

Implementing contour bank farming practices into the J2000 model to improve hydrological and erosion modelling in semi-arid Western Cape Province of South Africa

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Abstract

Contour bank farming is a well-known agricultural management technique in areas which are characterised by intensive and erosive rainfalls. Contour banks are designed to reduce the flow velocity of overland flow and to intercept water before it concentrates in rills, thereby reducing the risk of soil erosion and land degradation. By their structure, contour banks noticeably impact surface runoff pattern both temporally and spatially. Also subsurface flow may be affected by contour banks. For example, if contour banks intersect the A- and B-horizon of the soil, it can cause significant infiltration of water into the C-horizon, which if saline, can generate saline interflow to downslope areas. Although these aspects have been highlighted in previous research efforts, the quantitative and qualitative impacts of contours on runoff generation and associated erosion dynamics or salinisation are rarely considered in process-based hydrological modelling approaches. In this study an approach was developed to improve distributed hydrological and erosion modelling by integrating contour banks in the delineation and routing of Hydrological Response Units. Applying the distributed and process-based hydrological model J2000 which was modified with a contour bank and erosion module it could be shown that the implementation of contour banks improved the model performance significantly.