FERTILIZERguide
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Irrigated wheat

Eastern Oregon—east of Cascades

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Good management practices are essential if optimum fertilizer responses are to be realized. These practices include adequate irrigation, use of recommended varieties, selection of adapted soils, weed control, disease and insect control, proper seeding methods, and timely harvest.

It is important that the soil be sampled and tested as a guide to fertilization. Follow recommended soil sampling procedures to estimate fertilizer needs. The Oregon State University Extension Service agent in your county can provide you with soil sampling instructions, soil sample bags, and information sheets.

Nitrogen (N)

Irrigated grain requires a good supply of available N; however, excessive rates of N can reduce grain quality and increase the risk of lodging. An optimum response to N fertilization depends on adequate irrigation.

Of the suggested N application, 0 to 40 percent of the N should be applied preplant or at planting time, and the remainder during tillering in the spring. The urea or diammonium phosphate forms of N may cause seedling injury if banded close to the seed at planting.

The amount of N fertilizer required depends on the following factors: the preceding crop, the N carryover from the previous crop, the amount and type of residue to be plowed under, and possible leaching losses due to over-irrigation.

The following recommendations are for mineral soils with low organic matter content unless otherwise stated.

N fertilizer rates based on soil test

The amount of residual N in the soil varies considerably.

A soil test for nitrate-N (NO_3-N) helps in evaluating the N carryover from the previous crops in the case of mineral soils with low organic matter content.

N soil tests are not recommended following alfalfa (or other legumes) or for muck and peat soils.

Soil samples for NO_3-N should be taken following a growing season and prior to the application of N fertilizer.

Take soil samples from the 0- to 2-foot and 2- to 6-foot soil depths on deep soils. The soil samples should consist of soil cores removed from the entire 0- to 2-foot and 2- to 6-foot depths of soil. On soils shallower than 6 feet,take soil samples from 0–2 feet and from 2 feet to the rooting depth.

Soil test results for N are reported in parts per million (ppm). One ppm N in a 1-foot depth of soil equals about 4 lb N/a (Table 1).

Table 1.—N quantities according to soil depth.

Soil depth	Soil test NO_3-N	
(ft)	(ppm)	(lb/a)
0–2	4	32
2–6	3	48
		Total = 80

The total NO_3-N soil test values are used to estimate the N fertilizer requirement as indicated in Table 2.

Table 2.—N fertilization rates for irrigated wheat according to NO_3-N soil test values.

If the soil test for NO_3-N is (lb/a)	Apply this amount of N* (lb/a)
0–50	250–200
50–100	200–150
100–150	150–100
150–200	100–50
200–250	50–0
over 250	0

*These application rates are calculated for an estimated yield of 100 bu/a. Add or subtract 3 lb N/a for each bu/a when estimated yield is above or below 100 bu/a.

If the soil test value for NO_3-N is less than 2 ppm in the 0- to 2-foot soil depth, apply a minimum of 30 lb/a N when well-tillered wheat plants are not present regardless of the soil test value for N below 2 feet. This application will ensure adequate initial growth of wheat plants.

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N fertilizer rates based on previous crop

Where a soil test is not used, N fertilization is based on the preceding crop (Table 3).

As the amount of residual N in the soil varies considerably, a soil test usually is the most accurate method of estimating N fertilizer needs except following a legume crop.

Table 3.—N fertilization rates for irrigated wheat according to previous crop.

If the previous crop was	Apply this amount of N (lb/a)*
Grass sod	200–250
Grain	175–225
Potatoes or peppermint	150–200
Productive alfalfa	125–175

*These application rates are based on an estimated yield of 100 bu/a.

Phosphorus (P)

Best results are obtained when P is banded 2 inches to the side or below the seed at planting time. Plowing P down before planting is preferable to broadcast applications. (See Table 4.)

Table 4.—P fertilization rates for irrigated wheat on mineral soils.

If the soil test for P is (ppm)	Apply this amount of phosphate (P_2O_5) (lb/a)*	
	Central Ore. and Klamath Co.	Remainder of eastern Ore.
0–12	60	30
12–20	30	0
over 20	0	0

*Increase the application rate by 50 percent if P is not banded.

On muck soils in the Klamath area apply 40 lb P_2O_5/a.

Potassium (K)

K fertilizers usually are not required for production of irrigated spring-planted small grain in eastern Oregon, but K responses may be obtained when soil test values for mineral soils for K are less than 100 ppm. In this case, 30 to 50 lb K_2O/a should be banded at least 2 inches from the seed at planting or plowed down before planting.

On the acid muck soils in Klamath County, small grains have responded to the application of K.

Sulfur (S)

S requirements vary with soil texture, leaching losses, and the soil parent material. S frequently is contained in fertilizers used to supply other nutrients such as N, P, and K and may be present in irrigation water, which can be tested for S content.

Plants absorb S in the form of sulfate. Fertilizer materials supply S in the form of sulfate and elemental S. Elemental S must be converted to sulfate in the soil before the S becomes available to plants. The conversion of elemental S to sulfate usually is rapid for fine-ground (less than 40-mesh) material in warm, moist soil.

Elemental S is a strong soil acidifier.

S in the sulfate form can be applied at planting time (Table 5).

Table 5.—S application rates for irrigated wheat.

If the soil test for SO_4-S in the 0–2' soil depth is (ppm)	Apply this amount of S (lb/a)*	
	Loamy soil	Sandy soil
0–3	0–20	20–40
3–5	0	0–20
over 5	0	0

*When the irrigation water contains over 2 ppm S, additional S fertilizer probably is not required.

Magnesium (Mg)

Responses of small grains to applications of Mg have not been observed on mineral soils in eastern Oregon.

Lime

Responses of wheat to lime have not been observed in eastern Oregon; however, where the soil test pH value is less than 5.5, a lime application is suggested.

On sandy soils where soil acidity is most prevalent, 1 ton of 100-score lime raises the pH about 1 unit. In most instances, 1 to 1½ tons lime/a is adequate to correct soil acidity.

Mix lime into the seedbed at least several weeks before seeding. A lime application is effective for several years.

Micronutrient Elements

In the Klamath area, a micronutrient mix containing zinc, copper, and manganese has given yield responses with small grains on muck soils.

Manure

Manure can be used as a source of nutrients for small grains. Information on the use of manure is available from your county Extension agent.

For More Information

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

Irrigated Spring-Planted Small Grains—Peat and Muck Soils (Klamath and Lake Counties), FG 70, by J. Hart (reprinted 2000).

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

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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Fertilizer and Lime Materials, FG 52, by J. Hart (reprinted 1997). No charge.

You can access the above publications, as well as FG 40, *Irrigated Wheat: Eastern Oregon—East of Cascades*, our Publications and Videos catalog, and many other publications via our Web site at **eesc.orst.edu**

Guide to fertilization based on experiments conducted by Malcolm Johnson, Vance Pumphrey, and T.L. Jackson, Oregon Agricultural Experiment Station; and Bert G. Wilcox, OSU Extension Service; and on observation of growers' results.

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