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Dunham, Ben; Francischetti, Steffan; Nixon, Kyle

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. (Only the abstract of this paper appears in the printed version of The UMAP Journal. The full text is available on the Tools for Teaching 2006 CD ROM (ISBN 1-933223-07-03) and at <http://www.comap.com> for COMAP members, pp. 237-254.)

Classification: M55 N65

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