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Hydrology and Earth System Sciences Discussions

Interactive comment on "Impacts of agricultural intensification through upscaling of suitable rainwater harvesting technologies in the upper Ewaso Ng'iro North basin, Kenya" *by* J. K. Mutiga et al.

J. K. Mutiga et al.

kinotijk@gmail.com

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Dear Prof. van Griensven, Referee Editor, HESS. Let me take this opportunity on behalf of my co-authors to thank you very much for your valuable time in reviewing our manuscript. It is in this regard that we would like to appreciate the care and attention you put into the review of this manuscript. Their comments are useful and have been addressed as follows to clarify various issues raised. We now feel confident that the issues have been clearly written and explained. Comment 1 Calibration procedure followed Since the basin under study has poor coverage of meteorological stations

a common problem problem within Sub-saharan Africa (SSA), Mt. Kenya sub-basin which is being referred to as in this manuscript area of interest (Figure 1) was used for both calibration and validation of the model simulations since it long term quality daily climate data. Trial and error method together with the expert knowledge about the area was used to adjust the values of the parameters identified (Table 1). Sensitivity analysis was then carried out evaluate the effects of parameter variations on the model output (stream flow). Sensitivity tests were run to identify the most sensitive model parameters. To avoid over parameterization, only the most sensitive parameters were adjusted during the model calibration (Table 1). However, table showing the parameter values not included since the authors were trying to keep the manuscript pages low the cut the cost of publishing. But were convinced that the goodness of fit between the simulated and the observed was sufficient since it demonstrates the goodness of fit which we agree was an oversight and should have been included.

Page 2486, line 10 reads “Based on land use change scenarios, model parameters (Table 1) were recalculated and the model was re-run to deliver the modified flows”. This does not main they were re-calibrated, it means that the values of these parameters (Table 3) and NOT (Table 1) will vary with varying land uses, sorry for this confusion.

Comment 2 The length of simulation used was (1970 to 1990) where 1970 to 1980 was used for calibration and 1981 to 1990 for validation. This was considered good enough since climate variability in the basin has been observed to occur every 5years.

Comment 3 Implementation of rainwater harvesting scenario This was done was done at both water use input data level and management input data level (irrigation operation). Here including irrigation scheduling take care of the supplementary irrigation (SIR) during the dry spells (January to March and August to October). Comment 4 How was climate data for 2003 to 2013 obtained? It was assumed that the climate will not change, and therefore the status quo conditions will remain throughout the study period.

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Comment 5 How could the authors justify results such as on 2488, line 5-10 stating that the groundwater contributions were going down due to RWH? The groundwater component contributing to surface runoff (lateral soil flow as shown on Table 3) reduced but not the total groundwater components. The authors agree with reviewer that ''somehow, RWH should increase the infiltration (runoff water can be used for irrigation, hence increasing the green water storage with the potential to have more penetration to the shallow aquifer)" and this fact is well shown in Table 3 (Shallow GW flow, Deep aquifer recharge, Total aquifer recharge and soil percolation) and therefore no contradiction at all.

Comment 6 Processing of Land use maps and DEM. This is well explained on page 2485 lines 1-15. This is secondary data set and therefore no validation was done. The digital elevation model (DEM) was also secondary data with 20 meters resolution.

Comment 7 Why was the Penman-Monteith method used for evapotranspiration? (5) 2480- line 13. The Penman–Monteith method was used in this study since its input requirements were available (1970 to 2005) and this was used to validate simulated evapotranspiration.

Comment 8 2484 line 20: daily performance is giving, while the rest of the paper states that performances are measured on monthly basis. This is an error, it should be monthly performance.

Comment 9 Natural resource base here constitute water, pasture, vegetation and soils.

Comment 10 Agricultural drought is defined by Ngigi et al 2006 on page 2481 line 23 to 24. It is the drought resulting to crop failure due insufficient rainfall amounts.

Hoping to have clarified the major issues raised, I look forward to hearing from you and thank you for having interest in our work.

Yours sincerely, Jeniffer Kinoti Mutiga (Corresponding Author).

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Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 2477, 2011.