

ANR-790-4.4.4

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Fertilizer Management To Protect Water Quality Cropping And Tillage Practices For Fertilizer Management

The goals of all best management practices for reducing nutrient loss to waters are to efficiently use nutrients in the field and to keep what is not used from running off or leaching. Cropping and tillage practices that reduce surface runoff and soil erosion provide the lowest cost, most direct control of nutrient runoff.

Surface losses of nitrogen can be reduced by 40 to 85 percent by the use of crop rotations, no-till, and conservation tillage as compared to conventional practices. Phosphorus losses can be reduced by 40 to 70 percent by the use of crop rotations, cover crops, and conservation tillage as compared to continuous cropping and conventional tillage practices.

Cropping Practices

The cropping practices and structural controls that limit erosion are also used to protect against excessive nutrient loss. These are crop rotations, contour plowing, strip-cropping, sediment basins, and terraces.

Crop Rotations: Planting crops to minimize the number of years fields are in row crops. Systems should include rotations that contain grasses, legumes, and small grains such as rye, wheat, barley, and oats. Grasses, legumes, and small grains are more successful at protecting the soil from water and wind erosion than row crops.

For example, a winter cover of small grain offers effective protection against soil erosion and nutrient loss. Winter cover crops will also absorb and hold any unused nitrogen from the previous crop and prevent it from leaching to groundwater.

Contour Farming: Managing sloping, cultivated land in such a way that seedbed preparation, planting, and cultivation are done on the contour.

Strip-cropping: Growing crops in a systematic arrangement of strips or bands across a general slope. Crops are arranged so that a strip of grass or close-

growing crop is alternated with a clean-tilled crop or fallow.

Sediment Basin: A barrier or dam constructed across a waterway or at other suitable locations to collect silt or sediment.

Terrace: An earth embankment, channel, or a combination ridge and channel constructed across a slope to control runoff.

Level terraces can reduce total nitrogen losses in surface runoff by as much as 85 percent, but they can more than double groundwater nitrate loading as compared to contour farming. Terraces are recommended as nitrogen controls where no potential groundwater problem exists. Contour farming should be used in the humid eastern and Pacific Northwest states with groundwater nitrate problems.

Level terraces can reduce total phosphorus losses by as much as 65 percent as compared to contour farming. Terrace systems are a phosphorus control BMP across the nation.

Tillage Practices

Maintaining the protective effects of crop residues on sloping fields requires a shift away from conventional tillage systems that leave surface soil susceptible to erosion. Tillage options should be chosen which improve the land's soil- and nutrient-holding capacity.

The following practices offer control of both the relatively immobile nutrients—phosphorus and potassium—and the more soluble and mobile nutrient—nitrogen.

Conservation Tillage: Controls or reduces the amount of runoff and erosion from crop fields.

No-till Or Zero Tillage: Untilled residues of the previous crop are left on the soil surface to reduce soil erosion while the seed slot is opened with a fluted coulters or double-disk opener ahead of the planter shoe.

ANR-790

Water Quality 4.4.4

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Strip Tillage: A narrow strip is tilled with a rototiller gang or other implement; seed is planted in same operation.

Sweep Tillage: Soil is shattered and lifted, leaving residue in place and enhancing infiltration. Used on small-grain stubble to kill early fall weeds.

Listing: Plowing and planting in the same operation. Plowed soil is pushed into ridges between rows, and seeds are planted in the furrows between the ridges. Listing is popular in low rainfall areas because it concentrates soil moisture near the crop row. Most effective on the contour.

Ridge Plant: Planting on ridges year after year, with no seedbed preparation preceding planting. Produces a row configuration similar to listing. Used in higher rainfall areas to keep excess water away from plants early in the growing season. Effective for erosion control when done on the contour.

Plow-plant: Planting directly into plowed ground with no secondary tillage. Increases infiltration and water storage.

Wheel-track Plant: Planting on wheel tracks of the tractor or planter. Similar to plow-plant, but isn't restricted to freshly plowed ground.

Conclusion

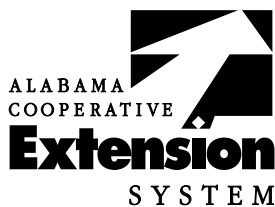
While the water quality issue can be a complicated one, these BMPs may be part of a simple solution. None of these techniques is new, but their water quality benefits can be easily overlooked.

References

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ANR-790-4.4.4

This publication, supported in part by a grant from the Alabama Department of Environmental Management and the Tennessee Valley Authority, was prepared by James E. Hairston, *Extension Water Quality Scientist*, assisted by Leigh Stribling, *Technical Writer*.

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UPS, **New June 1995**, Water Quality 4.4.4