



DRYLAND WINTER WHEAT

Eastern Washington Nutrient Management Guide

Nutrient management is essential to the economical production of high-yielding, high-quality crops, and to preserving soil, air, and water quality. As the term implies, nutrient *management* includes activities such as sampling to monitor soil nutrient levels and adjust application rates; altering practices such as the placement, application timing, and source of nutrients to maximize plant availability and uptake; and conducting a post-harvest assessment of yield, grain protein levels, and nutrient use efficiency.

Eastern Washington is unique in that diverse environment, soil, and topography result in variations in crop yield across the region as well as across farms and individual fields within farms. Due to the inherent variability associated with eastern Washington dryland crop production, a one-size-fits-all recommendation for the management of any one nutrient is of little value. Recommendations must be based on individual grower practices, achievable yields, and current soil test data. This document presents guidelines for managing major nutrients in eastern Washington dryland winter wheat and emphasizes how producers can tailor recommendations to their own production systems. It also identifies opportunities where information such as crop yield and protein and soil test nutrient levels can help refine and improve nutrient management practices.

Nitrogen (N) recommendations

Nitrogen recommendations are based on the potential yield for a site, the amount of N required to achieve yield and protein goals for a desired wheat class, subtracting an inventory of soil N contributions identified through soil testing. These measures of N efficiency can be used to refine future N management practices for the field or a management unit within a field. See “Additional considerations” at the end of this guide for more information.

Average Nitrogen Requirement Based on Yield

Nitrogen Requirement	
Nitrogen (N)	lbs per bushel of yield
9.0% protein (soft white)	2.5
11.5% protein (hard red)	2.7
12.5% protein (hard white)	3.1

Phosphorus (P) recommendations

Phosphorus recommendations are based on soil test values in a surface one-foot sample (Table 1). Note that winter wheat may respond to starter applications of P even if soil test levels are considered adequate. Placement of P is important; subsurface banding below, below and beside, or with the seed are all efficient placement methods to maximize P availability to the plant.

Phosphorous Recommendations for Dryland Winter Wheat

Soil Test P (ppm) 0 to 6-inch depth		Application rate lb P ₂ O ₅ /acre ¹
Acetate method	Bicarbonate (Olsen) method	
0 to 2	0 to 4	40
2 to 4	4 to 8	30
4 to 6	8 to 12	20 ²
6 to 8	12 to 16	10 ²
> 8	> 16	0 ²

Potassium (K) recommendations

Soils in the dryland areas of Washington generally contain adequate levels of K. If a soil test report shows less than 75 ppm K in the surface foot based on a sodium acetate extract, or less than 90 ppm K based on a bicarbonate extract (Olsen), applications of 50 lb K₂O/acre may be warranted.

Sulfur (S) recommendations

The soil test for S is less reliable than for other nutrients. When soil test SO₄ in the top two feet of soil is below 8 ppm or 30 lb/acre, applications of 15 lb S/acre are warranted. Higher rates may be needed if a legume will follow the wheat crop. Another tool is to analyze grain for nitrogen:sulfur (N:S) ratio. Ratios above 15:1 indicate a need for S fertilization. For hard red wheat production, a common practice is to apply 1 lb S for each 5 lb N applied, up to 25 lb S/acre.

Chloride (Cl) and micronutrients

Responses to Cl have been obtained with dryland winter wheat, particularly in annual cropping areas. Chloride reduces the incidence of leaf spot and the severity of certain diseases in wheat. When soil test Cl in the top two feet of soil is below 8 ppm or 30 lb/acre, a response to 15 lb Cl/acre is possible. Limited research has been done on micronutrient fertilization of dryland wheat in Washington, so specific recommendations are not available at this time.

Additional Considerations

- Soil testing is an important tool to evaluate the effectiveness of a fertility program. Over time, changes in soil test nutrient levels can be used to revise fertilizer application rates. For example, if soil test P levels are declining, increase the rate applied to maintain adequate levels. If levels are increasing over time, reduce application rates once soil test levels are adequate.
- High soil test N levels at the beginning of a crop year indicate the previous crop did not use all of the available N. If soil test N in the profile is above 50 lb/acre, consider whether the yield potential of the previous crop was too high, whether calculations involved an error in the soil N inventory, or if some other factor reduced yield below the season goal. As necessary, adjust the fertilizer program to reduce N in future soil tests.
- Large amounts of N at or below 4 feet in a soil profile are subject to leaching below the plant root zone. This deep N also contributes to undesirably high grain protein in soft white wheat. Modifying N application timing and making split applications are two ways to improve N availability and up-take by plants. If the majority of N in a preplant soil test is at or below 4 feet, consider splitting the timing of N application between fall and spring to promote more efficient use of N.



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