Management Practices for Erosion and Sediment Control in Irrigated Agriculture

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Abstract: Irrigation erosion and subsequent sediment losses to rivers and stream continue to be serious problems confronting irrigated agriculture. The seriousness of these problems depends upon user concerns which in turn depend upon geographic area and populations. Erosion problems are less severe in California than in Idaho, but the concern for controlling water quality can be greater in parts of California because of subsequent water uses. Basin irrigating rice can reduce suspended sediment loads in water because the basins serve as sediment retention basins. Furrow erosion causes significant suspended sediment loads in return flows in California, but the problem is much more severe in Idaho. Topsoil redistribution by furrow erosion and sedimentation has reduced potential crop yields by approximately 25%. Several sediment loss control practices have been developed and evaluated, and are effective, but costs deter their application. Research is presently directed toward controlling erosion along irrigation furrows. Methods to increase soil cohesion and utilize residues in minimum tillage and no-till systems have high potential for controlling erosion and sediment loss during the next decade.

Introduction

Irrigation erosion results from the following conditions:

1. Erosion from irrigation furrows
2. Erosion from irrigation return flows
3. Erosion from irrigation runoffs

These conditions lead to the following methods of control:

1. Practices to reduce erosion
2. Practices to prevent sediment from getting into the waterways
3. Practices to prevent sediment from entering the waterways

Erosion from irrigation furrows results from the following conditions:

1. Erosion caused by furrow irrigation
2. Erosion caused by furrow irrigation return flows

These conditions lead to the following methods of control:

1. Practices to reduce erosion
2. Practices to prevent sediment from getting into the waterways
3. Practices to prevent sediment from entering the waterways

Furrow irrigation erosion studies in California

Future irrigation erosion studies on tomato fields in the San Joaquin Valley showed that turbidity averaged 112 JU in the inflow water and more than 2,000 JU in the surface runoff, indicating significant erosion and sediment loss. Tailwater recovery systems are used for fertilizing and to prevent sediments from entering streams (Tanji et al., 1986). Similar studies were conducted in the Sacramento Valley (Tanji et al., 1981). Furrow inflows from 3 to 15 gpm (0.15 - 0.95 l/sec) on land with a slope of only 0.001% produced initial sediment concentrations in the return water ranging from 1,200 to 10,000 mg/l. These concentrations dropped to 10 to 40 mg/l within a half hour indicating that erosion decreases quickly after the furrows are wetted. The unit mass emission of suspended sediments was 193 lbs/acre (215 kg/ha) for a field that had been periodically cultivated up to the time of the test. A second test, with no cultivation between the two tests and a mass emission of only 60 lbs/acre (67 kg/ha) or about one third that of the first test. The difference represents the effect of recent cultivation on suspended sediment loss.