

# Lime Rate Adjustments Based on RNV and Depth

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Agricultural limestone quality is measured by its neutralizing value and fineness of grind. Neutralizing value is determined by calcium carbonate equivalent (CCE). The higher the CCE, the greater the limestone's ability to neutralize soil acidity. Reaction rate in the soil is affected by fineness of grind, with finer materials reacting faster with a soil to increase pH. Methods have been developed to calculate efficiency factors that involve using both CCE and material fineness. Regardless of the aglime material used, when the same amount of effective neutralizing material is applied and mixed thoroughly with the soil, the pH change in the zone of application will be the same.

**What is Relative Neutralizing Value?** The University of Kentucky has developed an efficiency factor called relative neutralizing value (RNV) that uses fineness (% passing both a 10-mesh and a 50-mesh screen) and % of calcium carbonate contained in the agricultural limestone. This calculation is explained in AGR-106 (*Determining the Quality of Aglime: Relative Neutralizing Value (RNV)*). The Kentucky Department of Agriculture takes samples twice each year from quarries and lime dealers across the state. They sieve the sample to determine fineness by separating into the two screen sizes mentioned above and analyze for calcium carbonate percentage. This information is available from quarries or dealers in the areas that they serve, and from county agents. Using this information and the AGR-106 equations, producers and county agents can calculate RNV's that compare effectiveness of available liming materials.

**How to Adjust Lime Rates Based on RNV.** A frequently asked question by crop producers is related to whether they need to adjust lime application rates based on RNV's of locally available lime. Past experience has shown that RNV calculations of available lime across the state can vary from a value of 53 to 100. With this wide variation, producers may want to consider this option, particularly when lime quality as measured and calculated as RNV is either quite low (<55) or quite high (>80) and when unadjusted recommended rates from soil test reports are above 4 tons/acre.

Table 1 gives some indication of adjustments to soil test report recommended rates that can be used, based on varying RNV's, of locally available liming materials. Recommended rates listed on the soil test report and detailed in AGR-1 (*Lime and Fertilizer Recommendations*) are based on an RNV of 67 (highlighted in the table).

Table 1. Adjusted lime rates based on soil test report recommendations and RNV of limestone available in the area..

Tons Recommended	Lime RNV*							
	53	58	67	71	75	80	90	100
----- tons/acre based on RNV adjustment -----								
1.0	1.3	1.2	<b>1.0</b>	0.9	0.8	0.8	0.75	0.7
2.0	2.5	2.3	<b>2.0</b>	1.9	1.8	1.7	1.5	1.3
3.0	3.8	3.5	<b>3.0</b>	2.8	2.7	2.5	2.25	2.0
4.0	5.1	4.6	<b>4.0</b>	3.8	3.6	3.4	3.0	2.7
5.0	6.3	5.8	<b>5.0</b>	4.7	4.5	4.2	3.7	3.4
6.0	7.6	6.9	<b>6.0</b>	5.7	5.4	5.0	4.5	4.0
7.0	8.8	8.1	<b>7.0</b>	6.6	6.25	5.9	5.2	4.7

\*RNV as determined from using information in AGR-106 and applying it to ag lime test results from the Kentucky Department of Agriculture.

**Amount of Soil Affected by Recommended Lime Rates.** Another important factor in getting intended neutralization of applied liming materials, is the amount of soil that the lime either will be mixed with, or that the recommended rate is designed to affect. Lime recommendations from the University of Kentucky are intended to either be thoroughly mixed with or effectively neutralize 6 2/3 inches of soil. Often times with more intensive tillage (moldboarding or chiseling), the lime is mixed with a greater soil depth. This often leads to lesser neutralization of soil acidity which results in soil pH's that were not increased to levels intended for a given lime recommendation. Although some may question whether recommended lime rates should be adjusted for no-tillage fields, since it is not mixed into the soil, UK research at both Princeton and Lexington has shown that no adjustment either in rate or frequency of application is necessary.

Table 2 lists factors that a lime recommendation from a soil test report or adjustment from Table 1 should be further multiplied by to account for mixing depth due to tillage operations after applying the agricultural limestone.

Table 2. Conversions for tillage mixing depth to multiply AGR-1\* recommended or adjusted rates from Table 1.

Tillage depth	Multiplying Factor
8 inches	1.20
9 inches	1.35

10 inches

1.50

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\*AGR-1 recommended rates are based on mixing depth of 6 2/3 inches.

**Summary.** The total lime application can be adjusted (increased or decreased) to reflect both quality (RNV) and tillage depth (usually increased) to obtain the intended soil neutralization. This lack of adjustment particularly for tillage depth is a major reason why recommended lime rates may not be achieving the desired soil pH changes in many intensive tillage mixing situations. Producers may need to carefully evaluate whether to reduce total lime rates to less than 2 tons/acre due to lime spreader equipment limitations.

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