THE USE OF PERFORATED PIPES FOR IRRIGATION EXPERIMENTS

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Early in 1963 a number of irrigation trials were planned at Hulett's, Mt. Edgecombe to study and improve the efficiency of water utilisation in sugar cane on our irrigated Estates.

The practical difficulty of applying water to trials, by overhead irrigation, with quarter rainers soon became evident, due to the windy conditions that prevail during the summer months. Even the slightest breeze distorts spray pattern within the plot and creates drift into adjacent treatments.

Simple trials with few treatments allow some latitude in time to permit acceptable delays until calm conditions return. More complicated and precise trials leave no latitude for irrigation delays, and consequently a more efficient and accurate method of applying water was sought.

Thoughts were turned to underhead irrigation, and a system utilising light portable 2 in. perforated piping, commercially known as Perf-O-Rain, proved an immediate success. The pipes are drilled to the Perf-O-Rain 2 in. type F pattern and adapted to operate at pressures indicated in Table 1.

Table 1

Flow rates of 2 in. perforated piping adapted from Perf-O-Rain Type F Pattern

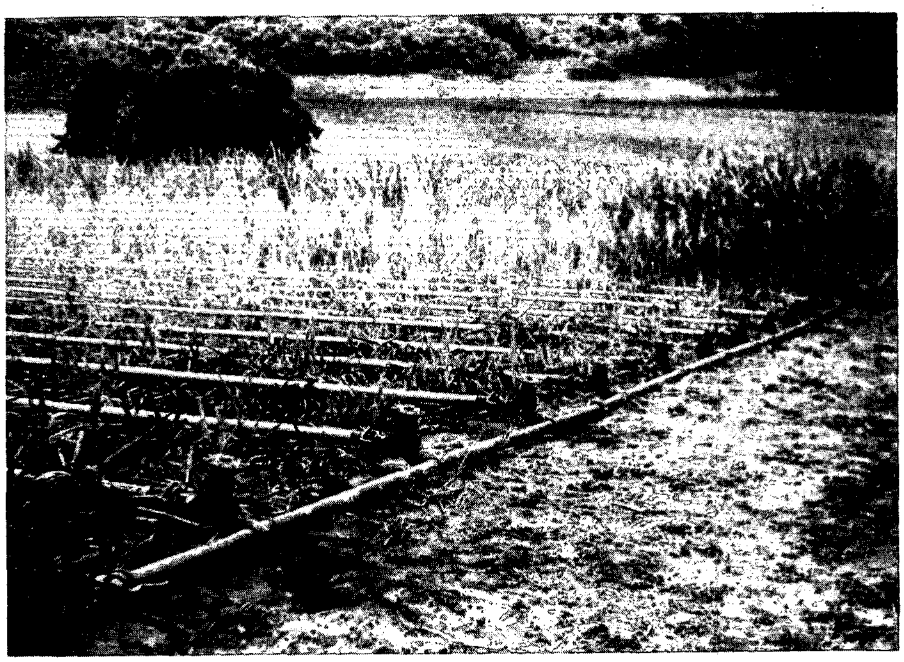
Working Pressure lbs. per sq. in.	2	3
Length of 2 in. piping, 11 x 43 ft.	473 ft.	473 ft.
Volume Imperial Gals. per min.	44	52
Height of Spray (approx.)	30 in.	44 in.
Coverage	4 ft. 6 in.	4 ft. 6 in.
Application Rate	1 in/25 min.	1 in/21 min.

The inability of this system to simulate overhead irrigation by applying water to the foliage after canopy was appreciated, but an even distribution of water without fear of drift more than compensated for this disadvantage.

The perforated pipes are laid along the length of each interline in the plot, with additional lengths to cover the two outside guard rows. A conventional size plot of 1/40 acre, having six lines 40 ft. long requires seven lengths of piping to ensure an even distribution of water. Each length of pipe is designed to extend into the guard row on either side at least 18 in. in order to reduce end effect. For ease of handling, two pipes 21.5 ft. long are linked to provide a total length of 43 ft. Furthermore, the low operating pressures favour the use of Bauer type couplings to avoid water leakage, which is likely to be experienced with the Ames system.

Water which enters the system under pressure is metered to a 2 in. manifold with a 2 in. Saunders valve at each take-off point for controlling pressure and ensuring an equal flow of water to each interrow. Adjustments are effected by observing the height of the spray pattern, and testing pressures from a Schroeder valve on each perforated pipe coupling. The Saunders valve is particularly suitable for fine adjustments which are to be made at each take-off point.

When a scheme is designed it is important to ensure adequate line pressure in order to cover friction losses and provide sufficient working head to each perforated pipe at any point within the experiment. Flow rates through a 43ft. length of perforated piping



Irrigating a ten line plot with eleven lengths of piping.

Note Manifold in the foreground.

Perforated pipes are laid 4 ft. 6 in. apart along the centre of each interrow.

adapted from the 2 in. Perf-O-Rain type F pattern are provided in Table 1.

The optimum operating pressure is one where the spray pattern covers the interrow at a steady pressure, which, in the case of 4 ft. 6 in. planting, falls within the range of 2-3 lbs. per square inch.

The quantity of water to be applied is calculated in gallons and simply metered to each plot. A plot of 6 lines 40 ft. long with a 4 ft. 6 in. spacing has a wetted area of 1/32 acre covered by seven pipe lines 43 ft. long. The quantity of water required to apply 1 in. per acre is therefore 708 imperial gallons which is delivered in 21 minutes at 3 lbs. per sq. in. working pressure.

In view of the relatively high flow rates obtained from this method of irrigating experimental plots, water application techniques should be based on time lapse applications for soils with low infiltration capacities.

Water entering the system is piped from the meter box by portable piping, or flexible plastic piping, to the manifold. The distance of the plots from the meter box is immaterial because measurements only commence when water starts to flow from the perforated pipes in the plot.

Various methods of assembling and moving pipes from one plot to another can be developed to save effort and time. After irrigating a plot, the water contained in the perforated pipes should be exhausted through a by-pass valve on the main supply system, or a drainage pipe leading outside the experimental block to avoid interfering with the water regime of other plots.

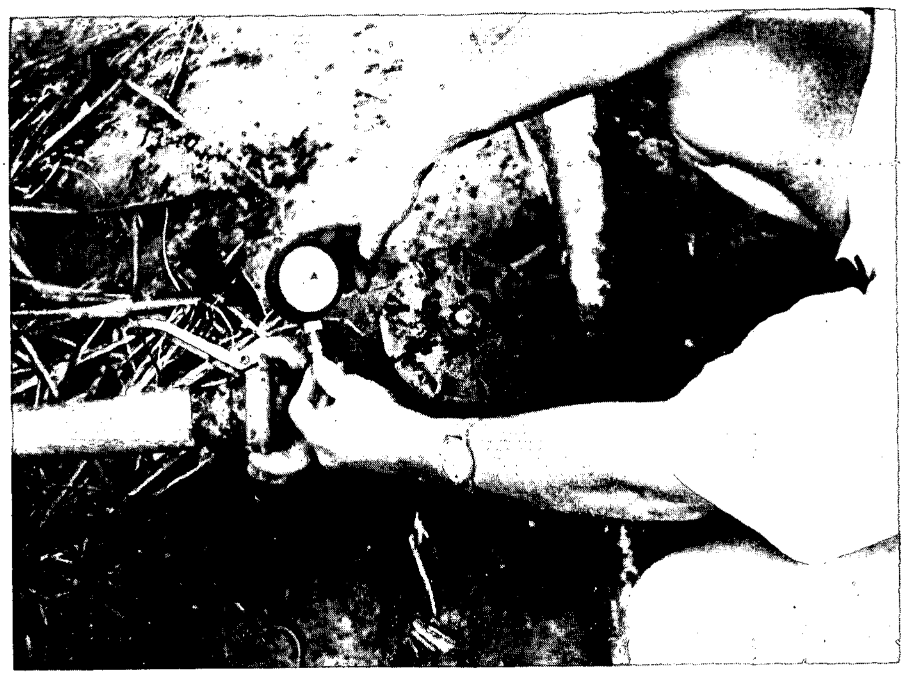
Consideration was given to planting cane lines on a gradient so that water would automatically drain back into the manifold after irrigation, but at low operating pressures of 2-3 lbs/sq. in. this would lead to an uneven distribution of water within the plot. Consequently the current method of draining involves manual raising of the perforated pipe at the opposite end to the manifold.

When pumping dam water the presence of debris or sand is unavoidable, even if a fine mesh screen is fitted to the foot valve. No trouble has so far been experienced, because the sand remains at the bottom of the pipes and any floating debris is washed to the end of the pipe and exhausted when emptying the lines.

Having drained the perforated pipes, it would be unwise to uncouple the two pipes within the plot and so induce soil compaction. Therefore, pipes are uncoupled at the manifold and drawn through the lines into the adjacent plot until the centre coupling is reached. The two pipes can then be disconnected and re-assembled in the next plot for irrigation.

Normally two people are required to operate the irrigation system which entails the moving and assembling of pipes, and water measurement. In an emergency, one person can be left to perform these operations, provided the heavy manifold assembly can be disconnected into two or more units. However, the loss of irrigating time is a hindrance to schedules, and such situations should be avoided whenever possible.

We wish to conclude by adding that two experiments at Hulett's Mt. Edgecombe, have been conducted with complete success using this method of irrigation. One experiment on Clansthal sands showed no run off in plant or ratoon cane with an application rate of 3 in/hour. The second experiment on a Windermere series also showed no run off under a trash blanket in the 1st ratoon. Control of soil moisture levels and irrigation timing by means of the Neutron Probe, conducted by the Research Agronomists of the S.A.S.A Experiment Station, showed complete coverage and even distribution throughout the cycle of the two experiments.



A take-off point on the manifold showing a Saunders valve, a Schroeder valve for testing pressures and a Bauer coupling to perforated pipe

Dr. Thompson: We have used the author's data and copied their equipment in laying down our first irrigation experiment at the Experiment Station for six years.

Perforated pipes will also be used for irrigating seedlings and for the root laboratory.

Mr. Hill: Tongaat has also adopted this method for irrigation experiments and we find it labour saving. We have modified their method to apply a type of perforated pipe down alternate rows and thus have almost halved the cost, with all the rows still getting water.