



# ***Interactive comment on “Negative trade-off between changes in vegetation water use and infiltration recovery after reforesting degraded pasture land in the Nepalese Lesser Himalaya” by C. P. Ghimire et al.***

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**Overview** This is an interesting paper that investigates the long term trade-off between leaving degraded land intact or re-establishing such land with forest cover. The authors successfully used a water balance approach coupled with a detailed assessment of the hydraulic properties of surface and sub-surface soils to show that the small increase in infiltration provided by reforestation was offset by higher evapotranspiration rates. The authors showed that water loss in reforested areas were substantially higher than

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that of degraded pasture and natural forest. This work has significantly important regional implications as the hydrological processes in the catchments of the Himalayas are poorly understood, despite the fact that these catchments supply water to millions of people. The results presented by the authors implore the need for better forest management in order to ensure that sufficient runoff be maintained through the dry season. The manuscript further adds to our knowledge of the impact of reforestation on the water availability, particularly in tropical regions, where such long term studies are generally very limited. I recommend this manuscript for publication. However, there are a few areas that must be addressed including minor grammatical and structural changes which should improve the quality of the manuscript.

Specific comments. P3439. L27. It may be a good idea to include examples of the unsustainable forms of land use. P3440. L14-16. Can it be specified if the natural forest or the plantation trees have access to groundwater. P3440. L17-18. Please indicate if the infiltration capacity is limited to surface infiltration or flow through the entire soil profile. P3441. L16-21. These studies suggest that infiltration rates were improved as a result of reforestation. Can more detail information regarding the increase in infiltration be provided? P3445-3446. L5-27. This is a very well described section of the land use. However, I do suggest that many of these characteristics can be included in a table, which makes comparison among sites very easy. I would also suggest the inclusion of site specific meteorological data as this is absent from the text. P3446. L14. Suggest the inclusion of the elevation of the pine forest site. P3447. L23. Suggest providing a description of the plot dimensions for each forest site. P3448. L8. Suggest including the depth of the gutters in the description of the dimensions. P3450. L24. Authors should be cautious with the wording, as it suggested that K was measured over the entire hillslope. Suggest including the number of point measurements that were made and then used to estimate the hillslope scale K. P3454. L15. Suggest that IOF is changed to HOF, which is more commonly used in the hydrology literature and is easily recognised. P3454. L20-21. This is a good assumption. Does the soil moisture data from the TDR probes support the assumption? P3455: L2-5. Looking at Fig 3, the K at

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the surface of the pasture and pine forest soils are significantly lower than the R15max. This suggests that under the rainfall conditions being referred to that water should not infiltrate through the surface or the 0.05–.15 m layers as has been suggested. The authors may want to review this and provide a clear description of which events would percolate through the soil. The perched water table should not develop if just below this layer the K increases to values above the R15max (L11–13). P3461: I agree with the recommendations for a multi-use forest system in these regions. I would like to suggest that something be included about the recommendations for this local area under investigation, particular what can be done in terms of reforestation i.e. natural vs. pine and also what approaches may be used to better manage the pine forest i.e. slow re-introduction of the native trees to the pine forests.

Technical corrections. P3441. L5. Suggest removing the word “become”. P3442. L15. Suggest removing “reviewed by”. P3443. L23–24. Suggest starting with the vegetation found at lower elevations then moving to vegetation at higher elevations. Also, since R. arboreum is occasional, can this be removed unless it is an important species? P3444. L14–15. Suggest removing the sentence “the rainy season (Monsoon) begins early July and ends by late September”, as it essentially repeats the previous line. P3453. L18. L24. Suggest removing “some”. P3454. L24. Change from Fig 2 to Fig 3. P3454: L25–26. Suggest removing “whereas” and simply state that the 187 mm of overland flow was produced annually. Suggest a similar restructuring for lines 26–28. P3455. L9–10. Suggest talking about the limited vertical percolation, which then affects SSF formation and not SSF affecting percolation. P3476. Fig 2. Should the y-axis in 2b read evaporation or evapotranspiration? P3477. Fig 3. This is a very good figure. I would also consider placing the depth on the y-axis and K on the top x-axis, which shows changes in K with depth, similar to those shown in many hydrology articles. P3479. Fig 5. Suggest including a description of the arrow connecting over-used to near-undisturbed forest in the figure caption. This would help explain why it is different from the other two arrows.

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