

## ***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.***

### **Anonymous Referee #2**

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This paper presents an interesting case study from Kenya on assessing the impact of land cover/use changes and promotion of rainwater harvesting on the catchment scale water balance. The major limitations of this paper are: 1) the conclusions presented in the abstract and conclusions sections are not well supported by the presented results, and 2) Materials and Methods are not convincingly presented. Therefore, it is suggested to conduct major revisions before the final publication can be recommended. Specific comments: Conclusions: 1) Page 2488, lines 21-24: The authors conclude,

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"Moreover, the results obtained also show that basin hydrology was found to be relatively sensitive to changes in land cover/use attributes, with a general pattern of increasing surface runoff with a decrease in forest, bushes and grasses with a subsequent decrease in evapotranspiration" Similarly in the abstract (page 2478, lines 21-22) it is stated that, " The results show a decrease in base flow during 1987-2003 period with decreasing forest, bush and grass covers, which can be attributed to poor natural vegetation emanating mainly from overgrazing and deforestation for agricultural activities".

In my opinion, these statements are not well justified by the presented results. The main results in this regard are presented in table 3 on water balance under different scenarios. Looking at these results, and also the percentages of water balance components with regard to total precipitation, and comparing between the scenarios show that these changes are very small (please see the supplement). For instance, surface runoff changes only 1% when comparing 1995 and 2003, and only 5% when comparing 1987 and 2003. In my opinion, we cannot draw above mentioned conclusions on the basis of such small changes. One would expect small changes in water balance partitioning as result of year to year variations in the climate; even if the land use is kept constant. Furthermore, considering uncertainties in the modeling parameters and structure, the noted impacts may not be regarded as considerable changes. Therefore, it is suggested to re-examine the results on land use impacts and re-formulate the conclusions. 2) Page 2489, lines 9-12. The level of RWH is likely to influence the runoff changes. Therefore statement mentioning, "irrespective of the level of future changes in RWH", should be revised. 3) Page 2489, lines 12: Please check if base flow increase is 5% or this is ET which increased by 5%?. 4) Page 2489 lines 16-30, and page 2490, lines 1-8. These statements are neither well supported by current study or by proper references. Authors should consider revising this part. Author should either give more material or references in support or may wish to delete this part. Materials and methods 1) The author should provide more details on why they preferred manual calibration, when there are tools available

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for automatic calibration of SWAT, which might help achieve better calibration and validation results (e.g. SWAT-CUP, see Abbaspour, K.C.; Yang, J.; Maximov, I.; Siber, R.; Bogner, K.; Mieleitner, J.; Zobrist, J.; Srinivasan, R. 2007. Modelling hydrology and water quality in the pre-Alpine/Alpine Thur Watershed using SWAT. Journal of Hydrology 333: 413-430. Abbaspour, K.C. 2008. SWAT-CUP2: SWAT calibration and uncertainty programs - A user manual. Department of Systems Analysis, Integrated Assessment and Modelling (SIAM). Duebendorf, Switzerland: Eawag, Swiss Federal Institute of Aquatic Science and Technology ). 2) In Table 1, it will be good to add the final values or final ranges of these parameters. 3) Calibration and validation results are presented only for the outlet of the study catchment. It is also mentioned (figure 1) that there were some other flow gauges. It would be good to add a table on NSE and R2 for all the flow gauges used in the calibration and validation, though some may have few years of records only. Other comments 1) Please correct the units written for the y-axis of Figures 3 and Figure 4. 2) Table 3. Please provide partitioning of water balance components in terms of percentage of the precipitation. You may wish to add these values in the parenthesis of table 3. 3) Add more information on recommended/promoted rainwater harvesting technologies in the study basin.

Please also note the supplement to this comment:

<http://www.hydrol-earth-syst-sci-discuss.net/8/C1667/2011/hessd-8-C1667-2011-supplement.pdf>

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