

Interactive comment on “Water availability, water demand, and reliability of in situ water harvesting in smallholder rain-fed agriculture in the Thukela River Basin, South Africa” by J. C. M. Andersson et al.

Anonymous Referee #1

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General comments

The objective of this study is to estimate water availability for in situ water harvesting (WH) and supplemental water demands (SWD) in smallholder agriculture in the large Thukela River Basin (29000 km²), South Africa by incorporating spatiotemporal process dynamics governing runoff generation and crop water demands and uncertainty considerations.

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The objective of the paper is of international interest with wide application in water scarce environments (dry areas).

The agro-hydrological model SWAT (Soil and Water Assessment Tool) was simply calibrated and evaluated with the SUFI-2 algorithm using available crop yield and discharge data.

The confrontation of water availability against supplemental water demand resulted in the delineation of in situ WH for smallholder systems sites with various levels of reliability.

The paper is written in well and clear English.

The bibliography is complete and of international broad.

However, the authors failed in presenting well the model parameters and justifying the choices and assumptions. The interpretation and discussion of the results lack also soundness especially when related to the analysis of the hydrological processes.

Specific and technical comments

P.4920/Abstract: Clarify whether it is for potential or for already implemented WH. Maize should be announced as the dominant/used/studied crop. Indicate the study period (years) and the rainfall amount. Add values of the model evaluation indices.

P.4924 L:1-7: Provide more details (average, min, max, etc) on precipitation and temperature in the study area as well as the soil characteristics (texture, depth, OM, water holding capacity, etc).

P.4924 L:25-27: 'There are ongoing efforts to promote WH ..'. You need to specify the areas already (if any) covered by WH systems and the targeted objectives. More information is requested on the types of WH techniques.

P.4925 L:3-8: Elaborate more on the choice of the SWAT model and especially it is successful applications in similar environments (dry areas).

P.4925 L:20-22: The paragraph 'Potential evapotranspirationtranspiration' can be moved to the section 2.2.2.:

P.4926 L:3: Why the subbasin threshold area was set to 2025 ha ?

P.4926 L:6-11: How homogenization to 10 m resolution was done with two maps of very coarse scales ?

P.4926 L:16: Indicate the length of climatic records.

P.4926 L:27-29: Be more specific: 'available quantitative data on water management', 'minor amount of missing values'.

P.4927 L:24-25: The types of non crop land covers (which represent 84% of the basin area) need to be specified and the use of default parameters requires justification.

P.4927 L:27: Reasons for the selection of SUFI-2

P.4928 L:12-14: Why the first observation period (Jan1st, 97 to Dec 31, 2001) was used for validation not calibration as it is done usually ?.

P.4929: Why the evaluation index of discharge is different from that of crop yield ?.

P. 4931 L:1: It is hardly difficult to consider that 100% of generated runoff can be considered available for WH.

P.4931 L:10: How the crop water deficit is known ? Any relations with the soil water content ? What level of water stress is accepted ?

P.4932 L:20: Any effects of exceptionally high runoff events ?

P.4932: L:28: Specify 'inadequate simulation of soil processes'

P.4933 Section3.2: In this section, the interpretation of the results needs to include the soil characteristics, the climate and crop parameters, etc.

P.4934 L:10-14: Specify the % of each main water balance component: rainfall, infiltra-

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tion, ET, outflow, etc.

P.4934 L:15-24: In this section and as above, the interpretation of the results needs to be related to soil characteristics, climate and crop parameters, etc.

P.4934 L:26: Provide complete name of the acronym ACRU.

P.4934 L:27: Precise the 50-year time period.

P.4935 L:6: How the altered land use has an effect only for $MAR > 300$ mm ?

P.4935 Section3.4: In this section and as above, the interpretation of the results needs to be related to soil characteristics, climate and crop parameters, etc.

P.4935 Section3.5: In this section and as above, the interpretation of the results needs to be related to soil characteristics, climate and crop parameters, etc.

P.4936 L:3: Why Spearman correlation coefficient is introduced only at this level and not at the methodology section ?.

P.4936 L:19: '7000 to 9000 ha ' (add percentage)

P.4936 Section 4.1: This section lacks comparison with other studies in similar environments.

P.4937 Section 4.2: The same remark as above.

P. 4949 Fig.1: The town labels are not clear on the map.

P.4950 Fig.2.: The box-and-whisker plots are not clear at all. How the observed maize yield is stable all over the calibration period ?. It is recommended to add the annual rainfall.

P.4951 Fig.3.: The plots are not clear and need to be redrawn.

P.4957 Fig. 7: Specify the period.

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