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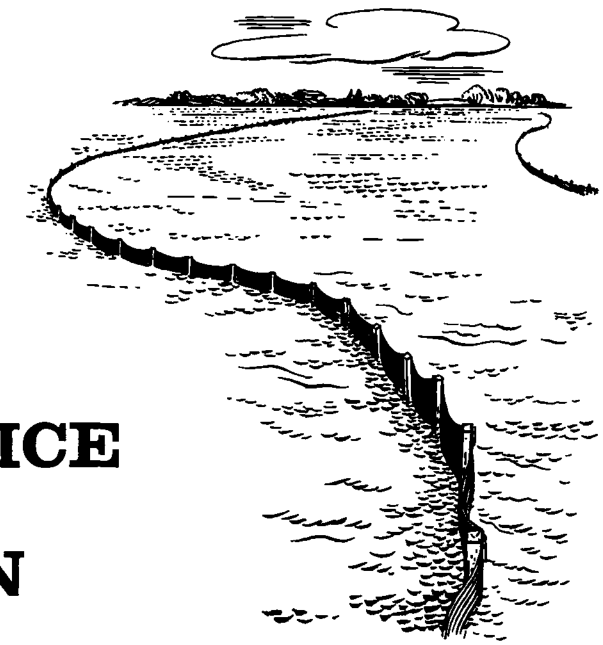


PLASTIC LEVEES FOR RICE IRRIGATION

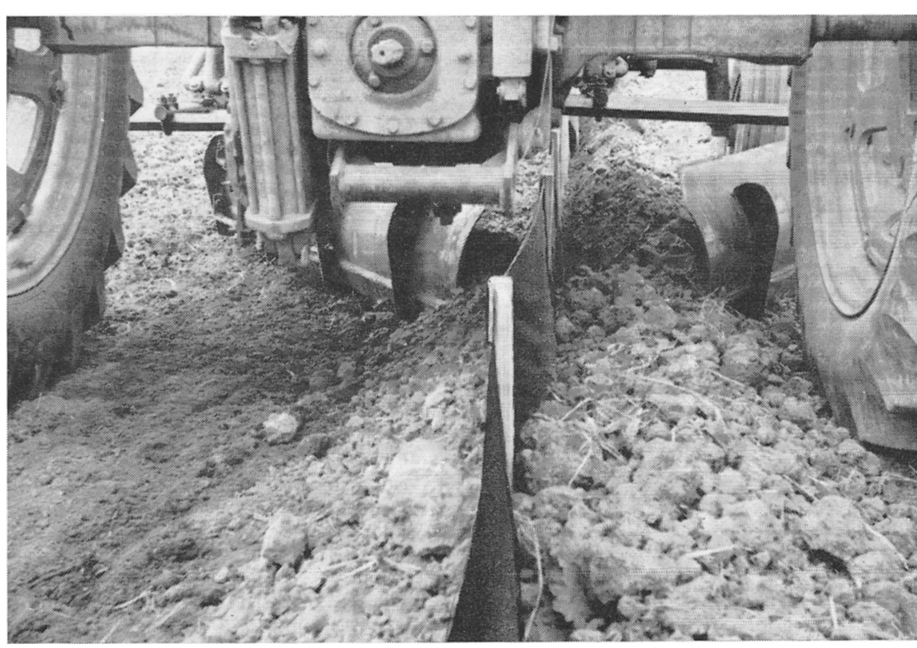
Plastic levees offer a new approach to water control and distribution in rice field irrigation. Field and plot test information obtained during the past two years has proved the physical feasibility of this technique. Studies are continuing on the economic feasibility of plastic levees and on the possibilities of developing a machine which could install these levees in one or two operations.

Water control in rice fields is normally accomplished with contour earth levees. These levees are constructed with a large V-type diker pulled by two or three large crawler tractors. The diker is 14 to 16 feet wide in front and 4 feet wide at the rear. Topsoil is scraped from a wide area at the front of the diker and formed up into a levee at the rear. After settlement, the levees are 16 to 20 inches high with a 5 to 6-foot base width. Unless borrow pits alongside the levees are plowed and graded to reduce their depth, rice does not grow next to the levee.

Soil levees remove from production strips of land ranging from 5 to 16 feet in width—depending on the care taken in grading the borrow pit and the number of seasons the levees have been used. Figuring an average of 200 feet of levee per acre, from 2.3 to 7.3 per cent of the total land area would be out of production. Also, the tops and slopes of soil levees produce weeds which may spread their seed throughout the area. Some of the cultural operations and the entire harvest operation must be performed between the soil levees—and often within small irregular units.

These limitations of soil levees can be overcome by using levees of plastic film held by stakes which can be installed immediately prior to flooding the field and removed before harvest. Studies were conducted on a 68-acre commercial rice field at the Sam Zall farm near Marysville for two seasons and small scale test plots located on the Davis Campus and the Rice Experiment Station at Biggs. These tests indicate that the use of plastic levees is physically feasible but of yet undetermined economic benefit. Only the physical features of plastic levees are discussed here and a subsequent article will consider economic aspects.

Backfilling furrows with plastic levees in place using V-blades under tractor.



Stakes

Douglas fir stakes, 1 × 2 inches, with rounded corners are used to support the plastic. Thirty-inch long stakes have been satisfactory in all experimental levees. The stakes have an average life of two years.

Black polyethylene film (obtained for these tests through cooperation of Visking Co., Chicago) was used to form the levee. The film used was 2 feet wide and can be obtained in rolls from 100 to 1,000 feet long. Film thicknesses of 4, 6, and 8 mils have been used. The choice of film thickness governs the stake spacing. Suggested maximum stake spacings are:

Film thickness mils	Max. stake spacing feet
4	2½
6	3
8	4

Fasteners

Wooden fasteners are used to attach the film to the top of the stake. Several different types of fasteners have been investigated and tested. Two types have proved to be satisfactory:

1. Three-inch piece of Douglas fir lath held by two 1-inch nails.

2. Three-inch piece of ⅛ × 1-inch garden label held by 2 half-inch staples.

Installation

After the seed bed has been prepared and the fertilizer applied by aircraft and worked into the soil, the contours are located by a survey crew. A clean furrow can be plowed along the contour using a single bottom moldboard plow to turn the furrow slice to the upslope side. The furrow should be 6 inches deep and have a 6-inch base width. The furrow bottom should be relatively smooth and clod free. Soil type and conditions are important factors and in some cases it may be necessary to shovel clods out of the furrow.

Stakes are pushed into the downslope edge of the furrow so that 14 inches remain above grade. For the experimental installations, the positive feed tool bar of a 50-h.p. wheel tractor was modified for use as a stake pusher. A steel framework attached to the tool bar provided a rack for the stakes and a seat for the stake setter. The stake setter located the stake point at the edge of the furrow and held the stake vertical while it was pushed into the soil. The tractor driver controlled the hydraulic system which raised and lowered the modified tool bar. The tractor tire was marked so that the driver could stop to set stakes as required.

Plastic film being installed in 1961 field trials for water control in rice irrigation.

The plastic film is unrolled along the furrow, stretched tight and fastened at the top of the stakes. Since the tops of the stakes are normally 14 inches above grade and the furrows are 6 inches deep, a 4-inch horizontal apron of plastic is spread flat in the furrow and anchored initially with soil every few feet. Four men are needed: one unrolling the film and stretching it tight, two fastening the film to the stakes, and one anchoring the horizontal apron.

The final step in the installation of the plastic levees is to backfill the furrows. This can be done with two blades mounted on the front cultivator bar of a wheel tractor as shown in the photo. Six-foot blades mounted at a 30 degree angle from the line of travel with a 1-foot opening between them at the rear and a 7-foot opening at the front have been used with success. The blades should be offset to the right of the tractor centerline to obtain clearance and operator visibility. This equipment permits simultaneous backfilling on both sides of the plastic regardless of the height of backfill on either side. A raised backfill 5 to 9 inches high, depending on soil conditions, is desirable.

Experimental levees constructed with 8-mil film on a 4-foot stake spacing and installed as described above have been successful and trouble-free. Success requires uniform and consistent spacing of stakes and care in stretching the film tightly between stakes. Waves large enough to wash out soil levees in other areas have splashed over the plastic levees without causing damage. For the field trials, standard redwood water control boxes were set in spur soil levees built into the field from the outside earth levee.

Harvesting

At the end of a season the field can be drained quickly by cutting the plastic levees in several places. After the water is off the field, stakes can be pulled by hand and laid alongside the levee, dropping the plastic to the ground. The field can then be harvested in straight lines. After harvest the stakes can be picked up and stored for the next season. When the rice stubble is burned, the plastic can be burned and the field is ready for plowing as a single unit.

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