



# Oregon State University Fertilizer Guide for

OREGON STATE UNIVERSITY  
**EXTENSION SERVICE**

Extension Service, Oregon State University, Harry A. Wadsworth, director. This publication was produced and distributed in furtherance of the Acts of Congress of May 8 and June 30, 1914. Extension work is a cooperative program of Oregon State University, the U.S. Department of Agriculture, and Oregon counties. Extension invites participation in its programs and offers them equally to all people.

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## LIMING MATERIALS FOR OREGON

### LIME QUALITY

The quality of liming material is related to its degree of fineness or particle size, the chemical composition or calcium carbonate equivalent, and the moisture content.

#### FINENESS FACTOR (ff)

The ff is related to the particle size of a liming material. *The particle size affects the rate at which a liming material goes into solution in the soil.* Lime does not neutralize acidity or release its nutrients until it has dissolved. Lime particles which are less than 7/100 (7 hundredths) of an inch in diameter (particles of this size will pass through a #10 sieve) are considered to be soluble enough to be effective. Liming material particles which do not pass a #10 sieve are considered to be relatively non-effective. The degree of solubility increases as the particle size decreases from #10 to #40 sieve, with lime particles which pass a #40 sieve being given the maximum solubility rating. Solubility ratings for different particle sizes are given in the table below. Liming materials are given an ff value based on particle size; ff values are calculated as indicated below.

#### CALCIUM CARBONATE EQUIVALENT (cce)

The cce is an expression of the acid neutralizing value of a liming material compared to pure calcium carbonate. Pure calcium carbonate is given a rating of 100.

Calcium Carbonate Equivalent of Some Liming Compounds			
Common name	Chemical name	Chemical formula	cce
Ground limestone	Calcium carbonate	CaCO <sub>3</sub>	100
Dolomite	Calcium-magnesium carbonate	CaMg(CO <sub>3</sub> ) <sub>2</sub>	109
Hydrated lime	Calcium hydroxide	Ca(OH) <sub>2</sub>	135
Burned lime	Calcium oxide	CaO	179

#### MOISTURE FACTOR (mf)

As water does not reduce acidity, the acid neutralizing value of a liming material decreases on a weight basis as the moisture content increases.

$$mf = \frac{100 - \% \text{ water in lime}}{100}$$

A liming material containing 15% water would have a moisture factor,

$$mf = \frac{100-15}{100} = 0.85$$

#### LIME SCORE (ls)

The ls of a dry liming material is a numerical expression of the quality of the lime and takes ff, cce, and mf into account.

A sample calculation of an ls value is given below.

#### LIME SCORE SAMPLE CALCULATION

##### ANALYSIS OF LIMING MATERIAL

###### Sieve Analysis

Passing #10 sieve	98%
Passing #20 sieve	92%
Passing #40 sieve	78%

Neutralizing value = cce = 92

Moisture content = 15%

##### CALCULATION OF LIME SCORE

Particle size group	Percent in particle size group (A)	Solubility rating (B)	Fineness value (A) x (B)
No. 40 sieve or smaller (% passing #40 sieve)	78	1.00	78
#20-40 sieve (% passing #20 minus % passing #40 sieve)	14	0.60	8.4
#10-20 sieve (% passing #10 minus % passing #20 sieve)	6	0.30	1.8
#10 sieve or larger (100% minus % passing #10 sieve)	2	0	0
Total			88.2

$$\text{Fineness factor (ff)} = \frac{\text{Total of fineness values}}{100} = \frac{88.2}{100} = 0.88$$

$$\text{Moisture factor (mf)} = \frac{100 - \% \text{ water in lime}}{100}$$

A liming material containing 15% water would have:

$$mf = \frac{100-15}{100} = 0.85$$

Therefore, for this liming material:

$$\begin{aligned}\text{Fineness factor (ff)} &= 0.88 \\ \text{Calcium carbonate equivalent (cce)} &= 92 \\ \text{Moisture factor (mf)} &= 0.85 \\ \text{Lime score} &= \text{ff} \times \text{cce} \times \text{mf} \\ &= 0.88 \times 92 \times 0.88 \\ &= 69\end{aligned}$$

#### AMOUNT OF LIMING MATERIAL TO APPLY

Liming recommendations are based on 100-score liming material. The amount of liming material to apply should be calculated as follows:

$$\frac{\text{Recommended liming rate}}{\text{Lime score (ls)}} \times 100$$

As an example, if a liming material had a ls of 69 and the recommended liming rate was 3 T/A, then:

The rate of application of liming material =

$$\frac{3 \text{ T/A}}{69} \times 100 = 4.3 \text{ T/A}$$

*Liming recommendations are based on soil test results and vary with the soil and crop to be grown.*

A one ton/acre application of 100-score ground limestone supplies about 2 milliequivalents of calcium/100 grams of soil to the surface 6" of a mineral soil.

#### CHEMICAL COMPOSITION OF LIMING MATERIALS

Liming materials vary in chemical composition. The chemical makeup of lime has an effect on its neutralizing value and nutrient content. Ground limestone, for instance, consists of calcium carbonate and is a source of calcium. Dolomitic limestone consists of calcium carbonate and magnesium carbonate and is a source of both calcium and magnesium. Some liming materials may contain other plant nutrients.

#### KINDS OF LIMING MATERIALS

Several different kinds of liming materials are available in Oregon. These include:

#### GROUND LIMESTONE

Consists of calcium carbonate and varying amounts of impurities. This material sometimes contains small amounts of magnesium carbonate. Pure calcium carbonate (calcite) contains 40% Ca.

#### DOLOMITIC LIME

Consists of varying proportions of calcium carbonate and magnesium carbonate and varying amounts of impurities. The calcium carbonate content can vary from 5% to 55%, the magnesium carbonate content from 33% to 52%, and the magnesium content from 9% to 15%.

Dolomitic lime is commonly recommended as a liming material for acid soils which are deficient in magnesium.

#### HYDRATED LIME

Sometimes referred to as slaked lime or builder lime. Consists of calcium hydroxide with varying amounts of impurities. It is a white powder which reacts quickly when mixed with moist soil.

#### BURNED LIME

Sometimes referred to as quick lime or unslaked lime. It consists of calcium oxide and often impurities. It is a white, caustic powder which reacts quickly when mixed with moist soil. Thorough mixing with the soil is important in order to prevent the formation of granules which may harden and be unavailable.

#### BY-PRODUCT LIMING MATERIALS

Effective liming materials are produced as by-products of industrial processes such as the manufacture of cement, pulp, sugar, calcium carbide, etc. These by-products contain varying amounts of calcium and magnesium compounds and other materials. Some of the names used for these by-product materials are--sugar lime, Cotrell lime or dust, lime sludge, carbide lime and pulp mill lime.

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Reviewed by a committee from the Oregon County Extension Agents and Agricultural Experiment Station and the lime industry.