Sprinkler Systems for Dummies: Optimizing a Hand-Moved Sprinkler System

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Summary

"Hand move" irrigation, a cheap but labor-intensive system used on small farms, consists of a movable pipe with sprinklers on top that can be attached to a stationary main. Our goal is a schedule that meets specific watering requirements and minimizes labor, given flow parameters and pipe specifications.

We apply Bernoulli's energy-conservation equation to the flow characteristics to determine sprinkler discharge speeds, ranges, and flow rates. Using symmetry and a model of sprinkler coverage, we find that three sprinklers, operating 57 min at 9 consecutive cycling stations during four 11-hour workdays, with the sprinklers 9 m apart on the 20 m mobile pipe and six mainline stations spaced 15 m apart, will water more than 99% of the field. Our computer model uses a genetic algorithm to improve the efficacy to 100% by changing sprinkler spacing to 10 m and adjusting the mainline station spacing accordingly.

The text of this paper appears on pp. 237–254.

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