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Hydrology and Earth System Sciences Discussions

Interactive comment on "Using an inverse modelling approach to evaluate the water retention in a simple water harvesting technique" *by* K. Verbist et al.

Anonymous Referee #1

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General

The article is of great interest particularly, as the authors rightly say, few efforts have been made to quantify and publish the hydrological significance of improvements in small-scale agriculture. This is also partly evidenced by few very recent cited articles in the manuscript. The HYDRUS model is indeed an appropriate tool to explore this area of science. The article is well written which makes it very easy to follow. There are, however, some areas which, in my view, require attention for further improvement:

1. Page 4269 line 22: Explain clearly the spacing between these trenches and what

influences the spacing between them. When read in conjunction with Fig 2 it would appear as if there is an interval of at least 60m between the trenches for slopes as steep as 30%.

2. Page 4270 line 18: Twenty-two TDR probes on a 6mx2m plot sounds like a very high density especially when it is noted that (page 4271, line 16) a further 25 undisturbed samples are taken after a rainfall event. There is a strong chance that samples are taken too close to the probes thus affecting readings. More repetitions with less density of probes could have served better to confirm findings.

3. Page 4271, line 13: What is significance of 61 minutes for observing infiltration? Factors of 15 minutes are more common in infiltration analyses.

4. Page 4282, line 17: the interval 60min-5800min is too large. It is possible to show more pictures in between to highlight, in more detail, the advancement of the wetting face and its recession around the trench as a result of the rainfall event.

5. Page 4283, line 2: Indeed the trench is a zone of moisture concentration hence better crop performance is guaranteed. With no information on the density of trenches within the field, it is difficult to visualise the practical significance of the trenches e.g. can crops downstream of the trench benefit from this technique or not? If so up to what distance after a typical rainfall event?

6. Dry areas like the study site are usually characterised by shallow depths of soil. A free drainage boundary condition used in the simulation may not best represent reality. Application of other boundary conditions may see more moisture retention in the area between the trenches. Have these been explored?

7. The degree of slope is not mentioned. But if fig 2 is to scale, then the study has been conducted in very steep slopes. This could also partly explain why there is no evidence of infiltration after the rainfall event but only lateral sub-surface drainage in the top soil towards the trench. Is it the case then that closer spacing of the trenches

may result in more zones of moisture concentration hence more benefit to cropping?

8. Is it the case that, away from the trenches, infiltration does not occur to significantly affect the root zone?

Furthermore, it would be interesting if there is discussion on the likely impacts of up-scaling this experiment to whole field scale and possibly beyond. For example, trenches fill up with soil after some time,depending on effectiveness of upstream soil conservation structures. What management recommendations are to be advanced to maintain sufficient depths of the trenches so as to keep this technique hydrologically viable? What could be recommended to reduce loss to runoff given that the storage of the trenches is fairly small? Also, in practice, farmers do not cover soil surfaces (sufficiently) to prevent soil evaporation. What is the expected alteration to the water balance when more soil evaporation is occurs?

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 4265, 2009.