

Aglime **B**asics for Crop Production



TODAY'S AGRICULTURE is all about sustainability. Building and maintaining long-term soil productivity makes modern agriculture sustainable. Benefits of sustained high soil productivity include environmental protection, efficient use of crop inputs and greater farm profits. On those soils where acidity limits crop yields, application of aglime is a best management practice (BMP).

Proper use of aglime protects the environment, increases efficiency of fertilizer nutrients, improves the effectiveness of some herbicides and enhances crop profit potential.

Importance of Aglime to Agriculture

Proper use of aglime is one of the most important management inputs in successful crop production. Excess soil acidity is a primary constraint to high, profitable yields and long-term soil productivity. The benefits of a sound liming program are:

- Aglime improves physical, chemical and biological properties of the soil.
- Aglime improves symbiotic nitrogen (N) fixation by legumes.
- Aglime influences the availability of plant nutrients.
- Aglime reduces mineral element toxicities.



This cotton leaf shows "crinkle leaf", a symptom of manganese toxicity related to acid soil conditions.

- Aglime improves the effectiveness of certain herbicides.
- Aglime supplies calcium (Ca), magnesium (Mg) and other minerals.

Why Soils Become Acid

Soils have a natural tendency to become acid with time. Many factors, both natural and managed, contribute to soil acidity.

Natural causes include parent material, native vegetation, precipitation, flooding, and soil depth.

Factors influenced by management include crops grown, N fertilization, tillage, erosion, and organic matter decomposition.



With conservation tillage methods, crop residue decomposition and nitrification of N fertilizers lower pH in the surface zone, especially in no-till.

Determining Aglime Needs

There are a number of factors that influence the need for aglime.

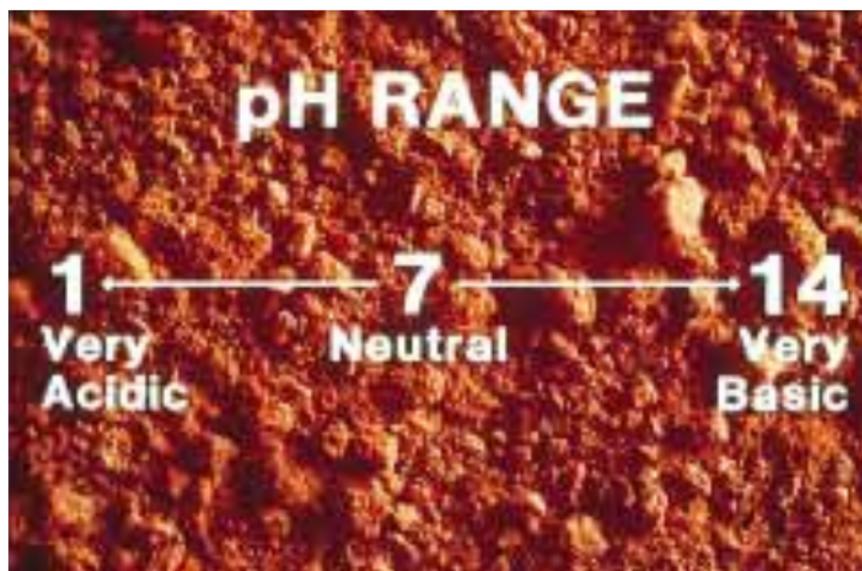
Soil pH identifies the degree of active acidity or alkalinity of the soil. It indicates the level of acidity a plant root will encounter growing in a specific soil. Used alone, it is not a good indicator of aglime needs.

Buffer capacity or cation exchange capacity (CEC) is a measure of how strongly the soil resists change in pH. It indicates how much aglime will be needed to change an acid pH to a desired level.

Crops to be grown determine the needed pH. Some are more tolerant of soil acidity than others. For example, soybeans, alfalfa, clovers and other crops respond to a pH near 7.

Soil Testing

Aglime should be applied to land only after representative soil samples have been collected and tested in a reputable soil testing lab. Aglime requirements determined by most labs are based on soil pH and some assessment of the buffering capacity. These chemical analyses provide the information needed to develop an aglime recommendation.



How to Calculate Aglime Requirements

Each state or province has its own specifications regarding aglime quality. Some recommend aglime as calcium carbonate (CaCO_3) equivalent (CCE), relative neutralizing value, or some other term. Others recommend a rate without specifying an assumed quality.

Aglime Quality and Types

Chemical composition and purity determine how much acid can be neutralized by a given amount of aglime. The physical property called “fineness of grind” determines how rapidly aglime will react and neutralize acidity. Moisture content indicates how much reactive aglime material has been replaced with water.

Purity or Neutralizing Value

Neutralizing value is expressed as a percentage of CCE, when pure CaCO_3 is set at 100 percent. The higher the CCE the greater the liming effectiveness. Some aglime, such as dolomitic limestone, can have a rating higher than 100 percent. Aglime usually contains impurities such as clays, sand and organic matter, which reduce CCE. **Table 1** lists several common aglime materials and their CCE.

Table 1. Acid neutralizing values for aglime materials.

Aglime material	Calcium carbonate equivalent, %
Calcium carbonate	100
Calcitic limestone	85 to 100
Dolomitic limestone	95 to 108
Marl (Selma chalk)	50 to 90
Calcium hydroxide(slaked lime)	120 to 135
Calcium oxide(burnt or quick lime)	150 to 175
Calcium silicate	86
Basic slag	50 to 70
Ground oyster shells	90 to 100
Cement kiln dusts	40 to 100
Wood ashes	40 to 50
Power plant ashes	25 to 50
Gypsum (land plaster)	none
By-products	variable

Table 2 shows how tonnage needs vary with different CCEs.

Table 2. Amounts of aglime materials at different CaCO_3 equivalences required to equal one ton of 100 percent CaCO_3 .

CaCO_3 equivalent of liming material, %	Pounds needed to equal one ton of pure CaCO_3
60	3,333
70	2,857
80	2,500
90	2,222
100	2,000
110	1,818

Particle Size or Fineness of Grind

High quality aglime contains a particle size distribution which allows it to react with the soil acidity in one to four years. There should be some reduction in acidity taking place immediately after application and incorporation. **Table 3** gives the effect of fineness of grind on availability of aglime.

Table 3. The effect of fineness on availability of aglime.

Mesh size	Years after application	
	1	4
	—Percent reacted—	
Coarser than 8	5	15
8 to 20	20	45
20 to 50	50	100
50 to 100	100	100

Moisture Content

Moisture content is important because water replaces an equivalent weight of reactive aglime. The more water in aglime, the lower the content of reactive material per ton of aglime product.

Applying Aglime

Aglime can be applied any time between the harvest of one crop and the planting of the next. It is usually broadcast on the soil before tillage operations and incorporated into the soil. In conservation tillage systems and on pastures and hay meadows, incorporation is not necessary. Fall applied aglime will have adequate time to react with the soil and reduce soil acidity before spring planting of crops such as corn, cotton and soybeans.

Aglime is a product for all seasons. Aglime can be applied when the soil is frozen.

- Aglime can be applied in early spring for all crops. Spring crops will benefit from applications of aglime because fine particles can react rapidly with soil acidity. Spring applications are also excellent for fall planted crops.
- Summer is a good time to lime pastures, especially those scheduled for fall fertilization and renovation.

Uniform applications and thorough incorporation of aglime in the soil are essential to a good liming program.

Key Facts about Aglime

- Aglime enhances crop growth and increases nutrient and water uptake, which helps protect the soil from wind and water erosion.
- Aglime improves soil physical, chemical and biological conditions.
- Aglime improves fertilizer nutrient efficiency by as much as 50 percent or more and boosts the effectiveness of certain herbicides.
- Aglime should be applied based on a representative soil test.
- Aglime quality is dependent on CCE, particle size, and moisture content.
- Aglime can be applied at almost any time. It is truly a product for all seasons and for all crops grown on acid soils.
- The best management decision a farmer can make is to apply appropriate amounts of quality aglime when soil acidity limits crop yields and potential profits.
- Use aglime where it is needed: For higher crop yields; for more profits per acre; for a safer, cleaner environment.

Technical information in this publication prepared by agronomic scientists of the Potash & Phosphate Institute (PPI).

For more information about aglime for profitable crop production, check **Aglime Facts**, a 16-page booklet available from the National Stone Association.

nsa National Stone Association

1415 Elliot Place, N.W. • Washington, D.C. 20007 • 202/342-1100