

Interactive comment on “Supplemental irrigation potential and impact on downstream flow of Karkheh River Basin of Iran” by B. Hessari et al.

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Author comment to Reviewer #1

We would like to thank the reviewer for his/her constructive comments and questions, which helped us to clarify a number of important points. Please find below the reviewer's comments (RC) with our responses (AC) and the corresponding changes we have made in the manuscript.

RC: # Criteria for identifying the potential rainfed areas for supplement irrigation has been considered as 1000 m around the stream network (Section 2.4). Is conveyance of water restricted beyond this buffer due to topographical, technological and economical constraints? Why are the rainfed areas beyond this buffer not potential for receiving

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supplement irrigation? This needs to be well justified.

AC: The main consideration for the selection of a distance of 1000-m distance from the stream is economic. It will not be feasible to develop large scale infrastructure for the application of one or two supplemental irrigations to the large areas that are covered by rainfed crops. As the results also indicate (Fig. 2), the irrigation is limited by the availability of the water resources not by the area of rainfed cropland. A distance of 1000 m ensures that supplemental irrigation can be supplied within a technically feasible distance from a water source, and within an elevation difference that does not impose uneconomical costs for water conveyance or pumping. It should also be kept in mind that the aim of the presented methodology is to assess the potential of supplemental irrigation; follow-up studies could be conducted to develop an economic optimization of the allocation of water resources. We have clarified the selection of the 1000-m distance in the text in Section 2.4 by adding: “without need for large investments in infrastructure or pumping”

RC: # Are the strategies considered for supplement irrigation (Section 2.3) based on the average crop water requirement in the basin and does both the strategies implemented have similar and optimum water productivity (main goal of supplement irrigation)? The basis for adopting these strategies needs to be further elaborated.

AC: The irrigation strategies were based on results of irrigation experiments in farmers' fields in two different sub-basins in Upper Karkheh River Basin, which in turn were based on long-term experience of local research and extension staff. We have improved our explanation of the selection of the irrigation strategies in the text through the following addition in Section 2.3: “These irrigation strategies represent recommendations that can be implemented by local farmers and that provide policy makers with clear scenarios for improving yield of rainfed wheat with supplemental irrigation in upper KRB.”

RC: # In Section 2.4 it is mentioned “all rainfed crop areas with less than 20% slopes

were considered potentially suitable for supplement irrigation". But later on the same Section it is argued "Ideally, slopes above 12% should neither be cultivated with field crop nor irrigated: : :: : :". Also i have the impression that three different irrigation methods are considered based on the land slopes (0 – 12%). Section 2.3 indicated that estimation of supplement irrigation requirement considers conveyance efficiency. As conveyance efficiency is highly depended on the irrigation method implemented, it was not clear how conveyance efficiency was considered for estimating supplement irrigation requirements for the rainfed area having slope in the range of 12-20%.

AC: The broad range of slopes (up to 20%) was used to cover the general view of maximization of cultivated land, as held by various stakeholders. Luckily, our results (Fig 2) show that the potential for supplemental irrigation of land on slopes above 12% is very limited. But we agree with the reviewer that our writings give an inconsistent impression. Therefore, we have rewritten the first sentence of Section 2.4 as follows: To assess the maximum possible area of land for supplemental irrigation, all rainfed crop areas with slopes less than 20% were considered.

We agree with the reviewer that the different irrigation methods recommended for the different slopes have different field application efficiencies. However, the conveyance efficiency, as mentioned in the text, represents the losses of irrigation water during transport from the source to the field. Thus the irrigation amounts represent the amount of water to be taken from the river. We have removed the word applying in the text (applying a single irrigation, applying two irrigations), because it was confusing. We have also added the following explanation and reference: "[conveyance efficiency,] assumed to be approximately 75% for earthen channels between the stream and the field (Brouwer et al., 1989). [...] These would result in field applications of 75 mm (fall) and 112 mm (spring)."

Brouwer, C., Prins, K., and Heibloem, M.: Irrigation water management: Irrigation scheduling. Training manual 4. FAO, Rome, 1989.

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