



Preventing runoff and soil loss and increasing water use efficiency under irrigation with a moving sprinkler system

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Irrigation with a moving sprinkler irrigation system (MSIS) has become increasingly popular in recent years in arid and semiarid regions. However, high amounts of runoff and soil loss were measured from fields during irrigation with this system. The objectives of this presentation are (i) to determine the main factors that lead to high runoff and soil loss during irrigation with MSIS; (ii) to study the effects of surface runoff on water distribution and crop yields in an irrigated field; (iii) to present means that prevent runoff and soil loss. Under MSIS irrigation, the impact energy of the irrigation water drops broke down the aggregates at the soil surface and formed a seal with a resultant decrease in infiltration rate and an increase in runoff and soil loss. The average runoff and soil loss from a 5.5-m² plot in a clay soil irrigated with MSIS with weekly events of 50 mm were 12.5 mm and 64.6 g/m², respectively. In contrast, under the same irrigation management but after microbasins were tilled along furrows, retaining runoff and favoring the infiltration of water into the soil, the average runoff and soil loss were 3.3 mm and 13 g/m², respectively. In an experimental peanut field with a silt loam soil (300 by 120 m size and 3% slope) irrigated with MSIS, microbasins increased the uniformity of soil water content along the slope. In this treatment, the pod and canopy yields were fairly uniform along the slope, with coefficients of variance of 1.3 and 2.8%, respectively. In contrast, in control plots, where runoff was allowed to move downhill, soil water content was higher downhill than uphill because of the high runoff amount, and the pod and canopy yields increased from uphill towards downhill, with coefficients of variance of 8.6 and 15.5%, respectively. Spraying 40 kg/ha of a low-molecular-weight, nonionic, synthetic polymer on the soil surface of a potato field reduced surface runoff by 62-75% compared with the untreated soil treatment under MSIS irrigation. The irrigation efficiency (the ratio between crop yield and total water application) of the MSIS with various emitters was 31-56 kg/mm in untreated soil treatment and 49-66 kg/mm under polymer treatment.