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Effects of furrow orientation on water erosion in extreme rainfall events

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Contour tillage is the practice of tillage parallel to the contours of the slope. Contouring is considered a universal conservation practice which should significantly reduce the soil loss that would occur if a given field were ploughed along the maximum slope. On the other hand, contour tillage seldom exactly on the contour, particularly in landscapes of rolling topography. Runoff flows laterally along the furrows and collects in the low areas, where the probability of accumulated water overtops the ridges dramatically increases and then, the risk of concentrated flow erosion (rills and ephemeral gullies).

This paper is focused on the erosive effects of high intensity rainfall events in agricultural lands, giving a special attention to the influence of the orientated roughness due to the plough furrows on rill and ephemeral gully erosion processes. In order to evaluate the effect of orientated roughness, it is compared the erosive response of several fields which presented different roughness orientations due to different patterns of tillage: a) Contouring, b) Up-downslope, and vi) Oblique direction

The results show that oriented roughness due to tillage, i.e. direction of plough furrows, plays a important role on the overland-flow concentration process and consequently on the final runoff erosive capacity. Findings suggest the existence of a threshold value of rainfall intensity at which the contour tillage could not be an

effective practice to reduce water erosion. On the contrary, this practice could significantly increase the soil losses. Moreover, in extreme rainstorms the orientation of the furrows up-downslope could represent the best condition for mitigating the formation of ephemeral gullies. Up-downslope furrows facilitate drainage along downslope parallel channels and reduce concentration of runoff.

Keywords: contour tillage, water erosion, extreme storms, semiarid, land management.