IMPROVED N FERTILIZER RECOMMENDATIONS FOR IRRIGATED WHEAT

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University of Idaho fertilizer nitrogen recommendations for irrigated soft white winter wheat are based, to a large extent, on Idaho Wheat Commission sponsored research. The Idaho Wheat Commission continues to support research that can improve fertilizer N recommendations for winter wheat.

Late winter or spring soil tests may be more appropriate for winter wheat, given the potential for N loss after planting. Early spring soil testing should more accurately reflect mineralization, immobilization, volatilization, and leaching of N occurring since the fall planting.

Four years of data have been collected for the calibration of spring soil tests for irrigated winter wheat. Fourteen trials, mostly on grower fields, were conducted across southern Idaho from 1994 through 1997. The trials were conducted near Parma and Homedale in western Idaho, Jerome and Rupert in the Magic Valley, and Aberdeen in eastern Idaho.

Residual N in soil samples collected in early spring have ranged from 22 ppm lower to 32 ppm higher than the residual N in samples collected preplant in the fall (Fig. 1). The wide difference in fall preplant and spring test results reflects the net effects of leaching, mineralization, immobilization, volatilization, and plant uptake that occur between fall and winter soil samplings. Such variability in soil test N from fall to spring shows how difficult it can be to accurately predict N requirements based on fall preplant samples.

Available N can be underestimated with the fall soil test, particularly when high amounts of N are mineralized from previous manure applications.

Figure 1. Fall and spring residual N at selected sites. 1994-97.

Underestimating available N can lead to excessive N applications that reduce both yield and quality. Yields in some cases were reduced as much as 20% with excessive N, even in the absence of lodging. Test weight decreased as much as three pounds per bushel with excessive N (60.5 to 57.5 pounds per bushel). Protein increased with excessive N to over 12% and 13 %, levels well above those desired by many domestic and foreign mills. Yields at the 1997 sites ranged from 60 bu/A without N at Jerome to 159 bu/A (Fig. 2) when adequately supplied with N at Aberdeen.

In the trials conducted to date there appears to be no advantage for irrigated winter wheat to provide more than 250-300 lb N/A, when both the fall soil test and fertilizer N (spring or fall applied) are combined (Fig. 3). With the spring soil test there appears to be no advantage to provide more than 200-250 lb N/A for winter wheat. The N requirement with the spring soil test is somewhat lower because some N is already taken up in the crop and spring topdressed N tends to be more effective than fall preplant applied N. Some low yielding sites required considerably less than 200 lb N/A and higher N rates reduced yield even with no lodging present.

Mineralized N in some sites has ranged up to 70 lb N/A. This N is released as soil temperatures warm and biological activity increases. Most of the N mineralization occurs after the head is initiated and tillering is completed. Mineralized N may consequently have less influence on yield than it will on the protein content of the grain at harvest.
Excessive available N can increase residual N left in the soil after harvest. Yield at the Parma location was not increased with topdressed spring N because soil test N in the fall measured over 400 lb/A. Excessive N contributed to lodging and residual N increased as the rate of fertilizer N increased (Fig 4). Residual N is subject to immobilization, leaching, and at this site denitrification (since the water table is high) all of which can reduce it's availability to subsequent crops.

![Bar chart showing residual N at harvest vs total N applied (lb/A)](chart)

**Figure 4.** Residual N after harvest as affected by fall and spring applied N.

Spring soil testing has proved as effective for indicating irrigated winter wheat fertilizer N recommendations as fall soil tests. Work will continue in the coming season with Idaho Wheat Commission support.