1958

EC58-704 Efficient Irrigation

Paul E. Fischbach

H. R. Mulliner

John F. Decker

E. C. 58-704

EFFICIENT IRRIGATION

Paul E. Fischbach, H. R. Mulliner, John F. Decker

Efficient irrigation is obtained by filling the effective root zone of the crop each irrigation and by minimizing run-off.

Since dry soils will take in water much faster than the basic intake rate, water should be applied in larger volume at the start of irrigation with the furrow stream reduced after furrows have been wetted. Rule to follow: Get stream of water through each furrow in one-fourth the total time it takes to irrigate, then cut back the furrow stream.

Siphon tubes or gate opening should be selected on the basic furrow stream size. Two or more tubes or twice the final gate opening per furrow may be used for the initial application.

EXTENSION SERVICE
UNIVERSITY OF NEBRASKA COLLEGE OF AGRICULTURE
AND U.S. DEPARTMENT OF AGRICULTURE
COOPERATING
W. V. LAMBERT, DIRECTOR

Slope, intake rate and length of run must all be considered in determining siphon tube size and size of gates.

The number 10 divided by slope gives the maximum non-erosive stream size per furrow. (Siphon tube or gate should discharge only 1/2 or 1/3 of this amount).

Examples

2.0% slope - 5 gpm	.5% slope - 20 gpm
1.0% slope - 10 gpm	.4% slope - 25 gpm
.9% slope - 11 gpm	.3% slope - 33 gpm
.7% slope - 14 gpm	.2% slope - 50 gpm

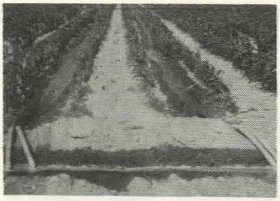
Basic intake rate varies between soils and for the same field at different irrigations. The following data may be used as guides:

Soil Texture	GPM/100' of Row	Acre Inches/Hour 40" Row	38" Row	Inches Water Held/foot
Loamy sand	2.4	.70	.73	.73 - 1.00
Sandy loam	1.9	.55	.58	1.25 - 1.50
Very fine sandy loam	1.7	.49	.52	1.50 - 1.75
Silt loam	1.1	.32	.34	1.75 - 2.25
Silty clay loam	0.7	.20	.21	2.00 - 2.25
Clay loam	0.5	.14	.15	2.00 - 2.25
Clays	0.3	.08	.09	1.80 - 2.00

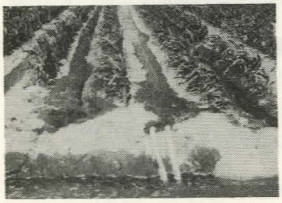
Some clayey soils may have intake rates as high as sandy loams.

Water discharged per siphon tube:

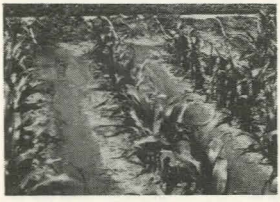
Tube Size inches	Inches Head 2	3	4	5	6
	Gallons per minute				
3/4"	2	3	5	6	7
1"	4	5	7	8	9
1-1/8"	6	7	8	10	11
1-1/4"	8	10	12	13	15
1-1/2"	13	16	18	21	24
2"	21	27	32	36	40



In field practice use of multiple tubes for wetting furrows is best accomplished by applying initial streams to alternate rows - run until furrow streams reach end of rows



Then change all tubes to alternate dry rows.



When second set of rows have been wetted, one tube is then changed to previously wetted furrows and the double set is allowed to run 4 times as long as the wetting period.

The same practice may be followed using gated pipe by varying gate openings. Larger initial streams may be limited by gate openings.

The following examples show how basic data is used to determine siphon tube size, length of run, and time to apply water for a full irrigation in 40 inch rows:

Siphon tube size:

	Soil Texture	
	Sandy loam	Silt loam
Per cent slope	0.3	0.4
Non-erosive stream	33 gpm	25 gpm
Cut-back stream	16 gpm	12 gpm
Siphon tube head (" water)	3	4
Siphon tube size	$1\frac{1}{2}$-16 gpm	$1\frac{1}{4}$"-12gpm

Length of Runs*

	Soil Texture	
	Sandy loam	Silt loam
Basic intake-gpm/100'	1.9	1.1
Cut-back stream	16 = 8	12 = 11
Intake/100'	1.9	1.1
Length of run	800'	1100'

* Rows will need to be shortened 5 to 10 per cent for cutback stream to reach end of furrow.

Time to apply water:

	Soil Texture	
	Sandy loam	Silt loam
Water capacity/' profile	1.37"	2.0"
Water capacity - 5' level	6.85"	10.0"
Water to apply @50% level	3.42"	5.0"
Water intake rate	.55"/hr.	.32"/hr.
Hours to apply water	6.2 hours	15.5 hours
Hours-initial stream	1 hr. 33 min.	3hrs.55min.
Hours-cut-back stream	6.0 hours	15.0 hours

Note -- For farms of variable soils or variable lengths of run, more than one siphon tube size should be used.