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Hydrology and Earth System Sciences
Discussions

Interactive comment on "From skill to value: isolating the influence of end-user behaviour on seasonal forecast assessment" *by* Matteo Giuliani et al.

Anonymous Referee #2

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This is a study into the value of inflow forecasts in water release decision making, focusing on the benefits to agricultural profitability. Previous studies have demonstrated how forecasts can be adopted in reservoir operations to marginally improve on a prespecified objective. This paper offers an incremental advance by coupling the reservoir model to an agricultural model, allowing for calculation of profits associated with the updated release schedule. The subject is certainly of general interest to the hydrological community. The paper is well written and the method easy to follow. While the study is mostly sound (I have a few concerns outlined below), a significant contribution to knowledge is missing. One can easily deduce without this study that reduced water supply deficits in a reservoir release model should lead to increased profits for

crop-growers relying on that water. The monetary values provided cannot be offered as a contribution either, since they are not reflective of actual profit gains that would be gleaned by crop-growers (partly because the reservoir operations are stylized for this case study rather than representing real world operations). The approach taken is described as a "novel evaluation framework". It appears to be a forecast product providing information for a reservoir model, the release from which forces an agricultural profit model. One-way coupling of models (which is what I understand this to be) does not qualify as a novel framework in my view. Lastly, because the study is conducted on a single site and using a short time series with only one drought (with much of the analysis drawn from performances during that drought), the conclusions are not generalizable. The authors acknowledge this lack of generalizability in their final sentences, and I think that their suggestions for future research are actually required in this paper to help with the knowledge contribution. While a single case study can be valuable, I cannot see compelling new insights on value of forecasts arising from this analysis to warrant publication. I think the suggested exponential relationship between forecast skill and farmer profit could be a significant contribution if demonstrated and elaborated more carefully through more detailed analysis across a range of possible droughts and with incremental adjustments to the forecast skill. I would be supportive of publication of this paper if the authors can (a) deepen their analysis to generate a more compelling advance on existing knowledge, and (b) address the small number of other concerns listed below.

Specific comments:

The decision to use quadratic water supply deficit as the objective function is not fully justified. If the purpose of the water supply is to meet farmer needs, and if profit is the goal of the farming community, then why not use farmer profit as the objective? This would greatly improve the interpretability of the results, particularly for aim (iii) "the inference of the relation between gains in forecast skill and gains in end-user profit." Currently, the paper lacks discussion on how the discontinuity between the optimization

objective and profitability affects the conclusions drawn. In particular, the squaring of the water deficit objective would normally result in hedging behavior that would reduce overall profit to avoid possible cases of extreme deficit. It's also not clear from this analysis how water deficit affects profit. Does a small deficit necessarily imply loss of crop production, or can farms run at full profitability during periods of small or moderate deficit?

The decision to vary the ensemble selected from mean to 10th and 25th percentiles to capture drought risk aversion requires better justification, too. It would seem more prudent to adjust the objective to represent risk-averse preference (e.g., increasing the exponent applied to the objective, or, if changing the objective function to farmer profit, adding penalties for very significant losses) than to deliberately under-estimate the inflow.

Line 81: please clarify what "heavily man-overworked" means (and why its relevant).

Line 89: do you mean "most Southerly" point on the lake shoreline, or the "near the outflow" of the lake?

Line 257: Why bother with the Pareto analysis if the flood objective effectively becomes a constraint. I don't think the readers of the study need all of the detail of the Pareto analysis if multi-objective optimization is not actually used to generate the key results.

Line 260: the fact that profits are improved through operations is used to support the idea that forecasts can be valuable for managing extreme drought. Presumably the impact is greatest during drought because this is the only time when profit can be compromised (i.e., average flow conditions are unlikely to lead to supply deficits, meaning forecasts are not actually useful except leading up to and during drought). Is this correct? If so, why not focus analysis on droughts and also introduce other drought events to help support and generalize these conclusions?

Line 311: Has this function been fitted across all of the points on Figure 6? Please

justify or comment on the appropriateness of combining the all-years and 2005 results in the same function. The idea of exponential relationship between profit and forecast skill would be a powerful conclusion, but is surely best demonstrated using (a) a model that can adjust forecast skill incrementally allowing generation of many data points, and (b) repeating the analysis across multiple droughts.

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