

Interactive comment on “Hydrological impact of rainwater harvesting in the Modder river basin of central South Africa” by W. A. Welderufael et al.

Anonymous Referee #2

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General comments

The main aim of this study was to assess the hydrological impact (water balance) of in-situ rainwater harvesting in the Upper Modder River Basin of Central South Africa (927.6 km²). Three scenarios were considered: (1) Baseline scenario, based on the actual land use of 2000, dominated by pasture (PAST); (2) Partial conversion of Land use 2000 to conventional agriculture (Agri-CON); and (3) Partial conversion of Land use 2000 to in-field rainwater harvesting (Agri-IRWH).

The GIS-based agro-hydrological model SWAT (Soil and Water Assessment Tool) was simply calibrated using observed daily mean stream flow data of a sub-catchment (419 km²) in the study area. SWAT performed relatively well.

C2860

The paper is written in well and clear English.

The bibliography is almost complete and of international broad. However, more relevant references could be added (see below).

The authors need to present well the model parameters and justify the choices and assumptions.

Specific and technical comments

P5053 L20: Rockstrom (2001): missing in the list

P5054 L10-28 You need to make more comprehensive review on of SWAT model applications related specifically to water harvesting in dry environment.

P5054 L23: Replace ‘suitable’ by ‘suitable’ in the whole paper.

P5055 L22: Conan et al. 2003b: missing in the list

P5056 / Study site Provide more details on: climatic characteristics, soil, land use, etc.. They are very important to understand the parameterization of the model.

P5056 L17 It is recommended to be replaced by “Model parameterization”

P5056 L18-23 Move to 2.3 Sensitivity and calibration (to be added as a separate section)

P5056 L21-22 Indicate the period of the observed flow data. Is it sufficient to calibrate the model by only one year (2002) data.

P5057 L26-28 How did you represent the IRWH in the model ?

P5058 L5-9 Very brief. Explain more the modification and attribution of CN.

P5058 / Sensitivity analysis Move the text (except the last phrase) to Material and method. You need here only to explain the data in Table 3.

P5058 / Calibration Mention and justify the use of those indices in Material and meth-

C2861

ods. '... simulation procedures, default and measured parameters ...' Be more specific.

P5059 L6-12 '... to capture some of the peak flows.' Give examples.

P5059 L15 Replace 'Fig.5' by 'Fig.6.'

P5059 L16 The abbreviations WY, DIRC and GWQ are first time introduced need to be spelled out.

P5059 /3.33 This section needs more comparison with other studies in similar environments.

P5061 L9 Replace 'Table' by 'table'

P5062 L8 It is recommended to make an analysis for different hydrological years: vert dry, dry, normal, humid. Any potential impacts on downstream users ?.

P5063 L3-7 You may provide other recommendations: model adjustments, etc.

P5064 L1 Choi et al. (2008) not found in the text.

P5064 L21-33 Resort the references starting with 'M'.

P5064 L30 Lin et al. (2007) not found in the text.

All tables and figures You need to spell out the abbreviations or make c.f.

P5069 Table 4 You may keep only the used and interpreted indices in the text.

P5071 Table 6 Why are using the SUM instead of the MEAN ?. I do recommend using only one decimal.

Tables 8, 9, 10: Delete the vertical lines.

P5078 Fig.1. You may add a photo for illustration.

P5077 Fig.2. Legends, names and scale are difficult to read. It seems that Rustfontein

C2862

dam was not considered in the modeling. Why ?

P5078 Fig.3. Enlarge the maps. Add one or two coordinates on the X and Y axis and indicate the projection system.

P5079 Fig.4. Add one or two coordinates on the X and Y axis and indicate the projection system. Add the location of climate station(s) Is the title of the figure is correct because the legends indicate that C52A is considered as a sub-catchment ?

P5080 Fig.5. Enlarge You may use bars for the rainfall. Is it an average or a specific year ?

P5081 Fig.6. Enlarge. You can put them in two pages. You may use bars for the rainfall. Is it an average or specific year ?

For the references I would also add some relevant published works for case studies in North Africa and West Asia:

Nasri, S., Albergel, J., Cudennec, C., Berndtsson, R. 2004. Hydrological processes in macroctchment water harvesting in the arid regions of Tunisia: The traditional system of Tabia. *Journal of Hydrological Sciences*, 49(2): 261-272.

Ouessar M., A. Bruggeman, F. Abdelli, R. H. Mohtar, D. Gabriels & W. M. Cornelis 2009. Modelling water-harvesting systems in the arid south of Tunisia using SWAT. *Hydrol. Earth Syst. Sci.*, 13 (10), 2003–2021.

Oweis, Th., Hachum, A. 2006. Water harvesting and supplemental irrigation for improved water productivity of dry farming systems in West Asia and North Africa. *Agricultural Water Management*, 80: 57-73.

Schiettecatte, W., Ouessar, M., Gabriels, D., Tanghe, S, Heirman, S., Abdelli, F. 2005. Impact of water harvesting techniques on soil and water conservation: a case study on a micro catchment in southeastern Tunisia. *Journal of Arid Environments*, 61: 297-313.

Interactive comment on *Hydrol. Earth Syst. Sci. Discuss.*, 8, 5051, 2011.

C2863