicitly compare POM and MAOM C/N dynamics. We agree that discussing POM C/N ratios without addressing MAOM stoichiometry limits the conceptual comparison between these pools, particularly given evolving perspectives on the accessibility and turnover of mineral-associated organic matter. In revision, we will expand this discussion and incorporate the suggested Jilling et al. (2018) reference to better frame MAOM as an active component of rhizosphere nutrient dynamics rather than solely a passive storage pool.

Is the mass of the fPom and oPOM represented in these equations for the mineral+carbon+soil content combined or is this just C mass?

The fPOM and oPOM masses are of the bulk soil content, not just C mass. This distinction is functionally important, and we will further clarify in our updated manuscript. This is a mass-based C contribution rather than just the proportion of total SOC that fPOM represents. Thus, it is telling us about how much carbon there actually is per unit soil. If just represented as Carbon mass, our outcomes would then be about the partitioning of C across these fractions, which while mechanistically is interesting, was not the focus of this particular study.

For consistency, I can also add regression results from a similar C proportion value for MAOM which is currently not presented - result values vary slightly but show a similar picture to that of %C.

Line 170: You air dried your soils to determine the size of various Fe pools but air drying can lead to irreversible Fe mineralogical changes. In some cases oxidation can lead to Fe(III) formation that then binds to organic matter or changes mineral crystalline structure changing pool make up in your soils. You don't make a case for different pools in this paper and just refer to total Fe so there is no edit necessary, I just wanted to make sure this was also something that the writers are aware of. For mineralogical assessment of these poos, it may be best to freeze dry. Your sites may have already been pretty dry to begin with so this may not have imposed as much an issue but given that temporally you may have some moisture differences it could have (hard to tell without knowing moisture temporal dynamics from samplings). Kaiser, M., Kleber, M., Berhe, A.A., 2015. How air-drying and rewetting modify soil organic matter characteristics: An assessment to improve data interpretation and inference. *Soil Biology and Biochemistry* 80, 324–340. Freeze drying has its own issues, but good to just know about.

We thank the reviewer for raising this important consideration. We were not previously aware of the extent to which air drying may alter reactive Fe phases and organo–mineral associations through oxidation and drying–rewetting effects. In the present study, we use operationally defined Fe extraction pools primarily as comparative indicators associated with SOC stabilization, rather than making detailed mineralogical interpretations of specific Fe phases. Additionally, all samples were processed consistently using the same drying protocol, which should reduce methodological variability across sites.

We agree this is an important caveat, particularly for studies explicitly focused on Fe mineralogy or redox-sensitive transformations, and we can add a brief acknowledgment of this limitation in the revised manuscript along with the suggested citation.

On Table 1 for Organic Amendments (Total Carbon Input) There seems to be an error, because the Minimum value (4489) is higher than the Max value (2991) – same for the Reduced Disturbance categories, all min values are higher than the max value listed (maybe these were subtracted from 1 so then the input is negatives as described earlier?).

Noted- this was just an oversight with some typos. Revised table is below:

Soil health principle	Management variable	Unit/Description	Min value	Max value	Mean	Median
Maintain continuous living cover	Winter cover cropping	Mean presence of winter cover crop over prior 5 years based on January NDVI	0	1	0.47	0.6
	Continuous cover	Fraction of continuous living cover (cash or cover crops) over 5 years based on monthly NDVI	0.25	0.83	0.53	0.52

Organic amendments	Total carbon input	Kg ha ⁻¹ ; based on organic amendments applied during sampling season 2020	449	2991	1848	1779
Crop rotational diversity	Cash crop richness	# of crops	3	7	4.33	4
	Crop families	# of cash crop families	1	5	3.5	3
	Cover crop richness	# of cover crop types	0	4	2.5	3
	Cover crop functional richness	Number of functional groups	0	2	2.5	3
Reduced disturbance	Bed permanence	0 = one season, 1= multiple seasons	0	1	0.05	0
	Deep tillage frequency (>12inches)	0= more than 1x per year, 1 = once per year, 2= once every few years, 3= never	0	3	1.11	.5
	Tillage depth	Inches	14	42	28.4	30

Apologies if this was missed in my review, but I don't believe your time variable was integrated into your analysis? You mention sampling three times in the year and getting results for each of those sampling times but it isn't clear in your current manuscript what you did with this resolution of data you collected. Did this add to the analysis or provide any contrast worth discussing? I would assume it did but hard to tell from this current version of the manuscript.

This is a valid point - in our methods we say we sample three times, but ultimately in this specific analysis, we rely entirely on mid-season sampling. Other timepoints were used for other analyses. Only bulk soil C was measured again on our third time point, but given that we don't expect to see many in-season differences in organic C, we present fractionation results from just mid-season soils. We will clarify this in an updated manuscript.

You refer to looking at %C in MAOM and noting that this is not the same as the total MAOM C stock. However, it's not clear from your description or written equations what the difference is, translation from quantitative term to how you derive this is not clear. **I would add a sentence or small example equation to help readers follow.** It might behoove the writers to add a table in the supplement where % C in X pool, absolute C in X pool, pool Y stocks are all defined and have an example equation provided for readers and anyone who wants to implement a similar division of C pools in soils for their studies to implement the same calculations. Similarly, I believe when you wrote mean values these are from the entire data set collected whereas C accounting is for C stock of soil (all pools included). But this may need some additional clarification.

We agree that a table will go a long way in clarifying the variables used in constructing different C pools and measurements utilized for our analysis. We will add a table, as formatted above,

and ensure that text also clarifies and justifies the use of different measurements utilized. In brief, we use C% or the carbon concentration for MAOM as an indicator of organo-mineral loading, whereas stock takes into account bulk density, and calculates an actual amount of mgC/gSoil.

I don't think it's clear from the description that PC1 and MAOM2 were included to be an edaphic variable grouping in Figure 3 description. Please rewrite it to be clearer.

For figure 3, we are looking at the marginal R2 values. We will re-write the caption to ensure that it is clear what variables were used to capture edaphic versus management effects.

Line 365: You introduce the term individual practice variables in line 365 as the variables that were better at explaining the variance in the data vs management and edaphic variables but you don't ever define what **individual practice variables are.** This makes the text confusing since it seems that here are separate from management variables. Please define these earlier on in the text and make sure your terms referring to subjects involved in the model are consistent.

We appreciate this observation - we will define this term earlier on in the methods section to make clear what the differences are in individual practice variables versus composite Z-scores for management practices. In brief, the difference is that for the bulk of the models, we use composite Z-scores that take multiple management practices into account, and that are then grouped by category of practice to then create just four z-scores to use in our modeling. Individual practice variables are the management practices that were aggregated to create the z-scores. So, for example, our crop rotational diversity encompasses # of cash, cover, and functional richness - these are aggregated up into a single z-score for analysis, but we also looked at these individual practices to see if any single practice might be more/less influential than the aggregate z-score. We will ensure that this difference is adequately explained to avoid confusion.

Line 395 You mention how your results suggest iron and crop diversity as important descriptors for variability in your data and lead to higher C predictions (although you said in your paper that you aren't really focusing on prediction capabilities for this model?). But you don't really incorporate this into your discussion of possible mechanisms at play in your system. **I think you should include a line that points out at root redox processes that may be allowing iron mineralogy to transform and promote the sticking of aggregates to form oPOM or why these two variables may be contributing together or separately to oPOM increase.**

Following paper isn't really looking at oPOM but MAOM does contribute to oPOM formation...so maybe a note for earlier that besides pore space there are other edaphic factors that can contribute to oPOM formation and stability

Yu, G., Xiao, J., Hu, S., Polizzotto, M.L., Zhao, F., McGrath, S.P., Li, H., Ran, W., Shen, Q., 2017. Mineral Availability as a Key Regulator of Soil Carbon Storage. Environmental Science and Technology 51, 4960–4969.

This is an excellent suggestion and a helpful reference. We will add a line, further down in the discussion of iron in the edaphic portion of the paper (~line 464) that reads:

“In addition, the observed relationships between crop diversity, iron fractions, and oPOM may reflect enhanced root-driven redox processes and rhizosphere exudation in more diverse systems, which can promote iron mineral transformations and the formation of short-range-ordered phases that facilitate aggregation and the occlusion of particulate organic matter.”

Again, this is kind of hard without knowing what cover crops were used or in what combination. I think the actual identities of the cover crops may make a huge difference in their contribution C and nutrient cycling. There is agricultural literature pointing at these differences in litter/biomass decomposition that could potentially contribute to some of the processes leading to oPOM formation. This second note doesn't need to be added to the text, but just a note for the authors.

Smychkovich, A., Glaze-Corcoran, S., Keiser, A., Hashemi, M., 2024. Assessing the Root and Shoot Composition, Decomposition, Carbon Contribution and Nitrogen Mineralization Trends of Single Species and Mixed Cover Crops.

We appreciate this observation and agree that cover crop species identity and mixture composition likely influence carbon and nutrient cycling dynamics through differences in litter chemistry, rooting characteristics, decomposition rates, and rhizosphere interactions. Across our study sites, cover crop compositions varied substantially, ranging from monocultures (e.g., rye) to multispecies mixtures including bell bean, vetch, oats, field pea, flax, teff, sunflower, and buckwheat.

However, the present study was not specifically designed to rigorously evaluate species-specific or mixture-specific cover crop effects on SOC fraction dynamics. In particular, representation across cover crop categories was uneven, with the dataset dominated by fallow and legume-containing systems and relatively fewer cereal-only cover crop systems. We therefore chose to focus our analyses on broader management gradients and functional groupings rather than species-level effects to avoid over-interpreting patterns beyond the resolution of the dataset. We agree that disentangling the effects of specific cover crop mixtures and residue traits on POM and MAOM formation represents an important direction for future work.

Line 435, the **sentence structure** here makes this difficult to parse, “Future on farm work could also account for interactions between practices and between practices and edaphic conditions. While we account for all practices simultaneously in our models, it is possible that, for example, simultaneous increases in tillage and continuous cover might have an especially positive impact on carbon fractions.”

Thank you for this note. A revised sentence could read:

“Future on-farm studies could further examine interactions among management practices, as well as between management and edaphic conditions. While our models include multiple

practices simultaneously, they do not explicitly test interaction effects. For example, the combined influence of reduced tillage and continuous cover may have non-additive effects on carbon fraction dynamics that are not captured by main effects alone.”

Also there are some studies on accounting for interactions between soil health/intervention practices in grasslands, maybe include Shangshi paper on this?

Liu, S., Ward, S.E., Wilby, A., Manning, P., Gong, M., Davies, J., Killick, R., Quinton, J.N., Bardgett, R.D., 2025. Multiple targeted grassland restoration interventions enhance ecosystem service multifunctionality. *Nat Commun* 16, 3971.

Isn't Fe a micronutrient included in Soil Health Tests for metals? It's just that the kind of mineralogy that is tied to the presence of Fe and its ability to stabilize C isn't a measurement, that in itself is too labor intensive of a measurement to be something to include in regular soil health tests at soil health labs.

Yes, Fe is often included in commercial soil health tests as a micronutrient, but right, the structure of that iron isn't parsed in most cases. Here we use the iron fractionation to isolate Fe relevant to SOC stabilization and organo-mineral complexes.

Line 465, pyrophosphate capitalized when it shouldn't be

Thank you for catching this- we will correct in revised manuscript.

Line 470, edaphic factors like texture (moisture/pore space) and pH may change dynamically over growing seasons due to management to be able to support plant growth. I'd be very curious to know if you get the same trends if you use soils collected from different periods in the growing season and with regards to California rain seasons. (This would be very interesting to also see in regions that experience full seasonality as well).

Agreed that pH changes dynamically, and certainly moisture as well, though texture and structure in our system is less dynamic. Unfortunately, we only had capacity to do fractions on one timepoint, but agree that it could be interesting to assess seasonal dynamics in a system like California with such varying weather conditions across seasons.

Line 490 what does directionality mean here?

An important point that requires clarification, thank you - I meant it in the sense that it is unclear whether enzyme activity is a driver of, or a response to, changes in SOC fractions, and that multiple opposing mechanisms might be operating. I will work to improve clarity of language here:

“However, the causal direction of this relationship remains uncertain: enzyme activity may both promote the breakdown of organic matter that contributes to MAOM formation and respond to increased substrate availability within existing carbon pools. As a result, enzyme activity can exert both stabilizing and destabilizing influences on SOC fractions, and relationships are often stronger and more consistent for POM pools”

This leads to the question of **what function or ecosystem function does each pool have in these agricultural landscapes** because I doubt the C in the MAOM pool is actually holding on to “old C” but its ability to selectively protect certain C compounds and release this in particular conditions may be tied to a function.

We thank the reviewer for this insightful comment. We agree that MAOM should not be interpreted solely as a passive or “old” carbon pool, but rather as a dynamic reservoir involved in both stabilization and potential release of organic matter. In response, we will add text to the Discussion to clarify the functional roles of each carbon fraction, emphasizing that MAOM represents microbially processed carbon associated with mineral surfaces that can contribute to both long-term storage and regulated nutrient cycling.

The free POM fraction reflects recent plant inputs and serves as a readily available substrate for microbial activity, supporting short-term nutrient cycling. Occluded POM represents an intermediate pool, where physical protection within aggregates slows decomposition and links carbon dynamics to soil structure.

What mechanisms generate formation of these different pools, why is it that oPOM and MAOM seem to have formed with strong influence from total Fe variables. This may again tie to the formation of “sticky” Fe oxides that help compact and form aggregates.

This is another great point that we’ve tried to make, but can make clearer - especially emphasizing the mechanistic links between iron mineralogy to both oPONM and MAOM. Specifically, we will highlight the dual role of reactive Fe phases in promoting aggregation (oPOM) and in providing sorption sites (for MAOM). We will make this more explicit in our discussion on iron.

Root exudates and enzymes contribute to MAOM formation however Hui Li’s paper on simple metabolites does not show this, this paper is focused on destabilization/disruption, which I don’t think this is an appropriate use of the citation here. I would refer to some of **Sokol’s papers for references on MAOM formation from root products**. Also: Liang, G., Stark, J., Waring, B.G., 2023. Mineral reactivity determines root effects on soil organic carbon. Nat Commun 14, 4962.

For evidence on root exudate contribution to MAOM formation.

Other references that may be cuing in to the dynamics you suggest about enzyme contribution to MAOM (though in most cases its via fungal enzyme degradation of DOM to then be MAOM)

Klink, S., Keller, A.B., Wild, A.J., Baumert, V.L., Gube, M., Lehdorff, E., Meyer, N., Mueller, C.W., Phillips, R.P., Pausch, J., 2022. Stable isotopes reveal that fungal residues contribute more to mineral-associated organic matter pools than plant residues. *Soil Biology and Biochemistry* 168, 108634. <https://doi.org/10.1016/j.soilbio.2022.108634>

Wang, T., Tian, Z., Bengtson, P., Tunlid, A., Persson, P., 2017. Mineral surface-reactive metabolites secreted during fungal decomposition contribute to the formation of soil organic matter. *Environmental Microbiology* 19, 5117–5129. <https://doi.org/10.1111/1462-2920.13990>

Thank you for all of these suggested citations. We will bolster some of the specific mechanisms of MAOM formation and destabilization. We will revise the paragraph to better reflect current understanding that root exudates contribute to MAOM formation primarily through microbial processing and necromass production, while also acknowledging their potential role in destabilizing existing MAOM. We have also replaced and expanded citations to include studies that more directly address root-derived contributions to MAOM formation (e.g., Liang et al., 2023; Klink et al., 2022; Wang et al., 2017).

Citation: <https://doi.org/10.5194/egusphere-2025-3440-RC1>

Reviewer #2

Overview:

The manuscript evaluates soil health management practices and edaphic factors influencing soil organic matter (SOM) and its pools in farmers' fields, making it relevant to the conditions experienced by farmers. However, I have significant concerns regarding the quality of the manuscript.

Key Points of Concern

1. Methodological Clarity:

The methodology lacks sufficient detail, making it difficult for other researchers to reproduce the study. Clear and explicit descriptions of experimental designs, procedures, and analyses are essential to ensure replicability.

Based on comments to the manuscript, we will resolve any ambiguities with regards to our methods. In particular, we will be happy to add more specific details regarding:

- Field size
- Depth of sampling
- Sampling design
- How we timed mid-season
- Length of soil drying
- Type of combustion
- Density fractionation methods
- Timing of sieving relative to drying
- How we shake samples
- Method of wet sieving
- Recovery calculations
- Bulk density sampling methods
- Specify relevant survey components
- Specify inclusion of polyculture lettuce

2. Vague Language:

There are several instances of vague language throughout the manuscript, which obscures the clarity of the findings and overall analysis. Precise statements are necessary to convey the research's significance effectively.

Areas where statements lack clarity have been noted from reviewer feedback. We are happy to re-write and ensure that key statements and areas that are unclear are made more precise. We will also ensure consistent usage of terms and define key phrases, or omit unnecessary jargon from the text.

3. **Abstract and Data Presentation:**

The abstract does not provide specific data or key results, which diminishes its effectiveness in summarizing the study's contributions. Abstracts should include concise, quantitative information to give readers a clear overview of the findings.

We are happy to include more specific findings and results in our abstract to provide an overview of our findings.

4. **Survey Data:**

While a survey was conducted, the manuscript does not present any data generated from this survey. Including survey results is vital for supporting the study's conclusions and demonstrating the research's relevance to practical applications.

While we include the survey instrument, we will also include raw data from surveys in the supplement to ensure these are made available to our readers.

5. **Site Selection:**

The selection of research sites is inadequately described, leaving questions about their appropriateness for the study. Clear criteria for site selection should be outlined to demonstrate that there are no confounding factors affecting the different soil groups and management practices being compared.

While we note how we identified participating farmers, and detailed soil information for each site, we will clarify our statements around why we chose to work with organic farmers, and the statement on synthetic confounders, which may have caused confusion.

6. **Management Practices:**

The manuscript fails to indicate the management practices employed on the various farms, which is critical for understanding the context of the study. Detailed descriptions of the practices used are necessary to assess their impact on soil health and SOM.

Management practices were listed in table 1, but acknowledge that more can be done throughout to clarify which practices were employed and how we use the survey data on management to create our management gradient Z-scores.

7. **Data Collection Points:**

Data were collected at three time points, but these points are not adequately presented in the results section. Additionally, while data were gathered from three soil depths, the manuscript does not show this depth-specific data, which could provide valuable insights into soil dynamics.

As noted with reviewer 1, we recognize that including multiple timepoints was an oversight and should have been clarified that we only used the mid-season timepoints. We will clarify this, and also include more details on how mid-season was determined. Ultimately this was a collaborative effort with growers, informing us when plants were reaching maturity, and was evaluated as a mid-point, based on the variety of lettuce, between transplant and harvest.

8. Implications and Conclusions:

The implications and conclusions drawn from the study remain vague and lack specificity. Articulating clear study implications and actionable conclusions will greatly enhance the manuscript's contribution to understanding soil health management.

We tried to make certain implications and conclusions of our models more clear through Table 2 and Figure 2, demonstrating how and where different management strategies impact specific C fractions. However, as reviewer 1 also notes, we will do more to then link these more clearly with functional outcomes that are particularly relevant for agricultural systems.

9. Overall Quality:

In general, the manuscript suffers from poor writing quality, with some instances of repetition that detract from the clarity and coherence of the arguments presented.

We agree that several sections of the manuscript will benefit from clearer and more concise language. In revision, we will streamline repetitive phrasing, improve consistency in terminology, and sharpen the presentation of key findings and implications.

Conclusion

In summary, while the manuscript provides important insights into soil health management practices relevant to farmers, it requires substantial revisions to improve methodological clarity, data presentation, and overall writing quality. Addressing these concerns will enhance the manuscript's rigor and impact.

We made note of some specifics from the in-text edits and note how we might address them below, some of which we have incorporated into above responses:

- Define working lands, or use alternative term
- Clarify between management decisions versus practices
- Clarify vague language/verbiage
- Clarify organic matter linkages to soil health? Specify soil OM
- Clarify that MAOM can cycle more quickly as well.
- Clarify MAOM vs POM structure and breakdown of POM
- Eliminate or clean up transitional adverbs
- Clean up/clarify why we chose organic farms and if/how this relates to confounding effects of synthetic fertilizers and pesticides
- Clarify the practice gradient

- Ensure consistent usage of SOM
- Clarify methods, as noted above
- Correct/verify min/maxes
- Add CEC units
- Clarify climate consistency and why relevant
- Clarify statistical importance versus importance of other factors in results
- Clarify positive association variables
- Clarify meaning for low-to-high comparisons table
- Sharpen main messages and take-aways
- Report survey results in supplement

We appreciate the reviewers' recognition of the relevance and potential applicability of this work across agricultural systems. We believe the revisions outlined above will substantially strengthen the manuscript's methodological transparency, conceptual clarity, and mechanistic interpretation. We respectfully request the opportunity to submit a revised manuscript for further consideration.

Best,
Kenzo Esquivel, on behalf of all co-authors