

Interactive comment on “Small farm dams: impact on river flows and sustainability in a context of climate change” by F. Habets et al.

Anonymous Referee #2

Received and published: 27 March 2014

“Small Farm Dams: Impact on River Flows and Sustainability in a Context of Climate Change”

This paper discusses the hydrological impacts of small farm dams on river flows in France as a function of spatial variations in hydrometeorological conditions, primarily precipitation patterns. The hydrological impacts were explored utilizing a small farm dam model connected to a hydrometeorological model, with several scenarios related to different filling capacities, catchment size and filling period being utilized. Although the perceived need for such dams in western France is high, the model results suggest that the creation of such dams, particularly in NW France, would result in significant impacts on river flows as well as relatively inefficient filling of the ponds, particularly in the context of climate change. The ability of the dams to increase irrigation water

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availability is limited by the decreased ability of the tanks to fill up under climate change. In general, it is shown that areas where the impact of small farm dams on streamflow is the greatest, the filling efficiency of the dams is also the lowest.

General Comments

The authors make an important point that the use of small surface-water retention ponds such as the farm dams of southwestern France will impact the water balance of a basin. While increasing the availability of irrigation water, the dams can decrease river flows or provide very inefficient filling. It is also correctly noted that while the need for increased irrigation water is most acute during drought years, and may increase further in the face of climate change scenarios, such structures are least able to provide adequate levels of supplemental irrigation during drought years. The overall contribution of such structures may therefore be overestimated.

The paper, however, has a number of points that should be addressed:

- 1) Although the above points are made, they could be made more clearly. For example, the authors often note "impacts" on streamflow, but don't clarify what these impacts are, or the implications of the impacts.
- 2) For the volume calculations, it is assumed that all irrigation water in the Pays de la Loire region currently comes from small farm dams. A reference should be given to support this assumption.
- 3) It is stated that the impact of dams could reach 10% of the annual discharge - what is this impact? Is it meant that 10% is withheld that would ordinarily go to runoff?
- 4) It is written that "as long as the dams were small and sparsely distributed...the impact was reduced. What impact do you mean? Please clarify.
- 5) The estimated pond area is based on an arbitrary depth value (3 m) and the actual irrigation water used in the region. These estimations, however, do not take into account evaporative losses from the ponds. These evaporative losses should be considered

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when calculating pond size.

6) In your discussion, you note that evaporative losses would affect the estimated impact on river flow by less than 10%, but it isn't clear why these losses were not included in the model simulations.

7) Also regarding pond size, and as noted in the discussion, power law relationships are usually utilized for area-volume relationships of such tanks. Although the authors indicate awareness of such relationships, it is not clear why they used the simpler geometric relationship for estimating tan

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 14391, 2013.