

# ***Interactive comment on “Modeling Land Use and Land Cover Change: Using a Hindcast to Estimate Economic Parameters in gcamland v2.0” by Katherine V. Calvin et al.***

## **Anonymous Referee #1**

Received and published: 28 December 2020

### GENERAL COMMENTS

In this manuscript, Calvin et al. conduct a large ensemble of simulations for the United States with the gcamland land use model to optimize model structure and parameters related to landowner decisionmaking. They find that an adaptive expectation structure performs best, in contrast to the linear structure previously used in GCAM. The authors also test the sensitivity of the optimization to various setup choices—including objective function, timestep, and calibration year—finding that, where the results are not robust across setups, they differ in mostly predictable and understandable ways.

This manuscript represents two important contributions to the development of gcam-

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land, which seem to not often be explored by other land models: The challenging of the model with historical data, and the testing of alternative structural formulations. (I am admittedly not familiar enough with the land use modeling literature to say for certain that the authors have included all relevant previous work in their review of previous literature, however.) It also provides a useful blueprint through which similar work could be performed for other land models. The manuscript is well-written and clear from the introduction through the conclusions, although I have some minor comments and suggestions (listed below).

I thus recommend that this manuscript be accepted subject to minor revisions.

### SPECIFIC COMMENTS

- The authors should better tie the paragraph at lines 69–79 (re: previous attempts to parameterize land use models based on real-world information) into the rest of the paper. In the following paragraph, they could more explicitly lay out the novelty of their work relative to what's been done before in this area. Then, in section 2.1.2, they should tie back more explicitly into the idea of elasticity, which is how they characterize much of the work pointed to at 69–79.
- Did the authors use any R (or other) packages to perform the Latin Hypercube sampling and/or to evaluate the results? If so, it would be helpful for reproducibility to specify those.
- Fig. 4 needs at least one other marking on the X-axis. Ideally, match Figs. 5 and 6.
- L334: "the difference in the bias area volatility" is confusing. Maybe a word is missing?
- Fig. S2: A 1:1 line would be helpful.
- Fig. 6: It would be helpful to have the thick lines below the rest, since that would allow the thinner lines to be seen even when they overlap it (which they frequently do).
- Fig. S11: Middle panel only includes bars for "5 year timestep (RMSE)" because that

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was the only setup where the error-minimizing setup used that parameter, right? That should be mentioned in the caption.

## TECHNICAL CORRECTIONS

- Lines 152–153: NRMS should be changed to NRMSE for consistency with the rest of the manuscript.
- Fig. 3: "... fodder crops \*are\* excluded..."
- L329–330: Units should be added to the first part of the sentence. Additionally, it feels weird to say "the parameter sets... result in an average observed Corn area", as the parameter sets don't have anything to do with the observations.
- Figs. S4, S5, S7, S9, S12, and S13 should be mentioned in the main text.
- Rounding inconsistencies between Sect. 5.2.1 and Table S3 should be corrected.
- "Ag, Forest, and Other" is referred to in the Supplement as "AgForest\_NonPasture". Ideally, one should be chosen for consistency.

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