

## Precision sprinkler for small field plots

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Agronomists frequently wish to apply measured amounts of water to field plots, especially in rainshelter experiments. It can be difficult to achieve precision, uniformity and a sufficiently low application to avoid runoff. A high density of fine nozzles can achieve this, however blockages are a problem. The precision sprinkler described here was designed to meet the above criteria, at low cost.

Inside the rainshelter at Wagga Wagga the plot layout consists of five runs of seven plots, each plot measures 3.0 m long by 1.8 m wide. Two tracks have been laid down the length of the rainshelter and along these the precision sprinkler travels, straddling the middle run. The sprinkler consists of a box-shaped frame made of light-weight square tube, upon this main frame at a height to clear the crop runs a 9.0 m reciprocating sled.

Attached to this sled are five individual sprinkle bars, one per plot, each consists of 1.8 m of PVC pipe with 0.8 mm holes drilled every 40 mm in its underside.

Measured amounts of water, depending on the amount of 'rain' to be applied and the size of the plots to be watered, are stored in plastic drums 40 cm above the sprinkle bars. The water flows from the drums through self-coiling hose to the sprinkle bars and once air has been expelled from the hose the resulting syphoning effect gives a continuous even flow of water over the plots. Clear plastic hose in the side of the drums allows for quick monitoring of the water levels.

The reciprocating movement of the sled is achieved by a system of chains and sprockets. Horizontal pegs are attached to chains which run in continuous loops around sprockets at either end of the sleds travel, these pegs pass through vertical slots in the sled pulling it from one end to the other. When the sled reaches the end of its travel the pegs move around the sprockets, slipping up or down the slots pulling the sled with them. Direction is therefore reversed because the top half of the chain is travelling in the opposite direction to the bottom half. Power for the unit is provided by a 12 volt windscreen wiper motor which means that gearing down to a slow enough speed was not necessary.

Blockages in the sprinkle bars have been largely overcome by the use of inline filters and 0.8 mm holes, 1.0 mm holes were tried however while these eliminated any blockages the resulting increased flow of water was found to be much more damaging to the soil surface structure causing crusting and runoff. Crusting of this soil occurred with any method of water application e.g. micro-jets, drippers and rain. This watering system allows five 3.0 m x 1.8 m plots to be watered simultaneously, giving an even rectangular watering pattern, evidenced by the sharp boundaries and evenness of the plots.

The track laid for the precision sprinkler enables the unit to be repositioned exactly each time a particular plot or series of plots are to be watered. The added bonus is that damage to the crop is kept to a minimum and there has been no soil disturbance.

Costs are kept to a minimum by using second hand materials and lower priced alternatives where possible, for example second hand bearings were used as wheels for the sled and the drums originally held disinfectant.

An application rate up to the equivalent of 25 mm of rain per hour is possible without causing runoff. Differing numbers of plots and plots of different width can be watered by changing the number and length of the sprinkle bars, plot length can also be altered by adjustment to the length of travel of the sled.