Reply to Reviewer #1

# Comments:

1. **The first point of the highlight describes the advantages of the CF model over other machine learning methods. The advantages of the CF model are not suitable for the highlight of this study. Therefore, I suggest that the authors revise the first point of the highlight.**

+ drop

**2. In the second section (lines 76-184), the authors describe the fundamental information necessary to identify EOIR in general and discuss the causal forest approach in detail. The structure of the manuscript is redundant. Some of the descriptions belong to the methods section. Therefore, I suggest that the authors adjust the content of the section. Move some content to the supplement material and others to the methods section.**

**3. The description of materials and methods section is redundant, please move some unimportant details description to supplementary materials.**

**4. What is the unit of the topographical slope？ (line 131)**

* It is degree.
* I added the the unit of EC (dS/m) additionally, since another reviewer pointed out the units of EC

**5. There are 3 numbers in each small frame of Figure 1, please describe the meaning of each number in detail in the figure caption. (line 137)**

* I added the explanation for those numbers in the footnote.

**6. Some formulas in the manuscript are not numbered (lines 116, 120, 268, 291, 371, 389).**

* I numbered only referenced equations. Should I number all the equations?

**7. What are the exact number and proportion of test set training sets? (line 192)**

* I changed this sentence “For each simulated field, we generated a training data set and a validation data set.”
* The modified version is “After generating one thousand synthetic fields, we repeated to evaluate each of the ML methods by one thousand times. In an individual simulation round, one of the fields was used as a training data set. As a validation data set, a different field from a training data set in that simulation round was used”.
* Proportion of training dataset for

**8. I can’t open the code link (**[**https://github.com/tmieno2/ML\_VRA.git**](https://github.com/tmieno2/ML_VRA.git)**, lines 199 and 249) with my browsers (chrome, edge, and Firefox). Please upload the code to the public research data repositories (Zenodo, Mendeley Data, figshare, Harvard Dataverse, etc.), not GitHub. Please generate a separate DOI for your code and cite it.**

**9. Please convert the length units of the manuscript to international length units. (line 207)**

* I converted to those units to meter (m)
  + plot size: 60-ft × 240-ft -> 18.288-m × 73.152-m
  + subplot size: 60-ft × 60-ft -> 18.288-m × 18.288-m
  + plot size: 10-ft × 10-ft -> 3.048-m × 3.048-m

**10. Please add the number of rows and columns to the plots, subplots, and cells schematics in Figure 2. (line 209)**

* I added the number of rows and columns of plots, subplots and cells in Figure 2.

**11. The titles of sections 3.2.1 and 3.2.2 do not provide useful information to the readers, please revise the titles. (lines 342 and 373)**

* Current name:
  + 3.2 OFPE Experiments and Estimating Site-specific Optimal N Rates
    - 3.2.1 RF, BRF, and CNN
    - 3.2.2 CF
* The title of section 3.2.1: Site-specific EONR estimation by RF, BRF, and CNN
* The title of section 3.2.1: Site-specific EONR estimation by CF
* Or, we could change the title of section 3.2 (e.g., Machine Learning Algorithm to Estimate Site-specific EONR) and use the same title for section 3.2.1 and 3.2.2

**12. The titles of 4.1 and 4.2 are confusing, please revise. (lines 410 and 457)**

* Current name:
  + 4.1 EONR Estimation
  + 4.2 Yield Prediction and EONR Estimation
* The title of section 4.2 could be changed to “The relationship between the performance of yield prediction and EONR estimation” (?)

**13. Why there are no CNN results in Figures 8,9, and 10? (lines 439, 441, and 453)**

* I need to add the explanation for it in section 4.1 EONR estimation.

**14. I suggest that the authors add to the supplementary material a table of the training accuracy of the different models.**

* run simulations on training dataset, and report the results.
* Seed
* The difference between training and testing dataset (the different of noise)

**15. Please add a separate section for research gaps or uncertainties. Are there any prerequisite assumptions for using the CF model?**

**16. Please revise the conclusion. Most of the content is discussing the uncertainty of the study. Please move the statement about uncertainty to a separate uncertainty section.**