



Winter wheat

Western Oregon—west of Cascades

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This fertilizer guide is based on wheat yield response to nutrients applied in experiments conducted by Oregon State University. The guide applies to fertilization of soft white winter wheat in western Oregon, where the risk of take-all root rot is low (first-year wheat or where take-all decline has become established). For further information about growing and fertilizing wheat in high take-all risk situations, refer to EC 1453, *Combating Take-All Root Rot of Winter Wheat in Western Oregon*.

Management Practices

Fertilizer recommendations assume good management practices such as weed and disease control, planting date, and cultivar selection. One cultivar seldom is adapted to all production environments. Of the currently available high-yielding cultivars, Yamhill is more tolerant of limited drainage than are Stephens, Malcom, or Hill-81. Yamhill and Hill-81 are more tolerant of low soil pH than is Stephens.

Plant wheat at the end of September to early October in a take-all free environment. Delay planting if temperatures are unseasonably warm in late September and early October. Planting after a period of cool weather assumes reduced aphid population and less possibility of aphid damage to young wheat plants. If planting is delayed, Stephens can be planted until mid-February, Hill-81 and Malcom until late January. Do not plant Yamhill or Daws after January 1. Delayed planting can cause substantial yield reductions.

Banding P, N, S, and some N fertilizers with or near the seed at planting has proven to be an effective method of fertilizer application for small amounts of nutrients and immobile nutrients such as P and K. (Caution: Fertilizer placed with the seed can delay emergence and reduce stands during exceptionally dry years.)

Surface drainage is important as wheat is likely to be killed if water stands on fields for more than a few days during the vegetative growth stage. Planting wheat on ridges will improve survival on poorly drained valley floor soils. (See FS 265, *Growing Winter Wheat on Poorly Drained Soil*, for more information.)

Follow recommended soil sampling and testing procedures for P, K, and lime to estimate fertilizer and lime needs.

County offices of the OSU Extension Service can provide soil sampling instructions and a list of soil testing laboratories serving Oregon.

Nitrogen (N)

An application of 20 lb N/a at seeding time is recommended if wheat follows a grass seed or grain crop. This fertilizer can be banded in combination with P fertilizers near or with the seed. Fall N application is not recommended for wheat following row crops or a good legume crop.

Spring application

The first step toward determination of optimum spring N rates is to identify a realistic yield goal. Wheat grain yield potential is 120 to 140 bu/a for deep, well-drained valley floor soils, 80 to 100 bu/a for well-drained hill soils with a rooting depth greater than 3 ft, and 60 to 80 bu/a on shallow hill soils and valley floor soils with restricted drainage. Over-fertilization with N is detrimental to the environment, especially groundwater supplies.

For wheat following wheat, grass seed, or other grain crops, apply 140 to 180 lb N/a before jointing (Feekes 6.0). If the spring N application is delayed after this time, a yield reduction can occur. An alternative is to apply 40 lb of N during late tillering (Feekes 5.0), generally mid-February, and the remaining N 1 month later. A split application will increase wheat yields 10 to 12 bu/a over a delayed single application. Some N may be spring applied with pesticides. Read and follow pesticide label directions.

Apply 100 to 140 lb N/a where wheat follows row crops, vetch, peas, or a poor perennial legume stand. An application of 60 to 100 lb N/a is recommended where wheat is grown after a good crop of alfalfa, crimson clover, or red clover.



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N applications after jointing (Feekes 6.0) break stems in wheel track areas. Grain yield is substantially reduced if vehicles with wide tires are used.

If drainage or soil depth limits wheat yield potential, reduce spring N rates 1 to 2 lb N for every bushel reduction in potential yield. If drainage limits yield in a particular field to 100 bu/a, a 40 bu/a reduction would be present. Multiply the 40 bu/a reduction by 1 and 2 to find the corresponding N rate reduction:

$$1 \times 40 = 40$$

$$2 \times 40 = 80$$

Reduce spring N by 40–80 lb/a for a spring N rate of 100–140 lb N/a.

Phosphorus (P)

The following P recommendations are for banding near the seed (Table 1). For optimum P use by wheat, the soil pH should be above 5.7.

Table 1.—P fertilization rates for winter wheat.

If the soil test for P is (ppm)*	Apply this amount of phosphate (P ₂ O ₅) (lb/a)
0–20	40–60
20–30	30–40
over 30	0

*In Jackson and Josephine counties, divide by 2.

Potassium (K)

If a soil test indicates potassium fertilization is required, 25 to 30 lb K₂O/a can be placed with the seed if normal rainfall and soil moisture are present. Higher rates of K fertilizer are best applied before seeding and worked into the seedbed. Table 2 shows guidelines for K fertilization.

Table 2.—K fertilization rates for winter wheat.

If the soil test for K is (ppm)	Apply this amount of potash (K ₂ O) (lb/a)
0–75	20–100
75–100	30–60
over 100	0

Sulfur (S)

Wheat S requirements can be provided by an application of 10 to 15 lb/a sulfate S at planting time or 30 to 40 lb S/a as finely ground elemental S the preceding year. If several tons straw/a are incorporated, an additional 10 to 15 lb S/a will be required in the fall.

S responses may not occur for a period of 3 or 4 years on Ultisols (red hill) with a history of high S fertilization or following other crops where more than 40 lb S/a was applied.

Magnesium (Mg)

Wheat response to Mg has not been observed in western Oregon. Trial applications of Mg are suggested where soil test levels are below 0.5 meq Mg/100 g soil.

Mg can be banded at 10–15 lb/a at planting as Sul-Po-Mag or K-Mag. Mg also can be supplied as dolomitic lime applied to neutralize soil acidity. Mix dolomite into the seedbed before seeding.

Micronutrients

Wheat in western Oregon has not been observed to respond to applications of micronutrients such as boron, manganese, and zinc.

Lime

Winter wheat tolerates moderately acidic (pH 5.4) soils. Wheat yields probably will not be increased by liming above pH 5.5.

Lime application is not suggested if the soil pH is 5.8 or higher. Lime application rates can be estimated from Table 3.

Table 3.—Lime application rates for winter wheat.

If the SMP buffer test for lime is	Apply this amount of lime* (t/a)
under 5.5	3–4
5.5–5.8	2–3
5.8–6.2	1–2
over 6.2	0

*Lime rate is based on 100-score lime.

Mix lime into the seedbed before seeding. Lime applications are effective for several years. Refer to FG 52, *Fertilizer and Lime Materials*, for more information about liming materials.

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For More Information

OSU Extension Service publications

Growing Winter Wheat on Poorly Drained Soil, FS 269, by N.R. Goetz, M. Stoltz, T.L. Jackson, and R.S. Karow (revised 1996). No charge.

How to Take a Soil Sample ... and Why, EC 628, by E.H. Gardner (revised 1997). No charge.

A List of Analytical Laboratories Serving Oregon, EM 8677, by J. Hart (revised 1997). No charge.

Combating Take-All Root Rot of Winter Wheat in Western Oregon, EC 1423, by N.W. Christensen and J.M Hart (1993). 75¢

To order copies of the above publications, send the complete title and series number, along with a check or money order for the amount listed (payable to Oregon State University), to:

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World Wide Web

Fertilizer and Lime Materials, FG 53, by J. Hart (revised 1997). No charge.

You can access the above publications, as well as FG 9, *Winter Wheat: Western Oregon—West of Cascades*, our Publications and Videos catalog, and many other publications via our Web site at resc.orst.edu

Other publications

Caputo, J.A. 1985. Effects of nitrogen applied on wheat straw on winter wheat (*triticum aestivum* L.) yields in western Oregon. M.S. thesis, Oregon State University, Corvallis, OR.

Christensen, N.W. and M. Brett. 1988. Wheat yield and N uptake as influenced by treating crop residue with urea-sulfuric acid. *J. of Fertilizer Issues* 5(2):50-55.

Hart, J.M. and N.W. Christensen. 1987. Economic considerations for N fertilization of wheat in the Willamette Valley. In *Proceedings Northwest Fert. Conf.*, Pasco, WA. July 14-16, Soil Imp. Comm. and NW Plant Food Assoc.

Kjelgren, R.K. 1984. Fertilizer nitrogen use efficiency of winter wheat in the Willamette Valley. M.S. thesis, Oregon State University, Corvallis, OR.

Yungen, J.A. 1984. The response of winter wheat to mid and late winter nitrogen rates, agronomic and truck crops data. Oregon State University Southern Oregon Experiment Station, Medford, OR, pp. 22-25.