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ENGINEERING

HYDRAULICS OF SURFACE IRRIGATION

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The problem of predicting the advance of irrigating streams down a border strip was investigated for the two-dimensional case by model analogy. The Hele-Shaw viscous fluid model used consisted of two closely spaced parallel glass plates between which a viscous fluid (glycerine) flows. The soil part of the cross section was simulated in the lower one-half of the model by compressed fiberglass filter material.

Tests were conducted using four stream size and five slope variables. The flow patterns were recorded using a 35 mm camera and the data were obtained from the negatives. The data were transformed into dimensionless parameters and their functional relationship was obtained by multiple regression analysis.

The resulting equation gives the advance distance as a function of time, flow rate, cumulative intake increment, roughness viscosity, gravity, and width:

$$x = 1200\, t^{-1.1} q^{1.7} I^{3.9} C^{-3.3} V^{1.1} g^{.3} b^{8.2}$$

Fair agreement with field data was obtained.

Note

1. Contribution from the Northwest Branch, Soil and Water Conservation Research Division, Agricultural Research Service, USDA, in cooperation with the Idaho Agricultural Experiment Station.