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Improving Irrigation Performance in Hose-drawn Traveller Sprinkler Systems

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Abstract

Travelling sprinkler systems usually use a large volume gun-sprinkler that requires high operating pressure. These sprinklers deliver water at high application rates with large drops that can damage plants and destroy soil surface structure and in some cases lead to surface sealing which in turn reduces soil infiltration and leads to an increase in runoff. They can also be characterised as having low application uniformity, especially in windy conditions. The use of a line with medium-or low-pressure sprinklers, mounted on the system-moving vehicle, instead of the gun-sprinkler, can be an alternative to the use of traveller systems in some crops and topographic conditions. Smaller sprinklers require less operating pressure, the water drops are smaller and the overlapping of water jets can increase irrigation uniformity. Field tests were used to compare the performance of the traveller machine using a line of four sprinklers (250 kPa) and a gun-sprinkler (350 kPa), at three different travelling speeds, corresponding to three different application depths. The evaluated parameters were: irrigation uniformity, evaporation and wind drift losses, runoff and sediment yield. With wind speeds between 1.4 and 4.0 m/s, the traveller with the line of sprinklers allowed better irrigation uniformity for all travelling speeds. Evaporation and wind drift losses were similar for both system options, presenting significant differences only for the lowest machine velocity. Runoff increased along the irrigation events, with the gun-sprinkler option presenting higher values. However, due to some variations in the soil water content and water depths that occurred in the field tests, it was not possible to prove that the significant differences observed were caused only as a result of the use of a different system option. Sediment yield was higher in the events with the gun-sprinkler due to higher amounts of runoff and more soil detachment by the larger drops of this system option. From these field tests it is possible to state that the line of sprinklers option has some management disadvantages compared to the gun-sprinkler option. It is more labour intensive, and its height from the soil can be a limiting factor for use with some crops. In cases where its use does not interfere with the crop canopy it can allow irrigations with higher performance. It can also be used as an alternative for the first

irrigation events, especially in poor-structured soils that present more crust formation problems.

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