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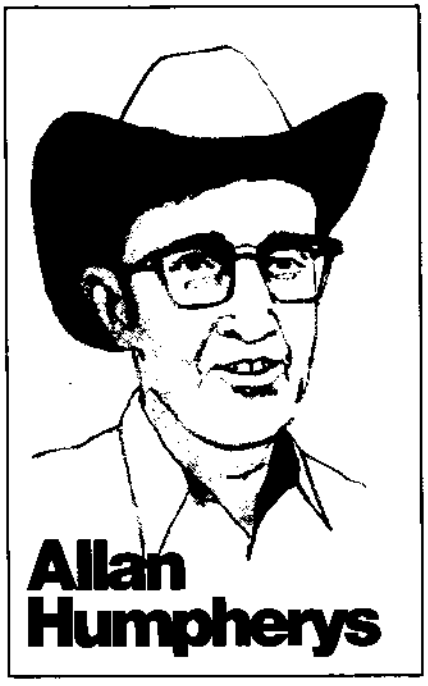

Research seeks answers to runoff losses

Sediment has been labeled as one of the worst pollutants of our natural streams. While much erosion is natural, sediment production from cropland is a problem for many irrigators. Farmers have always been interested in conservation; however, in recent years increased public attention to conservation has caused irrigators to become even more concerned with limiting erosion from their lands.

Stream size, slope, crop, soil, and water management practices are the principal factors that determine the amount of erosion. Researchers are studying the relative effects of these factors in causing erosion to obtain data that will identify those that are the most important and those that can be most readily controlled. This information can then be used to help irrigators minimize soil losses from their fields.

A University of Idaho research team consisting of Agricultural Engineers, Soil Scientists, and Agricultural Economists are studying the effects of various irrigation water management practices on sediment losses from irrigated fields. The engineers and soil scientists are obtaining field data from various types of irrigation systems, while the economists are obtaining cost data for various practices. The field investigations are being conducted in the Boise and Magic valleys in southwestern and southern Idaho. Representative fields with different soils, slopes, crops, and irrigation practices were selected for study. Each field site was instrumented to determine the amount and quality of water applied and lost in surface runoff. A typical runoff measuring station is shown where a measuring flume with water-stage recorder and an automatic water sampler were installed.

Table 1. Water and soil losses from irrigated fields.

Crop	Slope %	Runoff %	Net soil loss/acre lbs	tons
Corn	3.3	17	3,480	1.74
Alfalfa	4.3	17	65	0.03
Beans	1.5	33	11,600	5.8
Hops	0.4	28	3,050	1.52
Grain	1.2-1.4		680-2,620	0.34-1.31
Potatoes	1.7-2.6		11,980-74,000	5.94-37

Table 2. Last three irrigations of seed corn field.

Irrigation No.	Water applied in	Surface runoff in	Furrow stream gpm	Set time hr	Soil lost lb/acre
6th	5.1	0.59	3.8	24	160
7th	4.9	0.94	7.5	12	310
8th	9.8	1.68	7.5	24	640

John Busch, agricultural engineer on the team, Delbert Fitzsimmons, Glenn Lewis and Denny Naylor reported the following preliminary results and conclusions from the 1974 Boise Valley study. The first four crops listed in Table 1 were all grown on silt loam soils with different slopes. The slopes of the corn and alfalfa fields were similar. Although 17% of the water was lost in surface runoff from both fields, there was a marked difference in the amount of soil lost. The greater soil loss from the corn field demonstrates the influence of the crop and cultural practices on sediment production. The corn was cultivated several times, whereas the alfalfa field was disturbed very little. Although the slope of the bean field was about half that of the corn and alfalfa fields, soil losses from this field were the highest of the four fields. Much of this loss was due to a preplant irrigation during which 5,000 lb per acre of soil were lost. Soil loss from the hop field was approximately the same as from the corn field, even though more water ran off the hop field. This difference may, in part, be attributed to the flatter, less erosive slope of the hop field.

The grain and potato fields on similar soils in the Magic Valley were studied by engineer Floyd Ballard. The large variation in soil loss from the potato fields was caused by differences in slope and the farmer's irrigation practices. Soil losses from potato fields are often high, particularly early in the season, because of the loose, lightly packed soil.

Stream size and the duration of set or the amount of water applied during an irrigation are the two factors with the greatest effect upon the amount of suspended solids in the return flow. This is illustrated by the data presented in Table 2 for the last three irrigations on the corn field. The amount of water applied during the seventh irrigation was practically the same as that applied during the sixth irrigation. However, the stream size was twice as large and the set time was half as long. This resulted in approximately a two-fold increase in both surface runoff and soil loss. During the eighth irrigation, the stream size was the same as that for the seventh irrigation; however the irrigaton time was twice as long. The amount of water applied was doubled, with a corresponding increase in both surface runoff and soil loss.

Since the irrigator can control both of these factors, the results of the study indicated that significant reductions can be made in the amount of soil eroded during irrigation by carefully controlling stream size and the amount of water applied. Although most of the sediment in runoff from a field can be trapped by a sediment retention pond, it is better to keep field erosion to a minimum. Redistributing soil collected in a retention pond is an added expense for the irrigator.

As this study continues, the researchers are seeking effective and economical means of reducing both runoff and nutrient losses from irrigated fields.