EDITOR'S FORUM

OPINION ON SIGNIFICANT TOPICS IN AGRONOMY

Advances in conserving and recycling water

Major efforts to conserve water are most evident in areas where water supplies now limit crop production, or where available supplies can be expected to decrease severely in the near future. Use of water-conserving practices in these areas may be stimulated by legal actions that prohibit irrigation tailwater from entering barrow pits along roadways, because of expensive silt removal, or from entering shallow lakes where water may be wasted through evaporation.

A typical example of rapid expansion of water-conserving practices occurred during the 1960's in the Texas High Plains where the water table levels began to decline steadily after the development of irrigation from wells in the 1950's. Preventing runoff was difficult because the intake rate of the soil was very low and the land slopes generally did not permit leveling entire fields to zero grades. The High Plains Water District assists in surveillance of tailwater problems and is empowered by the state to enforce abatement of water waste by injection or other appropriate action. The influence of the district, coupled with the fact that it costs less to pump water from a shallow lake than from the groundwater, has resulted in rapid expansion of tailwater and playa lake recovery systems in that area. Also, irrigators are now applying water to maximize production per unit of water applied, rather than to maximize yields per acre.

In contrast, in many of the older irrigated areas of the West, where the land slopes are fairly steep but gravity water costs may be less than $5.00 per acre per year, there has been little incentive to conserve and recycle water until the last few years. Recent legal restrictions on the quantity of sediment that return flows may carry are causing a new, serious appraisal of desilting systems, or systems that return irrigation tailwater to the main system. However, unless sediment can be removed or prevented from entering the return flow system, the cost of removing sediment from the main system may curtail such practices. The key to solving this problem is to minimize the amount of irrigation tailwater and to prevent sediment from leaving the individual farm units. On steeply sloping, highly erodible soils, sprinkler systems are replacing many gravity systems because of the water control they provide. Sprinkler systems may not prevent all runoff and erosion, but they usually greatly reduce them.

Where irrigation tailwater and sediment cannot be economically prevented from leaving some individual farm units, some irrigation districts in southern Idaho are using low portions of farm fields as desilting basins for 1 to 3 years. During this period the low areas are filled with sediment without direct removal costs to the districts and farmers benefit from improved surface topography that enables better water control.

The use of on-farm water recirculating systems, therefore, is most common in areas where irrigation water is obtained from deep wells or where legal restrictions have forced the use of such systems. Recycling irrigation tailwater into the main canal systems is becoming more acceptable and common in areas like the Columbia Basin, where recycled water formerly was not favored because many feared such water was of much lower quality. This usually is not true if the irrigation water contains very little dissolved solids. Use of waste water has been practiced for many years and is expanding in such areas as near Los Angeles and Phoenix where sewage waste water and floodwaters are used to recharge groundwater basins. In some cases water treatment may be required before it can be reused. One of the more recent expansions of recycling systems is the application of effluents from vegetable and potato processing plants to farm land using either sprinkler or gravity systems. Such systems have expanded because it has become more economical to dispose of processing wastes on the land where a crop can be grown and some of the nitrogen recovered than to install secondary waste water treatment plants to meet increasing water quality standards for waste water returned to natural streams. In some instances reuse on the land has been the only practical solution.

Practices in nonirrigated areas have steadily been changed to minimize runoff. Any loss of water by runoff from nonirrigated lands in semiarid and arid regions usually results in a direct economic loss to farmers. Most water-conserving practices, such as deep chiseling, attempt to maximize the soil storage of precipitation where it falls, or to increase the water supply by such practices as snow trapping.

What about the future? Water supply problems in many water-short areas are going to become more acute as groundwater levels decline and as more land is irrigated. And, as competition for available water supplies increases, we will see many new water recycling systems being installed by individual farmers, canal companies, and irrigation districts. These will usually be fully automated systems that use electrical-mechanical controls or radio controls where the controlling source and use areas are remotely separated. Most of these systems will use closed or pipe transportation systems and most of the irrigation systems will be designed to maximize the control and uniform application of water, since these water supply costs will not be low. Almost every farm using water from a deep well will either have no runoff because water application will be completely controlled, or will have a recycling system. Even today, economics would justify such installations on most farms where a significant amount of pumped water is being lost from the farm.

Conjunctive use of surface and groundwaters will become commonplace since groundwater storage usually has less evaporation losses, and groundwater reservoirs represent some of the largest remaining undeveloped water storage systems. Research is also underway to develop the automatic controls and distribution systems that will be needed to both minimize irrigation tailwater and recycling costs and to incorporate the return flow into the distribution system. A recycling system, for example, enables using a cutback flow that otherwise is not very practical. Associated with better water control will be a significant reduction in sediment losses and sediment removal or spreading costs. Field practices will be developed to reduce sediment loads where runoff cannot be controlled.

Improved irrigation scheduling techniques using computers are rapidly being implemented and will play a major role in reducing the costs of recycling water. As water control improves and recycling increases, we will also see indirect benefits such as a decrease in the installation and maintenance costs of drainage systems where excessive input of water, and not salt control, is the main problem. The salt load in rivers will decrease as the quantity of waste water decreases, and plant nutrients that are attached to sediment and are now being lost will be recovered. —MARVIN E. JENSEN, *Agricultural Engineer, USDA-ARS, Kimberly, Idaho.*

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