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Interactive comment on "Spatially variable hydrologic impact and biomass production tradeoffs associated with Eucalyptus cultivation for biofuel production in Entre Rios, Argentina" *by* Azad Heidari et al.

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RC1: This paper is well organized. Method description, scientific results, and conclusions are presented clearly and concisely. The number and quality of references are appropriate.

AC: Thank you for your encouragement.

RC1: In my opinion, calibration and application of the SWAT model itself in this study do not carry sufficient scientific meaning. Without an in-depth discussion on physical

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processes represented by the calibrated SWAT and how to apply the research results, this research will be difficult to be implemented by potential stakeholders/policymakers.

AC: Although extensive field measurements were not available for this study, the following physical processes were checked for accuracy using literature values in this modeling work including: streamflow (separated to baseflow and surface flow), ET, N uptake, LAI development, and Biomass production. We can add some discussion of these physical processes and some additional (literature-based) justification of the calibrated parameter values (Table S1), along with some discussion of soil characteristics and geologic setting.

RC1: Moreover, simple discussion on water consumption by eucalyptus plantation in section "3.5 Green water footprint" does not represent the water footprint well.

AC: We have reported the water footprint at the farm gate level as discussed on (P10, L2). Farm-gate level water use is a well-accepted term among the biofuel research community. For example: "...this study only reports the water use at the farm gate, considering that total water use in the life cycle of biofuels is dominated by the feedstock production stage (Gerbens-Leenes et al., 2009)." However, unlike the paper cited above, we failed to mention that we evaluated the gross production of bioenergy, rather than the net production, meaning that we did not account for energy inputs in the production chain. Neglecting energy inputs means that the water footprint will be underestimated, especially when bioenergy production systems have large energy inputs. We will add this clarification and limitation to the paper.

RC1: The impacts of bioenergy crop growth on sediment and nutrient losses in the watershed are important but not covered in this research.

AC: We agree on the importance of water quality issues. Unfortunately, water quality measurements were not available for this study, and thus sediment and nutrient losses were not reported. However, we did check that N uptake was within a reasonable range (P7, L3). If the reviewer would like to see the sediment and nutrient losses simulated

by SWAT, we can add these uncalibrated results either in the paper or supplemental information. A study of water quality impacts of eucalyptus development in this region remains as important future work, and we would be happy to add a statement to this effect.

RC1: Additionally, tradeoffs between the costs of eucalyptus plantation and potential environmental impacts were not considered in this research, either.

AC: We agree this is an important aspect in decision-making, but as with water quality, detailed economic data were not available for this study. We would be happy to mention this as important future work.

RC1: What is the novel idea this manuscript provided to scientific knowledge? Does this manuscript develop a new methodology, tool, or theory? What can readers learn from this research, and how can they adopt it in other regions?

AC: This study provides a simulation-based approach for planning and managing biomass production at the watershed scale, accounting for tradeoffs between biomass production and water use. A novel aspect is the consideration of spatial variability. As a result, producing a map such as Figure 7 provides a framework that can be applied in other contexts to locate areas with relatively high productivity and/or low hydrologic impacts. In addition, as acknowledged by the second reviewer, "to the authors' knowledge, this is the first application of SWAT that focuses on improving eucalyptus growth parameterization and investigating the hydrologic impacts of eucalyptus plantations for biofuel development." We provided a detailed calibration and parameterization for plant growth (including LAI and biomass production), and the resulting plant growth parameters may be valuable for use in other regions, with potentially small adjustments.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2019-274, 2019.